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With the Compliments of

ALEXANDER AGASSIZ.

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1889-90.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
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UNIVERSITY MUSEUM, OXFORD STREET FACADE.

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FACULTY OF THE MUSEUM.

CHARLES W. ELIOT, *President.*

ALEXANDER AGASSIZ, *Curator.* GEORGE L. GOODALE.

JOSIAH D. WHITNEY, *Secretary.* HENRY P. BOWDITCH.

OFFICERS.

ALEXANDER AGASSIZ . . .	*Curator.*
JOSIAH D. WHITNEY	*Sturgis-Hooper Professor of Geology.*
HERMANN A. HAGEN	*Professor of Entomology.*
NATHANIEL S. SHALER . . .	*Professor of Palæontology.*
E. L. MARK	*Hersey Professor of Anatomy.*
W. M. DAVIS	*Assistant Professor of Geography.*
J. ELIOT WOLFF	*Instructor in Petrography.*
THADDEUS W. HARRIS . . .	*Instructor in Geology.*
G. HOWARD PARKER	*Instructor in Zoölogy.*
WALTER FAXON	*Assistant in Zoölogy.*
D. D. SLADE	*Assistant in Osteology.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER	*Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT	*Assistant in Palæontology.*
W. M. WOODWORTH	*Assistant in the Zoölogical Laboratory.*
W. E. RITTER	*Assistant in the Zoölogical Laboratory.*
R. S. TARR	*Assistant in the Geological Laboratory.*
R. DEC.	*Assistant in the Geographical Laboratory.*
MISS F. M. SLACK	*Librarian.*

REPORT.

To the President and Fellows of Harvard College: —

During the past year the usual courses of instruction have been given at the Museum in Zoölogy by Professor Mark and Mr. Parker, assisted by Mr. C. B. Davenport in the Laboratory work. Dr. Slade has given a course in Osteology.

Professor Farlow, assisted by Mr. W. A. Setchell, has given the botanical part of the introductory course of Natural History. Professors Whitney, Shaler, and Davis, and Dr. J. E. Wolff gave the usual courses in Geology, Palæontology, Physical Geography, and Petrography. Messrs. Harris and Cobb were the Assistants in the Undergraduate instruction of the Geological Department.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

The Assistants of the Museum, Professors Hagen and Faxon, Dr. Slade, Messrs. Garman and Brewster, and Professor Hyatt, have devoted a good share of their time in supplying specialists with material and information in their various departments.

The Geological Section of the Museum, containing the Exhibition Rooms and additional Laboratories of that department, is now ready for occupancy. On the first floor, it contains a large lecture-room, with a seating capacity of 320 students. On the second floor are placed the Petrographical Laboratories, — one for general use, the other for advanced students. In the basement are found a Chemical Laboratory, a room for grinding rocks, and a photographic room. The fourth floor is occupied

by the two Laboratories of the Physical Geography Department, with a room for modelling in the basement. On the third floor, the two Exhibition Rooms assigned to the Geological and Geographical Collections connect the Exhibition Rooms of the Museum of Comparative Zoölogy with these of the Botanical and Mineralogical Departments. These, in their turn, will eventually open into the Exhibition Rooms of the southwest corner piece adjoining those of the Peabody Museum.

I have annexed to this Report a view of the University Museum, as seen facing the northwest corner, including the newly erected Mineralogical Sections.

Messrs. W. M. Woodworth, W. Whitney, and G. H. Parker availed themselves of the facilities offered by the United States Fish Commission Station at Wood's Holl, for which the Museum is specially indebted to Colonel McDonald, U. S. Fish Commissioner. These gentlemen, as well as Messrs. C. B. Davenport, W. E. Ritter, and Professor Mark, spent some time at the Newport Marine Laboratory, either collecting material for future investigation, or carrying on special work in the embryology of Bryozoa, Annelids, Crustacea, Echinoderms, and Polyps. Mr. Woodworth spent a few days at the opening of the season in putting the Newport Laboratory in order for the reception of students.

The Museum has been fortunate enough to secure a fine skeleton of a Sperm Whale, about fifty feet in length. It was obtained through the kindness of Consul Dabney of Fayal, and is now in the hands of Professor Ward for mounting.

We have continued to make a few purchases, mainly to fill gaps in our Exhibition Rooms. Skins of some of the larger Selachians and Fishes have been mounted by Ward for the Atlantic and Pacific Exhibition Rooms. A fine Sea Elephant has been placed in the Atlantic Room. Otherwise, few changes have taken place in the Exhibition Rooms. The collections open to the public remain in a satisfactory condition, in spite of the constantly increasing number of visitors, and the crowded condition of the rooms on holidays and Sundays.

The Museum is again indebted to Messrs. Brewster and Cabot, Professor Faxon, and Dr. Slade, for the interest they have taken in their respective departments, and for the care they have given to the collections in their charge.

Material has been sent for study to Dr. Paul Meyer of Naples, to Professor Goette of Strasburg, to Baron Selys-Longchamps, and to Dr. Richard Semon. The Marquis of Doria has kindly undertaken a revision of our collection of Bats. Exchanges have been made with the Museum of the Academy of Sciences of St. Petersburg, through Prof. A. Strauch; the Museo Civico of Milan, through M. Belloti; the Jardin des Plantes, through Prof. L. Vaillant; the K. K. Hofnaturalien Cabinet (Dr. F. Steindachner); the British Museum (Dr. A. Günther); the University Museum of Christiana (Professor Collet); the University Museum of Berlin (Professor Möbius); Professor Ehlers of Göttingen; Professor Lütken of the University Museum of Copenhagen; Dr. E. Ramsay of the Australian Museum of New South Wales at Sidney; C. W. De Vis of the Queensland Museum at Brisbane; and with the National Museum at Washington. A few minor exchanges are also mentioned in the special reports of the Museum Assistants.

Of the Blake Collections, those in the hands of Professor Verrill have not yet been returned. Professor Perrier and Professor Milne-Edwards have retained a part of the Blake Collections, while working up the collections of the "Talisman." Dr. P. H. Carpenter has continued his work on the Report of the "Blake" Comatulæ; the proofs of several of the plates to accompany his Report have been received.

Professor Huxley has returned the Spirula dredged by the "Blake" off Grenada, which was sent him for comparison while writing his Monograph on the species of Spirulæ collected by the "Challenger."

Messrs. Scott and Osborn have returned the larger part of the second and third instalments of the Western Vertebrates sent them for study. This material has greatly increased in value, not only from the work they have done upon it in the way of cleaning and repairing the specimens, but also from the careful study they have bestowed upon the part of the collections of Western fossils which have been placed in their hands. They have sent the manuscript and drawings for a second Bulletin on the Fossil Mammals from the White River and Loup Fork Formations, which is now in press.

A number of exceptionally fine or interesting Crinoids have been sent to Messrs. Wachsmuth and Springer for study, to assist

them in the preparation of their magnificent Monograph of the Palæozoic Crinoids. The Curator of the Museum has always felt special interest in this monograph ; it owes its origin to the work of Mr. Wachsmuth, based upon his original collection now in the Museum. On the death of Professor Agassiz, when Mr. Wachsmuth left Cambridge, he started a new collection, and, with the assistance of his devoted and indefatigable collaborator, has brought together a second collection, unique in its way, which has become well known to palæontologists from the "Revision of the Palæocrinoids." It is hoped that some arrangement may be made by which the publication of this monograph, so much of which is based upon the work of Mr. Wachsmuth on the collection now in Cambridge, may eventually appear in the Memoirs of the Museum.

It will be seen from the special Reports of the Assistants, that the collections of the Museum continue in good condition, and that the Assistants not only have been active in the increase and care of the collections in their charge, but have been able to devote considerable time to original work, as shown by the lists of the publications of each Department accompanying the special Reports.

Appendix A of this Report contains a list of the publications of the Museum issued during the past academic year.

We have published twelve numbers of the Bulletin, four in the Geological, and eight in the Zoölogical Series. One number of the Memoirs, "The Genesis of the Arietidæ," by Professor Hyatt, has been published jointly with the Smithsonian Institution. This important memoir has been in preparation by Professor Hyatt for a number of years, and is an important contribution to the palæontological history of the Cephalopods.

A number of Bulletins are in preparation, representing the work of the students of the Zoölogical Laboratory in charge of Professor Mark.

Mr. Louis Cabot is preparing the final part of his Memoir on the Immature State of the Odonata.

Mr. Garman is preparing for the press a monograph on the Liparidæ, commenced several years ago by Professor Putnam. He has also nearly completed an account of the North American Reptiles. The second part of the Memoir on the Development of Osseous Fishes, by Professor Whitman and myself, is nearly

completed, and I have made good progress in the preparation of my Monograph on Calamocrinus, of which twenty plates have been completed.

The accessions to the Library show a decided increase in number even over the past year, which had shown the greatest accessions thus far received.

Special efforts having been made to interest the Visiting Committees of the Overseers in the affairs of the different departments of the University, I herewith add the Report which was prepared for the Committee on the University Museum.

"When Professor Goodale succeeded in obtaining the necessary funds for an extension of the University Museum in order to accommodate the Botanical Department, it became necessary that the Museum of Comparative Zoölogy should obtain means for building a section to connect the Natural History Laboratories with the Botanical Section.

"All attempts to obtain this from outside sources having failed, the Curator applied to the Corporation to advance the funds needed for the building and its equipment, so as to make it available for the Petrographical, Geographical, and Geological Departments. This the Corporation has done, and, as on former occasions, these advances, amounting to about $25,000, will have to be repaid from the income of the Museum. This will naturally cripple our resources for six or seven years, unless the sum can be provided for the Museum by the friends of the Geological Department. The Geological Section, now finished, completes the plan of the Laboratories for the Zoölogical, Geological, and Geographical Departments, and we are now well provided with Laboratories, though their equipment still leaves a good deal to be desired, as also in the way of models for the Geographical and Geological Departments, and in the fitting up of the Vivarium and Aquarium for the Zoölogical Department. For these objects an additional $8,000 is required. Ample room is now provided for the exhibition of everything that is likely to interest the public, and this space need never be enlarged, while the efficiency of the exhibit can always be improved by culling out poor specimens and replacing them by better or more interesting types. Of course the University may, in the course of time, outgrow the Laboratories, but there is ample room for their expansion in the corner piece which is eventually to connect the main building of

the University Museum with the Peabody Museum, forming the South Wing of the structure.

"There is, however, one point in the organization of the Museum to which I should like to call attention. Nearly two thirds of the North Wing, the part of our structure called the Museum of Comparative Zoölogy, is devoted to the storage of our collections intended for study and not for exhibition. I can safely say that there is no Museum in which the system of storage of both dry and alcoholic specimens is so convenient for access as that of the Museum collection. Special rooms are devoted to special subjects, and they are so arranged that a number of specialists could work at the same time on any part of the collections without inconvenience. For the alcoholic collections two rooms, 30 by 40 feet, are reserved in the basement for such use. In the rooms containing the dry collection (both recent and fossil) the space adjoining the windows has been equipped with tables, so that a large space is everywhere left, ample for the needs of specialists interested in any part of our collection. This space is an equivalent of 8 by 40 feet in each of the nineteen rooms in which the collections are stored. It is this part of the Museum which I should like to make more available to students and specialists. But without a larger staff to oversee the rooms while they may be occupied, it is impossible to grant the unrestricted use of our collections to those who might avail themselves of the facilities we are able to give for study.

"The practice of sending collections to specialists for study is ruinous to the specimens; each invoice involves considerable work on the part of the Assistants, and the danger of misplacing labels during the packing and unpacking is very considerable. So that in the future we shall be obliged, on the ground of safety for our collections, to refuse to send specimens out of the building, and invite the specialists to avail themselves of our facilities on the spot. The staff of the Museum is somewhat crippled at present, there being no Assistant in charge of the Invertebrates. As this collection can, however, be otherwise cared for, it has been decided by the Museum Faculty not to fill this place until the Museum is out of debt. I would also call attention to the necessity of having a regular Assistant for the care of our Vertebrate Fossil Collections. These are already quite extensive, and the collections we are likely to receive in the future from the

West must of necessity be very large. But at present the Museum has no means to pay such an Assistant, nor have we the means to spend from $5,000 to $6,000 annually for a number of years in making explorations of Western territories in order to fill our gaps, both in the fossils of the various well known Western fossiliferous beds, and in the systematic series of fossils which are found there. The Assistant in charge of the collection of Skeletons of Mammals receives no remuneration from the Museum.

"The Museum publications are strictly limited to the work done in the Museum by the Professors and their Assistants, and the students of the various Laboratories, or to the work of specialists based upon the Museum collections.

"The arrangement of our Palæontological Rooms progresses very slowly, mainly for want of funds for the necessary cases. It would require about $20,000 to place on exhibition a suitable selection of our fossils."

Provision has been made by borrowing the needed funds from the Corporation for the greater part of the fossils for the Tertiary Rooms, which promise to be our most valuable and instructive Exhibition Rooms. The acquisition of a fine series of Pampas Mammals, obtained through the agency of Professor Henry A. Ward, including mountable skeletons of Mylodon, Glyptodon, Lestodon, Scelidotherium, and Toxodon, will necessitate a redistribution of the space assigned to the Tertiary Faunæ. In order to provide for the North American Tertiary Mammals, two rooms at least will be required, which can be advantageously filled with interesting and instructive specimens for exhibition, and the Mesozoic and Palæozoic Faunæ will each have to be limited to one room.

ALEXANDER AGASSIZ.

Cambridge, October 1, 1890.

REPORT ON THE GEOLOGICAL DEPARTMENT.

By Josiah D. Whitney, *Sturgis-Hooper Professor of Geology.*

During the year a course of lectures on Economical Geology was given. This course (twice a week, lasting through the College year) was attended by about twenty students, mostly Seniors and candidates for higher degrees.

The time of the Professor in this department, when not engaged in lecturing or preparing for lectures, has been mostly given to the continuation of the work on the Century Dictionary, which has now reached the end of the letter R, and will be completed as originally planned, and laid before the public, in about eight months.

The collections of rocks made by and under the direction of the Sturgis-Hooper Professor in former years have been removed to the new Palæontological Rooms and placed in charge of the Professor of Petrography. These collections embrace a wide field, principally representing the western side of North America, Mexico, and parts of Central America. There is also a fine representation of the rocks of San Domingo, the same being the collection made by Mr. W. M. Gabb during his survey of that region. There is also a large collection of rocks made by Mr. Diller, while connected with the Assos expedition. All the specimens are of good size and in perfect order. There are also about three thousand slides belonging to these specimens, made in former years at the expense of the Sturgis-Hooper Professor. A portion of these slides are still in possession of Mr. Wadsworth, formerly Instructor in Petrography in this institution. A report on the rocks to which these slides belong is still expected from Mr. Wadsworth, and he has recently promised to have the same in readiness by the year 1892.

A small amount of field-work has been done by the Sturgis-Hooper Professor in continuation of that carried on in previous years with reference to the surface geology and glacial phenomena of North America, and the general subject of climatic change.

REPORT

ON THE INSTRUCTION IN GEOLOGY, PALÆONTOLOGY, PHYSICAL GEOGRAPHY, AND PETROGRAPHY.

By Professors N. S. Shaler and W. M. Davis, and Dr. J. E. Wolff.

During the Academic year 1889–90, the following courses of instruction were given in the Geological and Palæontological Laboratory, and in the field, by the instructors in the department.

1. N. H. 4. A course in Elementary Geology, by N. S. Shaler. Two lectures a week, with certain required reading; attended by one hundred and sixty students.

2. N. H. 4 *a*. A course of Practical Geological Exercises in the Laboratory and in the field, by Mr. T. W. Hartis, assisted by Mr. Collier Cobb, designed especially for those who intend in subsequent years to continue the study of Geology and Palæontology; attended by sixty-six students.

3. N. H. 8. A course of Advanced Geology, two lectures a week, by N. S. Shaler, together with assigned field-work, conducted by W. M. Davis and J. E. Wolff. Students in this course were required during the winter to prepare a thesis on an assigned subject. Those only who have passed a satisfactory examination in the elementary courses are permitted to attend. Fifty persons received this instruction.

4. N. H. 14. A course on Palæontology, by N. S. Shaler. Two lectures a week, with laboratory work and theses. Twelve students took this course.

5. N. H. 15. A course in Historical Geology, by N. S. Shaler, designed to train students in the determination of geological horizons; attended by one student.

6. N. H. 16. A course in field-work, designed to afford special training in the processes of geological surveying, by N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris; attended by seven students.

During the winter season the students in advanced classes attended regular evening meetings designed to serve the purpose accomplished by the Seminaria of the German Universities.

During the summer of 1890, forty-two students received instruction in the field. This instruction was given in three graded schools, one of which, the elementary school, was taught in Cambridge, and the other two in New York, Connecticut, Massachusetts, New Hampshire, and Maine. Instruction in these courses was given by N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris, with the assistance of Prof. H. S. Williams of Cornell University and Dr. W. B. Clarke of Johns Hopkins, who collaborated with the other instructors in the work done in New York and Massachusetts.

During the year, the following books and papers of a scientific nature have been published by N. S. Shaler: —

1. Aspects of the Earth. The Popular Account of some Familiar Geological Phenomena. New York, Charles Scribner's Sons, 1889, pp. xix. and 344. Sixty-eight Illustrations.

2. The Geology of the Island of Mt. Desert, Me. Eighth Annual Report of the Director of the United States Geological Survey, pp. 987–1061. Thirty Illustrations and Two Maps. Washington, D. C., Government Printing Office, 1889.

3. Soils of Massachusetts. A Lecture delivered at the Annual Meeting of the Massachusetts State Board of Agriculture, February 6, 1890. Wright and Potter Printing Co., State Printers, Boston, 1890, pp. 16.

4. The Topography of Florida, with a Note by Alexander Agassiz. Bulletin of the Museum of Comparative Zoölogy, Vol. XVI., No. 7, pp. 139–158. With One Map.

5. Tertiary and Cretaceous Deposits of Eastern Massachusetts. Bulletin of the Geological Society of America, Vol. I. pp. 443–452. With One Plate.

The course in Elementary Physical Geography and Meteorology (Natural History 1) was again in the hands of Professor Davis. It was attended by seventy students. The increasing development of laboratory methods in this course make the employment of an Assistant desirable in the coming year. The advanced course in the same subjects was attended by one Graduate and one Senior.

The most important additions to the collections of the Laboratory during the year was a set of colored plaster models,

designed by Professor Albert Heim, of Zurich. These represent a glacier in a lofty Alpine region; a torrent in a mountain region of less altitude; a bold coast line, with bars and dunes; and a volcanic island with a variety of cinder cones and lava flows. King's plaster models of Wisconsin have also been secured. A number of valuable maps have also been purchased, among which Haardt's Map of the Alpine System may be mentioned as the most successful representation of a great mountain range. A considerable number of smaller maps from various sources have been mounted on cardboard for use in the class-room.

During the period of the mid-year examinations, Professor Davis visited Baltimore to deliver a short course of lectures on Meteorology to the class in Physical Geography at Johns Hopkins University. In the April recess, he accompanied a party of students to the valley of the Upper Passaic, in New Jersey, to trace out the shore lines of a reputed glacial lake; the evidence discovered was incomplete, and somewhat contradictory. An account of the excursion was read to the Harvard Natural History Society by R. E. Dodge, of the Senior Class.

The following papers have been published during the year by W. M. Davis: —

Structure and Origin of Glacial Sand Plains. Bull. Geol. Sci. America, Vol. I., 1890, pp. 192–202, Plate III.

The Geographic Development of Northern New Jersey, by W. M. Davis and J. Walter Wood, Jr. Proc. Bost. Soc. Nat. Hist., Vol. XXIV., 1889, pp. 365–423.

The Rivers of Northern New Jersey, with Notes on the Classification of Rivers in General. Nat. Geogr. Mag., Vol. II., 1890, pp. 81–110.

The Intrusive and Extrusive Triassic Trap Sheets of the Connecticut Valley, by W. M. Davis and Charles Livy Whittle. Bulletin of the Museum of Comparative Zoölogy, Vol. XVI. (Geol. Series, Vol. II.), 1889, pp. 99–138. With Five Plates.

Ferrel's Convectional Theory of Tornadoes, by W. M. Davis and Charles Emerson Curry. Amer. Met. Journ., Vol. VI., 1889–90, pp. 337–349, 418–431, 448–463.

Dr. Hann's Studies on Cyclones and Anti-Cyclones. Science, May 30, 1890.

An Outline of Meteorology. Abstract of Six Lectures delivered to the Class in Physical Geography at the Johns Hopkins University in January, 1890. Johns Hopkins University Circular, May, 1890.

Secular Changes in Climate. A Paper read at the Eighteenth Meeting

of the New England Meteorological Society at Providence, R. I., April 15, 1890. Amer. Met. Journ., Vol. VII., 1890, pp. 67–78.

Types of New England Weather, in Investigations of the New England Meteorological Society, reprinted from the Annals of the Astron. Observatory of Harvard College, Vol. XXI., Part II., pp. 116–137.

An Investigation of the Sea-Breeze, by W. M. Davis, L. G. Schultz, and R. DeC. Ward, Ibid., pp. 215–263. With Eight Plates.

Reviews of Ferrel's Popular Treatise on the Winds. Nation; Science. February 28, 1890.

Review of Blanford's Climates and Weather of India. Nation; Science.

Review of Wright's Ice Age in North America. Nation.

In Petrography instruction was given by Dr. Wolff during the year to three advanced students engaged in special investigation. This comprised the "Novaculite of Arkansas," the "Crystalline Rocks of the Narragansett Basin in Rhode Island," and the "Eruptive and Stratified Rocks of Essex County, Massachusetts."

The following contributions from the Petrographical Laboratory were published as Museum Bulletins: —

On Peratophyre from Marblehead Neck, Massachusetts, by John H. Sears.

On some Occurrences of Ottrelite and Ilmenite Schist in New England, by J. E. Wolff.

In the spring the rock collections and Laboratory equipment and the Whitney collection of rocks were moved into the upper rooms of the Petrographical Laboratory in the new Geological Section of the Museum, and the Chemical Laboratory and rock section machinery into the basement.

The Instructor continued during the year his study of the Crystalline Schists of the Eastern United States.

REPORT ON THE INSTRUCTION IN BIOLOGY.*

By Professors Farlow and Mark, Dr. D. D. Slade, and Mr. G. H. Parker.

The courses of instruction in Zoölogy for the Academic year 1889–90 were the same as in the preceding year, and were carried on by the same instructors.

There were eighty students in Nat. Hist. 2: one Graduate, ten Seniors, eleven Juniors, nineteen Sophomores, twenty-six Freshmen, seven Specials, and six Scientific Students. For laboratory work the class was, as usual, divided into sections. The Assistants were Mr. C. B. Davenport and Mr. N. B. Potter.

In Nat. Hist. 13 there were eight students. The lectures were increased somewhat beyond those of the previous year, and with the laboratory work embraced the anatomy and histology of Hydra, Asteracanthion, Tænia, and Lumbricus. Mr. W. M. Woodworth was assistant in the course.

There were eight persons in Nat. Hist. 9, all but one of them being Graduates. Early in the year Mr. Parker completed a paper on "The Eyes in Blind Cray-fishes," and he has also made considerable progress with his investigations on the comparative histology and development of the compound eyes in Crustacea. The plates illustrating an extended paper by Mr. C. B. Davenport on "Cristatella, the Origin and Development of the Individual in the Colony," have already been completed by the lithographer, and the text has been ready for the printer for some time. Mr. W. E. Ritter has written a paper on "The Parietal Eye in some Lizards from the Western United States," and Mr. W. M. Woodworth has completed the first of his studies on an interesting fresh-water Planarian, the title of his paper being, "Contributions to the Morphology of Turbellaria. I. On the Structure of Phagocata gracilis, Leidy." The engraving of

* Professor Farlow's Report will hereafter appear with the Report of the Botanical Department.

the plates for Mr. E. R. Boyer's article "On the Mesoderm in Teleosts, especially the Source of the Mesodermic Elements which form the Limb-Bud," is in progress; and papers by Mr. W. Whitney, "Notes on the Nervous System of Thyone briareus, Lesueur," and by Mr. H. P. Johnson, "Studies on Direct Nuclear Division," are also finished.

These papers will all be published in the Museum Bulletin as rapidly as the plates illustrating them can be engraved.

Since the last Annual Report Nos. XV., XVI., and XVII. of the "Contributions from the Zoölogical Laboratory" have been issued in the Museum Bulletin, viz.: — XV. Studies on Lepidosteus, by E. L. Mark, (9 plates,) February, 1890. — XVI. On the Egg Membranes and Micropyle of some Osseous Fishes, by C. H. Eigenmann, (3 plates,) March, 1890. — XVII. The Histology and Development of the Eye in the Lobster, by G. H. Parker, (4 plates,) May, 1890.

The meetings of the Zoölogical Club have been continued with regularity, and with the usual interest.

The instruction in Comparative Osteology, in charge of Dr. D. D. Slade, Nat. Hist. 21, during the academic year 1889–90, has been given by means of lectures, laboratory work, and frequent examinations. The course has been followed by two Seniors, two Graduates, and by three Special Students.

The course Nat. Hist. 5 was conducted in 1889–90 on the same plan as in the previous year, by Mr. G. H. Parker and Professor W. G. Farlow, assisted by Mr. W. A. Setchell. The number of students taking the course was larger than in any previous year, and inasmuch as the room was necessarily also occupied during a part of the time by the members of another course, whose students were more numerous than usual, it required careful arrangement to provide each student with the amount of space necessary for good work. The completion of the new Botanical Rooms, in which, in the future, the instruction of the botanical portion of Nat. Hist. 5 will be given, will relieve the crowding unavoidable during the present year.

The number of students taking Nat. Hist. 23 was also larger than usual, and, it being impossible to find places for them all in the Reptile Room, where the course had been given for the past few years, by the kindness of the Director of the Museum the class was allowed to use temporarily one of the new Geological

Rooms, which was fitted up for the purpose. Hereafter this course will be given in one of the new Botanical Laboratories, much to the relief of the other Laboratories, in which we have been for several years placed awaiting the completion of our new rooms.

The course in research in Cryptogamic Botany, Nat. Hist. 12, was taken by four students, two of whom received the degree of Ph. D., and one the degree of S. B., in June, 1890. Of the former, Mr. W. A. Setchell presented as a doctor's thesis a paper on the "Structure of some Laminariaceæ," which is to be printed soon. Mr. Setchell also published during the year a paper, "Concerning the Structure and Development of *Tuomeya fluviatilis*, Harv." Mr. W. C. Sturgis presented for his doctor's thesis a paper on the "Carpologic Structure and Development of the Collemaceæ and allied Groups." The two last named papers appeared in the Proceedings of the American Academy of Arts and Sciences. The thesis presented by Mr. G. J. Pierce, on "*Corticium Oakesii*, B. & C., and *Michenera artocreus*, B. & C.," is soon to be published. Mr. H. M. Richards also presented a paper entitled "Notes on *Zonaria variegata*, Lamx.," which has already appeared in the Proceedings of the American Academy of Arts and Sciences.

REPORT ON THE OSTEOLOGICAL DEPARTMENT.

By D. D. Slade.

The collection has received no additions during the past year, although such would be very desirable, especially in the orders of the Insectivora and Cheiroptera. It has been consulted by gentlemen connected with the other departments of the University for the purposes of special study and comparison. Occasional specimens have been brought in by strangers for determination.

The entire collection is in good condition, and has received no material damage by its use for illustration and study. No specimens have been lost.

A paper in Science, July 25, 1890, on "The Absence of the Patella in Marsupials," has been published; also nearly ready for publication, "The Significance of the Zugal Arch in the Mammalia."

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

The past year has been singularly uneventful as far as this department is concerned. Only two specimens have been given to the Museum; a star-nosed mole, by Miss Jennie White, and a parrot, by Mr. F. W. Story. The latter is in Ward's hands for mounting. A dusky duck (*Anas obscura*), a cormorant (*Phalacrocorax carbo*), a gannet (*Sula bassana*), and a brant (*Branta bernicla*), have been purchased by Mr. Agassiz for the mounted collection in the Atlantic Room.

By an exchange with the American Museum of New York, the Cambridge Museum has also received fourteen skins of ground squirrels of the genus Tamias, representing about eight species new to our collection.

The following material has been lent to specialists for study and elaboration: to Mr. J. A. Allen the entire series of skins of mice (*Muridæ*) and ground squirrels (*Tamias*); to Mr. D. J. Elliot certain specimens of the woodhewers or tree-creepers (*Dendrocolaptidæ*); to the Marquis Doria, of Genoa, all the bats and some of the moles in the Alcoholic Collection.

Mr. Allen has returned the ground squirrels after carefully identifying and labelling them in accordance with his late rearrangement * of this difficult group. He still retains the mice, pending the completion of his study of that family.

Mr. Elliot's investigations have resulted in a paper entitled "A Study of the Genus Dendrornis and its Species." †

Nothing has yet been done towards the rearrangement of the Alcoholic Collection of Birds, which at present is not in condition

* See "A Review of the North American Ground Squirrels of the Genus Tamias." Bull. Am. Mus. Nat. Hist., Vol. III., No. 1, May, 1890, pp. 45–116.

† The Auk, Vol. VII., No. 2, April, 1890, pp. 160–189.

for convenient reference. The other collections in this department are in excellent order, and wholly free from insect pests.

The Assistant has published the following notes and papers in "The Auk": —

"The Present Status of the Wild Pigeon (*Ectopistes migratorius*) as a Bird of the United States, with some Notes on its Habits."

"Birds through an Opera Glass." (Review of a book by Miss Florence A. Merriam.)

"Nesting Habits of the Parrakeet (*Conurus carolinensis*)."

"Melanerpes carolinus eating Oranges."

"The Little Brown Crane (*Grus canadensis*) in Rhode Island."

"Capture of a Canada Jay (*Perisoreus canadensis*) near Cambridge, Massachusetts."

"Bullock's Oriole in Maine."

"Recent Occurrence of the Turkey Vulture in Eastern Massachusetts."

"Capture of a Third Specimen of the Barn Owl in Massachusetts."

"Food of Young Humming-birds."

"The Purple Grackle at Charleston, South Carolina."

"The Acadian Sharp-tailed Sparrow and Scott's Seaside Sparrow on the Coast of South Carolina."

In "Forest and Stream": —

Two notes without formal titles relating to the occurrence of the Evening Grosbeak (*Coccothraustes vespertina*) in New England.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

Comprehensive series of the Fishes have been sent as exchanges to the Australian Museum of Sydney, the British Museum of London, the Imperial Academy of Sciences of St. Petersburg, the K. Gesellschaft der Wissenschaften of Göttingen, the K. K. Academie der Wissenschaften of Vienna, the Königl. Zoologische Sammlung of Berlin, the Museo Civico of Milan, the Museum d'Histoire Naturelle of Paris, the Queensland Museum of Brisbane, the Smithsonian Institution of Washington, the Universitetets Zoologiske Museum of Copenhagen, and the Zoolog. Museum Universitetet of Christiania. To the shipment for St. Petersburg there was added a series of the Reptiles and Batrachians. Other Fishes and Reptiles were furnished Prof. A. Goette, Dr. R. Semon, Prof. B. G. Wilder, and the instructors and students of the University.

We are pleased to acknowledge the following receipts: — Yucatan Reptiles and Batrachians from the Hon. Edward Thompson; a large number of Missouri Cave Animals, both vertebrates and invertebrates, from Miss Ruth Coffin; various lots of New England species, from Miss Reed, Messrs. Frank Bolles, N. Vickary, W. J. Wright, and Dr. L. C. Jones; Mississippi Valley species, from Professors H. Garman and G. H. Parker; and California Reptiles, from Mr. W. E. Ritter. An excellent collection of Reptiles, Batrachians, Fishes, and Selachians was received from the Australian Museum, and a valuable representation of Pacific Coast Fishes from Prof. C. H. Eigenmann. Important additions of Tropical Reptiles and Batrachians have been made by exchanges with Mr. N. L. Wilson. A number of purchases of desiderata from South America and the Old World have contributed materially to the completeness of the collections. With rare exceptions, all arrivals were good in kind and condition.

The mounted specimens of Sharks and Skates, returned by Professor Ward, add greatly to the attractiveness of the Atlantic Room.

As heretofore, in taking care of the material attention has not been confined to the Reptiles and Fishes.

The publications concerning these departments include "A Revision of the Edentulous Genera of Curimatinæ," by Carl H. Eigenmann and Mrs. R. S. Eigenmann, in the Annals of the New York Academy of Science, Vol. IV., and the following by the present writer, besides unsigned reviews, notices, and articles less directly connected with ichthyology and herpetology.

In the Bulletin of the Museum: —

"Cave Animals from Southwestern Missouri."

In the Bulletin of the Essex Institute: —

"On the Species of the Genus Chalcinus."
"On Species of Gasteropelecus."
"On Species of Cynopotamus."
"On the Species of Anostomus."

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

By Dr. H. A. Hagen.

The collection is in very good condition. The vulcanized stoppers of the small vials in the Biological Collection had to be changed for pure rubber stoppers. (See Canad. Entom., 1886, Experience with Rubber Stoppers in the Biological Collection.) The larger vials were in good order; of the medium size, representing the largest number in the collection, very few needed a change of the stoppers. The importance of the subject had induced me to make observations through a number of years. A test vial of the medium size, 70 mm. long, 16 mm. broad, was filled, October, 1873. The air bubble retained in the vial was carefully measured, and was 14 mm. long; next summer it was smaller, owing to the greater expansion of the alcohol, proving at the same time the close fitting of the stopper. 14 November, 1880, the bubble was 20 mm. long; 12 November, 1888, it was 30 mm.; 10 August, 1890, it was 40 mm. long. So it can probably stay many years longer without refilling.

The collection of Dr. John L. LeConte has been placed in the new cabinets presented last year to the Museum by Mrs. LeConte. They are the best ever provided for the Museum. Each box is marked "LeConte's Collection," and all are numbered as separate series. Each box contains two of the original boxes, with the original covers. Sufficient space is left to arrange some parts too much crowded in the old boxes. The whole collection is in excellent condition, and free of pests. It is impossible to suggest a better and safer arrangement for such a valuable treasure.

Six new cabinets have been received for the Museum Collection.

Additions have been received from Mr. F. Blake, Weston, Mass., Insects collected in Peoria, Illinois; Mr. P. H. Dudley,

NewYork, an interesting lot of White Ants from Panama; Mr. F. W. Putnam, Cambridge, a Bombus nest with parasites from Ohio; Mr. J. G. Jack of the Arboretum, additions to the Biological Collection; Mr. D. W. Coquillett, Los Angeles, Cal., Neuroptera; Mr. Sam. Henshaw, Cambridge, additions to the Biological Collection; and from Dr. Henry J. Bowditch, August 15, 1890, a living colony of Psocus venosus, Br., from Peterborough, N. H.

Changes and improvements have been made in the collection of Lepidoptera and in the Biological Collection. The Odonata are now ready, and alone fill a whole cabinet. The new specimens of the other orders are now in the right place.

The following papers from this department have been published during the last year: —

Louis Cabot. The Immature State of the Odonata. Part III. Subfamily Cordulina. Memoirs of the Museum of Comparative Zoölogy, Vol. XVII., No. 1, with Six Plates. Of the next part, four plates are ready for next year, finishing the Libellulina. Only one part more, containing all the Agrionina, is to follow, to finish the large and very important work on the immature state of the Odonata contained in the collection of the Museum.

H. A. Hagen. Unsere gegenwärtige Kenntniss der Ephemerinen. Stettiner Entomologische Zeitung, 1890, Vol. LI. pp. 11–13.

New Synopsis of the Odonata of North America: —

1. Calopterygina. Psyche, Vol. V., 1889, No. 164, December, pp. 241–250.

2. Anax. Ibid., No. 166, February, 1890, pp. 303–308.

3. Two Species of Anchora. Ibid., No. 170, June, pp. 353–355.

4. Cordulina. Ibid., No. 171, July, pp. 367–373, with One Plate.

5. A Synopsis of the Odonat Genus Leucorhinia, Br. Trans. Amer. Ent. Soc., Philadelphia, July, 1890, Vol. XVII. pp. 229–236, One Plate.

Baron Ed. de Selys-Longchamps, Comptes Rendus de la Société Entomologique de Belgique, Vol. II., No. 2, July 5, 1890, pp. lxvi.–lxx., has given a report on the publications of Dr. Hagen, Nos. 1 and 2, and on some remarks by him on recent Odonata of America.

REPORT ON THE CRUSTACEA.

By Walter Faxon.

During the year past the collection of Crustacea has been thoroughly overhauled and put into perfect order. Material has been brought together to illustrate the Pacific and Indo-Asiatic Faunæ. Exchanges have been made with the United States National Museum, the Massachusetts Fish Commission, Professor F. W. Cragin, etc. Our collection of Caprellidæ has been returned by Dr. P. Mayer. It has furnished valuable material to Dr. Mayer in the preparation of his supplement to the Monograph of the Caprellidæ (Fauna und Flora des Golfes von Neapel), published at Berlin during the current year. I have published a Supplement to my Revision of the Astacidæ, based upon the material in our Museum and in the United States National Museum, in the Proc. U. S. Nat. Mus., Vol. XII.

REPORT ON THE PALÆONTOLOGICAL COLLECTIONS.

By Alpheus Hyatt.

The work on the collection of Trilobites, which consists in getting together all the species of each genus, and the selection of appropriate specimens for exhibition in the Stratigraphical Collections, was continued during the first part of the year. This process not only eliminates materials suitable for exhibition from the mass of the collections, but also greatly improves the accessibility and arrangement of the latter, and considerably diminishes the space occupied by them in the rooms where they are stored. The greater part of the Assistants' time has, however, been given to a revision of the magnificent collection of Fossil Cephalopods for the express purpose of selecting representative forms of the genera for exhibition in the Systematic Collection.

The Schary Collection furnished the larger number of the Palæozoic types, and the whole of this has been roughly revised and brought into one room together with all the other collections of Fossil Cephalopoda, and the specimens arranged in their appropriate generic groups. Quite a number of genera were more or less closely revised in order to bring them up to the latest published investigations, and representatives of the new groups into which they have been divided were picked out, but most of this work was necessarily of a preliminary nature, not including any close revision of species, and much still remains to be done before this class of fossils can be reported as finished. The magnitude of some parts of this collection is certainly astonishing, the specimens of the Schary Collection representing the Orthoceratidæ, although stored with strict attention to economy of space, now occupy one hundred and ninety-four trays, and number about eleven thousand specimens, and approximately about eighty species.

During the progress of the dusting of this and other collections,

a very considerable number of specimens have been found which would very soon have been destroyed by oxidation. Such a collection should be looked over carefully every two or three years, and the specimens fossilized in iron pyrite protected with several thick coats of varnish. Miss Clark has also been occupied in mounting specimens for exhibition, and in labelling.

This department is indebted to Dr. Robert T. Jackson for considerable work in various directions. He has superintended the moving of collections, has concentrated and in part culled the Anticosti Collection, separating the useless from the valuable materials. He has also arranged and concentrated the Cretaceous and Tertiary Pelecypoda which were widely scattered, picking out species suitable for exhibition in the Stratigraphical Collection, and has also done the same service for several small collections, consisting for the most part of Mollusca and Gasteropoda, but containing some species from all departments of the animal kingdom. This work has put into available condition for final arrangement or study a large amount of material that before was widely scattered, and given considerable free space in the cases. Dr. Jackson has also worked on the large and valuable materials of the Dyer Collection, revising all the portions not previously arranged, and roughly classifying them. This is now ready for distribution into genera, and it should be stated, for the benefit of future students, that the collection, although it was carefully numbered by Mr. Dyer with printed numbers, was probably never catalogued by him. No catalogue was ever sent, so far as can be ascertained, with the collection, and the Assistant, after inquiring of several geologists well acquainted with Mr. Dyer, has come to the conclusion that the numbers merely represent Mr. Dyer's intentions. Fortunately, a considerable number of the ordinary run of the specimens are labelled, and all the types, so that no important losses of localities will be occasioned by the absence of a catalogue.

Mr. Frank Springer spent some time in studying the collection of Crinoids, and borrowed material of this group for investigation by Mr. Wachsmuth and himself. Several slabs of Trilobite tracks were received from the New York State Natural History Museum. Three boxes of fossils were received from Mr. Springer, containing a small but valuable collection of Cretaceous Fossils, and the skull of a mammal from New Mexico.

During the past year the following papers have been published by the Assistants in the department: —

Genesis of the Arietidæ, by Alpheus Hyatt, pp. 238, with six Genealogical Tables, fourteen plates and twenty-nine figures in the text. Published jointly by the Smithsonian Institute and the Museum in the "Smithsonian Contributions to Knowledge," No. 673, Washington, 1889, and in the Memoirs of the Museum of Comparative Zoölogy, Vol. XVI., No. 3.

Rot in Iris Germanica, by Robert T. Jackson. Garden and Forest, Vol. II. p. 522, 1889.

Phylogeny of the Pelecypoda, Studies of the Aviculidæ and their Allies, by Dr. Robert Tracy Jackson, Memoirs of the Boston Society of Natural History, Vol. IV., No. 8, 1890, pp. 277–400, with fifty-two figures and eight plates. Thesis offered for the Degree of Doctor of Science in Harvard University, May, 1889.

REPORT ON THE LIBRARY.

By Miss F. M. Slack.

During the year ending September 1, 1890, the Library has received 683 volumes, 1,991 parts, and 75 pamphlets: —

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	11	46	9
Exchange	125	768	40
Purchase	124	217	
A. Agassiz	81	844	26
Binding Parts	267		
Whitney Library	75	116	
	683	1991	75

The number of volumes now in the Library (exclusive of pamphlets and the greater part of the Whitney Library) is 19,102. There are 13,219 pamphlets bound in 2,158 volumes, making the total number of volumes 21,260.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1889-90.

Of the Bulletin.

Vol. XVI. [Geological Series, Vol. II.]

No. 6. The Intrusive and Extrusive Triassic Trap Sheets of the Connecticut Valley. By W. M. Davis and C. L. Whittle. pp. 40. 5 Plates. December, 1889.

No. 7. The Topography of Florida. By N. S. Shaler. With a Note by A. Agassiz. pp. 10. Plate. March, 1890.

No. 8. On Some Occurrences of Ottrelite and Ilmenite Schist in New England. By J. E. Wolff. pp. 7. April, 1890.

No. 9. On Keratophyre from Marblehead Neck, Massachusetts. By J. H. Sears. pp. 6. July, 1890.

(Vol. XVI. *to be continued.*)

Vol. XVII.

No. 5. The Morphology of the Carotids, based on a Study of the Blood-vessels of Chlamydoselachus anguineus, Garman. By H. Ayers. pp. 34. Plate. October, 1889.

No. 6. Cave Animals from Southwestern Missouri. By S. Garman. pp. 16. 2 Plates. December, 1889.

Vol. XIX. [Complete.]

No. 1. Studies on Lepidosteus. Part I. By E. L. Mark. pp. 128. 9 Plates. February, 1890.

No. 2. On the Egg Membranes and Micropyle of some Osseous Fishes. By C. H. Eigenmann. pp. 26. 3 Plates. March, 1890.

No. 3. Report on the Results of Dredging by the United States Coast Survey Steamer "Blake." — XXXII. Report on the Nudibranchs. By R. Bergh. pp. 28. 3 Plates. March, 1890.

No. 4. A Third Supplement to the Fifth Volume of the Terrestrial Air-breathing Mollusks of the United States and Adjacent Territories. By W. G. Binney. pp. 44. 11 Plates. May, 1890.

Vol. XX.

No. 1. The Histology and Development of the Eye in the Lobster. By G. H. Parker. pp. 60. 4 Plates. May, 1890.

(Vol. XX. *to be continued.*)

Of the Memoirs.

Vol. XVI.

No. 3. Genesis of the Arietidæ. By A. Hyatt. pp. i.–xii., 238. 14 Plates and 6 Tables. Published in Conjunction with the Smithsonian Institution. December, 1889.

(Vol. XVI. *is completed.*)

Vol. XVII.

No. 1. The Immature State of the Odonata. Part III. Sub-family Cordulina. By Louis Cabot. pp. 52. 6 Plates. February, 1890.

[B]

INVESTED FUNDS OF THE MUSEUM.

In the hands of the Treasurer of Harvard College, Sept. 1, 1889.

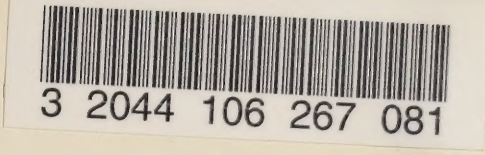
Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,933.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
	$580,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Museum Faculty. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Humboldt Fund can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Holl, or elsewhere.

Applications for the Tables reserved for advanced students at the Newport Marine Laboratory, and for the Tables at the Wood's Holl Station, should be made to the Curator of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.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