

ANNUAL REPORT
OF
THE CURATOR
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
AT HARVARD COLLEGE,
TO THE
PRESIDENT AND FELLOWS OF HARVARD COLLEGE
FOR
1897-98.

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C. B. DAVENPORT *Instructor in Zoölogy.*
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R. J. FORSYTHE *Instructor in Metallurgy.*
J. B. WOODWORTH *Instructor in Geology.*
R. A. DALY *Instructor in Physiography.*
S. R. WILLIAMS *Assistant in the Zoölogical Laboratories.*
C. W. PRENTISS *Assistant in the Zoölogical Laboratories.*
P. FRANDSEN *Assistant in the Zoölogical Laboratories.*
H. W. RAND *Assistant in the Zoölogical Laboratories.*
G. C. CURTIS *Assistant in the Geographical Laboratory.*
J. E. WOODMAN *Assistant in Geology.*
J. M. BOUTWELL *Assistant in Physical Geography.*

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 the Natural History Laboratories. Those in Zoölogy were given by Professor Mark, Doctors Davenport, Parker, and Castle, assisted in the Laboratory work by Messrs. R. W. Hall and F. C. Waite. Professors Shaler and Davis, together with Messrs. Robert T. Jackson, R. DeCoursey Ward, T. A. Jaggar, Jr., and J. B. Woodworth, gave courses of instruction in Geology, Palæontology, Physical Geography, and Meteorology. The Assistants in these Departments were Messrs. C. H. White, J. E. Woodman, and J. M. Boutwell.

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

Professor Hans Reusch, Director of the Geological Survey of Norway, acted during the past year as Sturgis Hooper Professor, giving Lectures and assisting advanced students.

As the reports concerning instruction both in Geology and Zoölogy will hereafter appear in the circulars of the Division of Geology and Zoölogy, under the auspices of the Faculty of Arts and Sciences, it seems unnecessary to duplicate the publication in the Museum Reports.

The Newport Marine Laboratory was not opened this year to students of the Zoölogical Department as heretofore. The advanced students have found the necessary facilities at the Laboratory of the United States Fish Commission at Wood's Hole, to which students properly qualified have been admitted by the Hon. George M. Bowers, U. S. Fish Commissioner. The income of the Virginia Barret Gibbs Scholarship has been assigned ac-

ording to the terms of the gift, and the income of the Humboldt Fund has been applied to assisting students working at the Wood's Hole Laboratory.

Professor Faxon reports that the principal additions to his Department consist of a large and very complete collection of North American land and fresh-water shells (over 20,000 specimens), presented to the Museum by Dr. R. Ellsworth Call of Lawrence, Indiana, and of a very beautiful collection of marine shells from the Straits of Malacca, presented to the Museum through Professor Goodale.

Messrs. Henshaw, Garman, and Brewster report the collections under their care in excellent condition. The additions to their Departments are enumerated in their Reports. The Departments in charge of Dr. Woodworth and Dr. Mayer need no special notice, as during the greater part of the year these two Assistants were absent with me in Fiji. Dr. Woodworth has left for Samoa to collect additional material for his Bololo paper, and Dr. Mayer has spent the greater part of the summer collecting *Acalephs* in the Tortugas and along the east coast of the United States.

To Professor Hyatt, to Mr. William Brewster, as well as to Dr. R. T. Jackson, the Museum is indebted for the care of their respective Departments.

The Exhibition Rooms have remained much as they were at the time of the last Report. A stand-pipe and hose have been placed in the Museum building in order to guard each floor against fire. The tables used for heating in the different Laboratories have been specially protected against the spreading of fire.

Specimens have been sent to Dr. Dendy, to Mr. H. A. Pillsbury, and to the Smithsonian Institution for examination, and a lot of Galapagos Turtles to the Hon. Walter Rothschild. A number of specialists have consulted the Entomological Department, and Mr. G. N. Calkins has examined our collection of *Hydroids* from the Pacific Coast of the United States.

In addition to the gifts specified in the different Reports, I may mention a collection of Fossil *Medusæ* from the Cambrian of Alabama, presented by the United States Geological Survey. Fossils from Griffin Landing, Savannah River, presented by Mr. C. B. Moore of Philadelphia. The collections made during my expedition to Fiji consist of Land Shells, Reptiles, Insects, Corals, and pelagic animals. An interesting fossil Egg (*Struthiolithus*)

was purchased for the Museum through Mr. Eastman, and forms the subject of one of the Bulletins issued during the past year.

The Museum has, as in former years, provided the room for a great part of the instruction in Geology and Zoölogy given to the students of Radcliffe College, as well as to the large classes in the Summer School of Geology.

It seems only reasonable that some provision should be made for the use of the rooms so occupied, as the Museum has no source of income to meet the ever increasing demands made upon it by the policy of the University in granting the facilities of the Museum to persons who in no way promote its material welfare.

The increase of the Library by purchase, gift, and exchange has been somewhat larger than in former years. The Library now numbers nearly 32,000 volumes. Among the valuable additions to it I may mention some volumes of pamphlets on Land Shells, collected by Mr. William G. Binney, and a number of volumes from the Library of the late Colonel Theodore Lyman.

The Reports on the "Albatross" Expedition of 1891 are progressing favorably. Mr. Westergren has completed the Plates to accompany the Report on Fishes, and Mr. Garman has the text well advanced. The Report on the Ophiuridæ, by Messrs. Lütken and Mortensen, is in the press.

The Report on the Acalephs, by Dr. Otto Maas, has been published as No. 1 of Vol. XXIII. of the Memoirs. Of the Bulletin, Vol. XXXI. has been published during the past year, and two numbers of Vol. XXIII., and seven numbers of Vol. XXXII. They contain six numbers from the Zoölogical Laboratory in charge of Dr. Mark, two papers by Mr. Eastman, and two by Dr. Woodworth.

The Isopods of the "Albatross" Expedition, by Dr. Hansen, a Preliminary Report on the Echini of the same Expedition, by myself, as well as papers on Dactylometra and on Australian Medusæ in conjunction with Dr. A. G. Mayer, and a Report on my Expedition to the Great Barrier Reef of Australia.

In connection with the "Blake" explorations, I have published an interesting paper by Prof. R. T. Hill, on the Geological History of the Isthmus of Panama, and Professor Bouvier and Dr. Fischer have completed a memoir on the Pleurotomaria dredged by the "Hassler" off Barbados.

The Corporation has continued an appropriation of four hundred dollars to assist in publishing some of the theses from the Zoölogical Laboratory.

I spent the past winter in Fiji, accompanied by Dr. Woodworth and Dr. Mayer, in studying the Coral Reefs. The Expedition was most successful, the weather admirable, and an immense amount of material relating to coral reefs was collected. A preliminary account of the expedition has been published in the American Journal of Science for February and for July of this year. I hope during the early part of the coming year to publish the full Report of the Expedition, the text of which is nearly completed, while the accompanying plates are in the hands of the lithographers. In order to supply information which we could not obtain in our limited time I have been able, through the kindness of Professor David of Sydney, to engage Mr. E. C. Andrews to visit Fiji, and explore more in detail the elevated limestones which play so important a part in the history of the coral reefs of that group. Mr. Andrews reached Fiji in July, and has been at work there during the past summer.

I am specially indebted for facilities and assistance to Sir William C. Van Horne, and Mr. T. G. Shaughnessy of the Canadian Pacific Railroad, to Sir George O'Brien, Governor of Fiji, to the Hon. J. Stewart, Colonial Secretary, to Hon. W. L. Allardyce, Assistant Native Commissioner, to Mr. Berry, to Captain Calder, and to a number of friends in Fiji, to whom a great part of the success of our trip is due.

A List of the Publications of the Museum will be found in Appendix A, and a list of the publications of the officers and instructors other than those contained in our Memoirs and Bulletins will be found accompanying the special Reports.

This will be the last Museum Report which I shall have the honor to make. My resignation both as Curator and Director of the Museum, to take effect at the close of the present academic year, has been accepted by the Faculty of the Museum, and by the Corporation. This resignation was accompanied by certain conditions, which will be found in Appendix C.

The Faculty of the Museum has appointed Professor George L. Goodale and Dr. Henry P. Walcott as a Committee to take charge of the Museum, and Dr. W. McM. Woodworth has been appointed Assistant in charge.

Although my administrative connection with the Museum ceases now, I look forward to its future with no little concern. When the more intimate relation between the Museum and the University (dating back to 1876) was established, it was hoped that the new arrangement might prove advantageous to both institutions. So far as the Museum is concerned, this hope has not been fulfilled. While the divisions of Zoölogy and Geology in the University have been greatly expanded by the facilities afforded them by the Museum, the latter has gained no corresponding benefit from the University, nor has it received from the friends and graduates of Harvard the aid and support which might have been expected as a result of this mutual arrangement.

The funds available for carrying on the Museum and for promoting research are meagre in the extreme, and there are literally no means existing for the publication of the original work presented from the various laboratories. The slender thread which connected the Museum with the teaching departments at the time of its incorporation with the University is practically severed, the administration of the Museum being no longer in any way concerned with instruction, as was originally included in the articles of agreement between the University and the Museum. Under existing conditions the University Museum cannot hope to hold its own with similar institutions which have grown up in late years. The Natural History Museums in New York and in Chicago, connected as they are with municipalities which deal with them in a most generous and intelligent manner, will leave far behind a University Museum depending upon resources which grow annually less with a painful regularity.

ALEXANDER AGASSIZ.

CAMBRIDGE, September 1, 1898.

REPORT ON COURSES IN GEOLOGY AND
PALÆONTOLOGY.

BY PROFESSOR N. S. SHALER.

DURING the year ending September 1, Mr. Shaler gave lectures on Geology and Palæontology in Courses 4, 14, and 15, on Economical Geology in Course 18, and directed the work of advanced students in Geology. In this work, he was assisted by Dr. Jackson, and by Mr. J. E. Woodman. As chairman of the Division of Geology, much time was given to executive work in addition to that already required as Dean of the Lawrence Scientific School. As a member of the Massachusetts Highway Commission, some time was spent in the service of the Commonwealth.

Of scientific work done during the year, a Report on the Geology of the Richmond Basin, in co-operation with Mr. J. B. Woodworth, was brought to a finish, and investigations were carried on upon the Geology of Cape Cod, and the Pleistocene deposits of Eastern Massachusetts, the whole being a part of studies undertaken for the United States Geological Survey. During the summer of 1898, some observations were made upon the Lake Basins of Montana, which will later be made the subject of a report.

The following reports are subjoined as representing the work of Instructors and Assistants in the Laboratories of Geology and Palæontology, under the charge of Mr. Shaler.

Dr. R. T. Jackson reports as follows upon the instruction in Palæontology : —

(Geol. 14.) A course in Palæontology, by N. S. Shaler, assisted by R. T. Jackson. Two lectures a week, with theses and laboratory work. (Taken as a half course by those omitting laboratory work.) Attended by twenty students, fourteen of whom took it as a half course.

(Geol. 15.) A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler and R. T. Jackson. Attended by five students.

Dr. R. T. Jackson reports that the collections used in teaching Palæontology are in good condition. Two additional cases for holding teaching collections were built. A fine series of Cambrian fossils from St. John, New Brunswick, was purchased of Mr. G. F. Matthew.

Mr. J. B. Woodworth reports as follows upon the instruction in General Geology:—

The instruction given by me this year included Courses 5, 8, and 16, and the supervision of the studies of certain students in Courses 22 *a* and 22 *b*, and of instruction given in Radcliffe College.

Course 5, Elementary Field and Laboratory Geology, was given in the second half year. It was attended by ninety-three students. The field work was conducted under the immediate charge of Mr. Woodman, who also acted as Assistant in the Laboratory. Mr. C. H. White was also assigned to this course as an Assistant in the Laboratory and the field. I wish to make especial mention of the services of Mr. H. T. Burr, and Ernest Haycock, both of whom gave voluntary assistance in the laboratory teaching, and in the field. These students placed themselves under the direction of the instructor in the course, with the view of obtaining experience in teaching. The experiment, as tried this year, was satisfactory to both parties. It is obviously an advantage to advanced students and to the Department for one of its officers to have a knowledge of the capacity to teach on the part of prospective applicants for positions in other institutions.

Course 8, General Critical Geology, was taken by sixteen men. In addition to the usual field and library work, some additional pains was taken to instruct students in the use of geological maps and reports, a work which was supervised by Mr. Woodman in the Library of the Museum. As in previous years, the attempt was made to make the field excursions illustrative of phenomena discussed theoretically in the Lecture Room, and at the same time to give the student training in the observation and interpretation of rocks and rock structures. The following localities were visited. In the autumn: (1) the Medford diabase dike; (2) the Mystic River quarries; (3) the westward extension of the Somerville quarries; (4) the Auburndale esker, and the Woodland sandplain, a study of glacial deposits. In the spring: (1) a basal

section of the Carboniferous in the Norfolk County basin at Pondville, showing a typical section of sediments; (2) the overthrust in the Carboniferous area at Plainville, Mass.; (3) the North Attleborough collapsed anticline, including a study of Carboniferous felsite flows, and the Hoppin Hill Cambrian area; (4) the Attleborough syncline.

Course 16, Glacial Geology, was attended by twelve men. That part of the field work which was of a research character was directed towards a study of the extension of the boulder moraine at Arlington, of the moraine at Bridgewater, and of the morainal accumulations of India Point and Robin Hill at Providence, R. I.

The work in Course 22 *a*, in my charge, consisted of a study of the complex of sediments, lava flows, and breccias of the so called Wamsutta group lying in the towns of Attleborough, and North Attleborough, Mass. Messrs. H. T. Burr and R. E. Burke carried on investigations in this field in the autumn. This region, though one of extreme difficulty on account of the complicated structure of its rocks, is one of great geologic and petrographic interest, because the rocks of the group named now turn out to be accumulations of débris about a volcanic vent of Carboniferous age. Mr. Ernest Haycock worked to the south of this field in the autumn; and in the winter and spring, he took up bibliographic research on the Geology of Nova Scotia, supplementing his reading with an excursion to the islands off the south coast of that Province in the spring recess.

Course 22 *b*, Geologic Correlation, was taken by one student, working on the Hamilton formation of North America.

Among the additions to the collections of the Geological Laboratory there should be mentioned two models: one on the scale of 3:50,000 of the Dents du Midi, Tour Sallières, and Mont Ruan, Canton Valais, Switzerland; the other, a model of Nantucket, made by Mr. G. C. Curtis, on the basis of the U. S. Geological Survey Atlas sheet, and colored by him after maps by Professor Shaler and J. B. Woodworth. A collection of rocks, made by Dr. Pfeiffer, and illustrating the geology of the district represented in the first named model, was also obtained by purchase. Several specimens were given to the collection by Dr. R. T. Jackson, Mr. Charles H. White, Mr. J. M. Boutwell, and Professor Wolff.

Courses 5 and 8 were repeated to students in Radcliffe College, and a course of lectures, two a week, was given on Elementary

Geology, intended as a course parallel to Geology 4. Course 5 was given in the Laboratory in the first half of the year, when the room was not otherwise occupied; Courses 5*a*, the Lecture Course, and 8, were given in the Lecture Room. In addition to these courses, one on Glacial Geology was conducted by Mr. Woodman. Thirty Radcliffe students were enrolled in these courses.

Scientific work was carried on as in the previous year, in co-operation with Professor Shaler, in the investigation of the Richmond area of Newark rocks in Virginia. The month of September, 1897, and a part of the mid-year examination period, were devoted to work in the field. A report on the structure and physical history of this basin was completed during the winter and spring, and submitted to the director of the U. S. Geological Survey in June, 1898. During the year there was published:—

Charles Thomas Jackson, by J. B. Woodworth, *American Geologist*, Vol. XX., August, 1897, pp. 69–110, and a notice of *La Face de la Terre*, by Edward Suess, Vol. I., Paris, 1897, *Science*, Vol. VII., 1898, pp. 803–806.

The summer of 1898 was spent in Europe, including an examination of parts of the British Islands, Möens Klint, and the glaciers of the Rhone Valley and Chamonix.

Mr. J. E. Woodman carried on geological work in Nova Scotia in the summer of 1897, the results of which he has presented to the Boston Society of Natural History. In 1898, he led the elementary Summer School of Geology in Cambridge, and conducted field investigations in Cape Breton.

Mr. Jaggar reports as follows on the work done in the Laboratory of Experimental Geology.

During the past winter work has continued in the Laboratory of Experimental Geology under the direction of T. A. Jaggar. Mr. V. F. Marsters completed a research on the synthesis of basalt, reproducing in the Fourquignon furnace a series of crystalline basaltic rocks containing augite, hypersthene, picotite, labradorite, oligoclase, and olivine, with glass in varying amounts. Mr. G. H. Noyes completed two models illustrative of the effect of initial fracture in guiding the deformation of strata, and performed a series of experiments to illustrate the process of formation of glacial sand deltas.

An apparatus for imitating geyser eruption was added to the laboratory.

The following papers were published :—

A Microsclerometer for determining the Hardness of Minerals, *Am. Jour. Sci.*, Vol. IV., 1897. Same in German, *Groth's Zeitschrift für Krystallographie*, Bd. XXIX., Heft 3.

Some Conditions affecting Geyser Eruption. *Am. Jour. Sci.*, Vol. V., May, 1898.

An Occurrence of Acid Pegmatite in Diabase. *Amer. Geologist*, Vol. XXI., April, 1898.

In press :—

Death Gulch, a Natural Bear-Trap. *Appleton's Pop. Sci. Monthly*.

In the summers of 1897 and 1898, Dr. Jaggard has been engaged in work on the U. S. Geological Survey of the Yellowstone Park Timber Reservation under Mr. Arnold Hague, and the mining district of the Black Hills under Mr. S. F. Emmons. In the spring of 1898, a special investigation on "The Hardness of Nephrite and Jadeite" was completed, to be a chapter in a monograph on "Jade," prepared by Mr. Heber Bishop of New York. Dr. Jaggard has in preparation a Handbook of Experimental Geology.

REPORT ON COURSES IN PHYSICAL GEOGRAPHY.

BY PROFESSOR W. M. DAVIS.

DURING the past year, no significant changes have been made in the courses on Physical Geography. With the exception of the advanced course (Geology 20), all were repeated for Radcliffe students. The course on the Physiography of Europe, first given two years ago, and now offered alternately with a course on the Physiography of the United States, has again been greatly aided by the use of the large scale topographical maps of the various European countries, which were brought from the College Library and temporarily placed in the Geographical Laboratory, as needed.

Special subjects since studied in the advanced course are as follows: the physical features of Norway, by Mr. R. L. Barrett; the coastal plain of Maine, by Mr. J. M. Boutwell; the drumlins and beaches of Nantasket, by Mr. R. B. Dixon; the Piedmont topography of Bavaria, by Mr. D. Gibbs; a classification of lakes, by Mr. W. L. W. Field; the topography of the neighborhood of Turner's Falls, Mass., by Mr. M. S. W. Jefferson, and the tidal phenomena of the Atlantic coast of the United States, by the same; and the Allegheny Plateau, by Mr. V. F. Marsters. In connection with this course, an excursion was made in the autumn to Syracuse, N. Y., for the purpose of examining the channels cut transversely across the northern spurs of the Allegheny plateau by temporary glacial streams, as first described by Mr. G. K. Gilbert.

Mr. Ward spent eight months, from June, 1897, to January, 1898, in making a tour around South America in order to gain some personal experience of weather and climate over a broad range of latitude. The points visited included Rio Janeiro, the National Observatory at Cordova, the Falkland Islands, the Strait of Magellan, Valparaiso, and the Harvard Observatory at Arequipa.

During his stay of three months in Peru, Mr. Ward inspected the meteorological stations of the Harvard College Observatory, including that on El Misti (19,200 ft.), the highest meteorological station in the world, and that at Cuzco. Extended barometer

and psychrometer comparisons were made, and a full set of instructions was prepared, especially adapted to the needs of the observers at the various stations. A study of cloud movements was carried on at the Harvard College Observatory at Arequipa, the results of which are to be published in the "Meteorologische Zeitschrift"; special studies were made of the dust whirls, and of the *médanos* (crescentic dunes) of the desert. Some experiments in kite building, for the meteorological investigation of the free air, were carried on as well. The physiological effects of the high altitudes of El Misti, and of the Galera Tunnel (15,655 ft.) on the Oroya Railway, were studied; some sphygmograph curves obtained on El Misti have been reproduced in the "Journal of the Boston Society of Medical Sciences" (June, 1898), being the first curves from so great an altitude that have been reproduced. Mr. Ward made regular meteorological observations several times a day throughout his trip, the records obtained at sea being reported to the U. S. Hydrographic Office. Hourly observations of the surface temperatures of Lake Titicaca were made during two trips across that lake.

On returning to Cambridge, the course in Climatology previously given in the first half year was given in the second half year, so that Mr. Ward's absence caused no decrease in the amount of instruction offered in meteorology and climatology. The additions to the laboratory materials for use in meteorology and climatology made during the last half year have been a large-scale colored chart of mean annual isanomalous temperatures, a considerable number of diagrams enlarged for class use from textbook figures, and some three dozen lantern slides of meteorological phenomena.

Mr. Curtis has continued his work on the Harvard Geographical models, being chiefly engaged in making copies from the originals, for sale to various colleges and schools. The work thus became nearly self-supporting. The utility of the models being shown, Messrs. Ginn and Company have now undertaken the publication of the models, the work of casting and coloring being in the hands of Messrs. Paul Vogt and Sons of Boston. It is hoped that the three models already prepared may be only the beginning of an extended series.

Two courses have been given in the Summer School of 1898, a general course on Elementary Physiography, and the Physiography

of the United States. Mr. M. S. W. Jefferson, and Dr. R. A. Daly acted as Assistants in the first course, and Mr. M. H. Wright in the second. Although the number of persons in attendance was smaller than a year ago, it is thought that the work thus done is effective in promoting the better teaching of geography, inasmuch as instructors in colleges, normal schools, and academies, as well as teachers in high and grammar schools, were enrolled in the classes. A number of field excursions were made in each course, including visits to Provincetown and Shelburne Falls, Mass., Portland, Me., Monadnock, N. H., and Meriden, Conn.

Professor Davis gave a course of eight lectures on Saturday mornings in the winter to school teachers of Boston and the neighboring cities, as one of the "Lowell Free Courses" in the Teacher's School of Science of the Boston Society of Natural History. The subjects here treated were such as would afford the most direct assistance in the work of teachers in grammar schools. In the spring, he delivered six lectures in the Brookline High School, On the Relation of Man to the Earth. Before the opening of the Summer School, he attended a conference called by a Committee of the National Educational Association, and held in Springfield, Mass., July 1 and 2, for the purpose of defining a course in Physical Geography appropriate for the high schools of the country. It was interesting to notice that all the members of the conference, ten in number, appointed by various educational organizations in different parts of the country, had at one time or another attended Harvard courses in geology or geography, with the exception of one, who was afterwards enrolled as a member of the first course in geography during the current summer. The report of the conference will be published in an early number of the *Journal of School Geography*.

Much time has been given during the year to the preparation of an elementary textbook of Physical Geography, adapted to use in high schools; Mr. W. H. Snyder, Master in Science at Worcester Academy, being associated with the writer in the latter part of the work. The book is now in press, and will be published in the autumn. In the absence of Professor Schilling, Professor Davis has taken his place as Chairman of the Committee of Special Students in Harvard College during the academic year. During the coming year he will be absent in Europe, his work being in part undertaken by Dr. Daly.

EXCURSIONS AND CONFERENCES.

New Mica Mines near Pompton, N. J.; Professor Wolff.

On the Arapahoe and Denver Deposits, Colorado; Professor Davis.

Some of the Results of a recent Excursion to the Western United States; Dr. Albrecht Penck.

Abstract of Gilbert's Essay on "Modification of the Great Lakes by Earth Movement"; Mr. J. M. Boutwell.

The Effects of Marine Erosion on the West Coast of Norway; Professor Reusch.

The Causes of recent Mountain-building Movements in Eastern New England; Professor Shaler.

Gold Mining in the Ural Mountains; Dr. Charles Palache.

The Middle Devonian Faunas of Western New York; Mr. A. W. Grabau.

The Crushing of Rocks by Glacial Action; Mr. J. B. Woodworth.

The Spring Excursion to New Jersey; Mr. J. E. Woodman.

Review of Geikie's Ancient Volcanoes of Great Britain; Dr. Jaggard.
Glacial River Channels of Western New York; Mr. M. S. W. Jefferson.

Remarks on a copy of the German Edition of Vespucci's Third Voyage, printed in Nuremberg by Wolfgang Huerber in 1505; Mr. J. B. Woodworth.

Some Recent Observations in Norway; Mr. R. L. Barrett.

New Lantern Views of Physiographic Features, taken during a summer trip across the United States and Canada; Professor Davis.

The Geology of the Dents du Midi in Switzerland; Dr. G. J. Pfeiffer.

Review of Geikie's "Founders of Geology"; Mr. J. E. Woodman.
Death Gulch, a Natural Bear-Trap; Dr. Jaggard.

Some Conditions affecting Geyser Eruption. Dr. Jaggard.

Geology of the Wamsutta Group near Attleborough Falls; Messrs. H. T. Burr and R. E. Burke.

The Classification of Lakes; Mr. W. L. W. Field.

De Margerie's translation of "Das Antlitz der Erde," by E. Suess (review); Professor Davis.

Localized Stages in Growth; Dr. R. T. Jackson.

De Geer's new theory for the Origin of Eskers; Professor Reusch.

An Excursion in the Fassathal, Tyrol; Dr. Eakle.

Review of Michel-Levy's "Notes on the Puys, Monte Doré, and the Eruptions of the Limagne"; Mr. V. F. Marsters.

Tides in the Chesapeake and Delaware Bays; Mr. M. S. W. Jefferson.

Some Glacial Deposits near Bridgewater, Mass. ; Mr. H. T. Burr-
The Coastal Plain of Maine ; Mr. J. M. Boutwell.

A Glacial Drainage System passing through Lunenburg, Mass. ; Mr.
J. S. Pray.

Some recent Accessions to the Collection of Fossil Vertebrates ; Dr.
C. R. Eastman.

Deltas and Outlets of the Glacial Lake Bouvé ; Mr. A. W. Grabau.

A Geological Model of Nantucket ; Mr. G. C. Curtis.

Recent Investigations in the Archæan Rocks of Scandinavia ; Pro-
fessor Reusch.

Placer Gold Deposits ; Professor Shaler.

Evidences of a Paleozoic Ice Age in Northern Norway ; Professor
Reusch.

A recent Geological Survey of the Eastern Border of the Yellowstone
Plateau ; Dr. Jaggard.

A recent Scientific Voyage to South America ; Mr. R. De C. Ward.

Note on Nitrate Deposits of the Atacama Desert ; Dr. Palache.

Physiography of Cuba ; Mr. J. M. Boutwell.

Geology of the Richmond Basin ; Mr. J. B. Woodworth.

Landslip Erosion in Norway ; Professor Reusch.

On certain Relations between Streams and Divides ; Professor Shaler.

The Elevated Shore-Lines of Monhegan Island ; Mr. G. C. Curtis.

The Structure of Steel and of Metallic Alloys ; Mr. Albert Sauveur.

The St. Louis Tornado of May 27, 1896 ; Mr. Ward.

The Waterspout off Martha's Vineyard, August 19, 1896 ; Mr.
Ward.

The Snowstorm of January 31—February 1, 1898 ; Mr. Ward.

The Gay's River Conglomerate, Nova Scotia ; Mr. J. E. Woodman.

General Account of the Geology of Nova Scotia ; Mr. E. Haycock.

Note on peculiar Geological Work of certain Plants ; Mr. C. H.
White.

EXCURSIONS.

Northampton, Mass. ; Professor B. K. Emerson, of Amherst College.

The Narragansett Basin, Mass. ; Mr. J. B. Woodworth.

North Attleborough, Mass. ; Mr. J. B. Woodworth.

Implement-bearing beds at Trenton, N. J. ; Mr. J. E. Woodman.

Connecticut Valley ; Dr. Palache.

Essex, Mass. ; Mr. John H. Sears.

PUBLICATIONS BY OFFICERS AND STUDENTS OF THE
DEPARTMENT OF GEOLOGY AND GEOGRAPHY
SINCE THE LAST REPORT.

By N. S. Shaler : —

Outlines of the Earth's History. D. Appleton & Co., New York.
12mo. 1898.

By W. M. Davis : —

The Present Trend of Geography. Address at the University Con-
vocation of the State of New York. Albany, 1897.

Home Geography. Journ. School Geogr., 1897, I. 2-7.

The Temperate Zones. Ibid., 1897, I. 139-143.

Topographic Maps of the United States. Ibid., 1897, I. 200-204.

Winds and Ocean Currents. Ibid., 1898, II. 16-20.

Waves and Tides. Ibid., 1898, II. 122-132.

The Equipment of a Geographical Laboratory. Ibid., 1898, II.
170-181.

Geography as a University Subject; read at the Toronto Meeting of
the British Association. Scottish Geographical Magazine, 1897, pp.
24-29.

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515-523.

Report on the Triassic Formation of Connecticut. 18th Ann. Rep.
U. S. Geol. Survey.

Current Notes in Physiography; in Science for 1896-97.

Physiography [of the vicinity of Boston], in Guide to Localities, etc.,
of the Vicinity of Boston, by Grabau and Woodman, Am. Assoc. Adv.
Sci., 1898, pp. 1-7.

Notes on Publications on the Physiography of the United States for
1897 (with J. M. Boutwell), in Annales de Geogr. Bibliographie de
l'Année, 1897.

By R. DeC. Ward : —

Meteorological Observations during an Atlantic Voyage. Science,
Vol. VI., Aug. 27, 1897, pp. 324, 325.

Reviews of American Publications on Climatology in Annales de
Géographie, 6 Année, 15 Sept., 1896. Bibliographie de l'Année,
1896. Paris, 8vo, 1897.

Meteorology in South America. *Science*, Vol. VI., Oct. 1, 1897, pp. 523-525.

A Winter Barograph Curve from the South Pacific Ocean. *Monthly Weather Review*, Vol. XXV., Nov., 1897, pp. 484, 485. Reprinted.

The Climatic Control of Occupation in Chile. *Journal of School Geography*, Vol. II., Dec., 1897, pp. 289-292.

A Visit to the Highest Meteorological Station in the World. *Boston Medical and Surgical Journal*, Vol. 137, Dec. 16, 1897, pp. 637-639.

Water Surface Temperatures of Lake Titicaca. *Science*, Vol. VII., Jan. 7, 1898, pp. 28, 29.

Harvard's Meteorological Work on the West Coast of South America. *Ibid*, Jan. 21, 1898, pp. 95-98.

Climatic Contrasts along the Oroya Railway, *Ibid*, Vol. VII., Jan. 28, 1898, 133-136.

A Day in the Falkland Islands. *Journal of School Geography*, Vol. III., Feb., 1898, pp. 49-56.

A note on the South American Coastal Cloud. *Science*, Vol. VII., Feb. 11, 1898, pp. 211, 212.

Cumulus Clouds over a Fire. *Monthly Weather Review*, March, 1898, pp. 104, 105.

A Visit to the Highest Meteorological Station in the World. *Ibid*, April, 1898, pp. 150-152.

Sphygmograph Curves from 15,700 ft. and from 19,200 ft. above Sea Level. *Journal Boston Society of Medical Sciences*, June, 1898, 2 pp., 3 Figs. Reprinted.

Associate Editor, *Journal of School Geography*, New York.

Contributed Current Notes on Meteorology to *Science* regularly throughout the year.

By T. A. Jaggar : —

1. A Microsclerometer, for determining the Hardness of Minerals. *Am. Jour. Sci.*, Vol. IV., December, 1897.

2. Ein Mikrosklerometer zur Härtebestimmung. *Zeitschrift für Krystallog.* Munich, Bd. XXIX. Heft 3, p. 262.

3. An Occurrence of Acid Pegmatite in Diabase. *American Geologist*, Vol. XXI., April, 1898.

4. Some Conditions affecting Geyser Eruption. *Amer. Jour. Sci.*, Vol. V., May, 1898.

5. Death Gulch, a Natural Bear-Trap. *Appleton's Popular Science Monthly*. (In press.)

By J. B. Woodworth : —

1. Charles Thomas Jackson. *American Geologist*, Aug., 1897, Vol. XX. pp. 69-110.

2. Notice of *La Face de la Terre*, by Edward Suess, Vol. I., Paris, 1897. *Science*, 1898, Vol. VII. pp. 803-806. Separately printed, pp. 8.

By J. E. Woodman : —

(With A. W. Grabau) *Guide to Localities illustrating the Geology, Marine Zoölogy, and Botany of the Vicinity of Boston*. A. A. A. S., Fiftieth Anniversary Meeting, Boston, Aug., 1898, pp. 100.

By R. A. Daly : —

Studies in the so-called Porphyritic Gneiss of New Hampshire. *Journal of Geology* (Chicago), 1897, Vol. V. pp. 694-722, 776-794.

By M. S. W. Jefferson : —

The Post-glacial Connecticut at Turner's Falls, Mass. *Journal of Geology* (Chicago), 1898, Vol. VI. pp. 463-472.

By A. W. Grabau : —

1. *The Geology of Eighteen Mile Creek*. *Bulletin Buffalo Soc. Nat. Sciences*, 1898, Vol. VI. pp. i-xxiv, 1-91.

2. (With J. E. Woodman.) *Guide to Localities, etc.*, cited above.

3. *Notes on Contours*. *Journal School Geography*, 1898, Vol. II. pp. 230-232.

4. *Palæontology of the Cambrian Terranes of the Boston Basin*. [Abstract.] *Science*, Vol. VIII. p. 505. Also, *American Geologist*, 1898.

By G. C. Curtis : —

A Model of Sea-shore Characteristics. *Journal of School Geography*, 1898, Vol. II. pp. 215-227.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

BY PROFESSOR E. L. MARK.

THE resignation of Dr. W. McM. Woodworth a year ago and the appointment of Dr. W. E. Castle as Instructor in Anatomy and Embryology changed slightly the distribution of work among the instructors in the Department, but the scope and nature of the lectures and laboratory work were not materially altered except in the case of Zoölogy 4, where the animal chosen for minute study was different from those selected in previous years.

The attendance upon the several courses in Zoölogy is shown in the accompanying table, which at the same time gives similar information about the students of Radcliffe College attending courses in Zoölogy.

Courses, 1897-98.	Grad.	Med.	Sen.	Jun.	Soph.	Fresh.	Spec.	Sci.	Total.
Zoölogy 1			10 <i>1</i>	13 <i>2</i>	21 <i>3</i>	31 <i>10</i>	10 <i>7</i>	36	121 <i>23</i>
" 2	2		1 <i>1</i>	5 <i>1</i>	10 <i>2</i>	4 <i>9</i>	2 <i>5</i>	24	48 <i>18</i>
" 3	2		3 <i>1</i>	4 <i>3</i>	1		1	10	20 <i>5</i>
" 4	4		3	3				5	15
" 5	4		2	2				4	12
" 9	1								1
" 10	5							1	6
" 15	3	2	4	2				3	14
" 20a	10 <i>1</i>							1	11
Totals . .	31 <i>1</i>	2	23 <i>3</i>	29 <i>6</i>	32 <i>5</i>	35 <i>19</i>	12 <i>13</i>	84	248 <i>46</i>

The figures in *italic* refer to students in Radcliffe College.

Zoölogy 1 was conducted by Dr. Davenport, as usual. His Chief Assistant was Mr. R. W. Hall, and the Sub-Assistants were Messrs. H. G. Barber, A. S. Hanna, R. H. Johnson, and H. McBurney.

With the change in Instructors, Zoölogy 2 was transferred from Dr. Parker to Dr. Castle. The forms selected for laboratory work were nearly the same as those used in previous years; they were

Spirostomum and Stentor, Grantia, Metridium, Asterias, Nereis, Cambarus, Periplaneta, Helix, and Rana. Each student was required, as usual, to give six hours per week to laboratory work. There were regularly two lectures per week (Mondays and Wednesdays), and occasionally an additional lecture on Friday.

Mr. F. C. Waite was Assistant in the course, and is commended by Dr. Castle for his zeal and industry. Mr. H. G. Barber also assisted in the laboratory work to relieve Dr. Castle during hours when his engagements in another course required his presence elsewhere.

The only change made by Dr. Parker in conducting the work of Zoölogy 3 was to limit the permission to substitute topic work for the regular work during the last seven weeks of the course to those students whose work in the course had given evidence of their being likely to profit by this opportunity. Six students were thus permitted to omit the dissection of the pigeon and substitute for it comparative work on selected topics. The results obtained by two of these students may be later submitted for publication. Two students not enrolled in the course attended the lectures. Two Papers based upon work done in connection with this course in the previous year have been published since my last report: they are Nos. LXXXV. and LXXXVII. of the list of "Contributions" accompanying the present report.

It has been possible during the past few years to increase the anatomical preparations useful in this course by the best of those voluntarily made for that purpose by students in the course. These, together with those which the Department "Diener" has been able to make when not otherwise engaged, form a valuable part of the material for the illustration of lectures, and it is the purpose to increase this collection as rapidly as practicable.

In Zoölogy 4 the lectures on bibliography, the microscope, microtomes, and other matters of technique, were given as usual by Dr. Mark. There were three lectures per week, and students spent from six to ten hours per week in laboratory work, six hours being the required minimum. The object selected for study this year was the leech *Clepsine*. The laboratory work was conducted by Dr. Castle, who also gave seven of the lectures in the course, his subject being the anatomy and histology of *Clepsine*.

Zoölogy 5 was conducted as in previous years, the laboratory work being, however, under the direction of Dr. Castle. An ar-

rangement was made with the students whereby the Laboratory acquires a selected portion of the preparations made in the course ; these preparations are to be added from year to year to the embryological and histological collections already acquired.

The new course on Fossil Invertebrates, by Dr. R. T. Jackson, Zoölogy 9, was taken by one student, a graduate. It is expected that this course will be elected in future by an increasing number of zoölogical students, who need to supplement their knowledge of recent forms by the broader view which embraces extinct species, and the lessons taught by their sequence in time. A valuable collection of fifty species of Cretaceous and Tertiary Protozoa was purchased for use in this course.

The subjects treated of by Dr. Davenport in his lectures on Experimental Morphology (Zoölogy 10) were this year ontogenetic. As usual each student worked on a special problem. The results have in two cases been embodied in papers now ready for publication. A short paper giving the results of studies in this course in 1896-97 has recently been published as No. XCII. of the Contributions, and another paper based on the work of a student in Radcliffe College has also been published in the Contributions as No. LXXXVI. The provisions for work in the Aquarium Room in the basement have been of great value in this course, and the room itself has been made more agreeable and safe for work in the coldest weather by the addition of storm windows.

Zoölogy 15 was given by Dr. Parker, as usual. The general subject was this year "Sense Organs." Two students enrolled in the Medical School, in addition to those under the Faculty of Arts and Sciences, were in attendance on this course. When provision can be made for supplementing the lectures with laboratory work, the course will be more valuable, especially to zoölogical and medical students.

The number of students carrying on investigations under me (Zoölogy 20 *a*) was the same as in the previous year. The papers produced in this course and published since my last report are numbered LXXXII., LXXXIV., LXXXVIII., LXXXIX., XC., and XCI. in the Contributions. Those now in course of publication are by Tower, Folsom, Bancroft, Waite, and Galloway (Dero).

At the last Commencement, the degree of Doctor of Philosophy was conferred upon two candidates in Zoölogy, Mr. Frank Watts Bancroft and Mr. Frederick Clayton Waite. The subjects of their

theses are given in the Contributions now in press. Dr. Bancroft has received an appointment to a Parker Fellowship, and proposes to study abroad. The recently established degree of Master of Science was conferred in June upon a student in Zoölogy who was in attendance at the University in the Graduate School during 1896-97, and the degree of A. M. upon six students whose work was chiefly zoölogical.

The more important of the Contributions from the Zoölogical Laboratory during the past year have been published in the Museum Bulletin as heretofore by the co-operation of the Curator and the Corporation of Harvard College. The following is a list of the Contributions which have been published since my report of 1896-97. To it is appended a list of those papers which are now ready for the press :—

- LXXXII. PORTER, J. F. — Two new Gregarinida. *Journal of Morphology*. Vol. XIV. No. 1, pp. 1-20. 3 Pls. June, 1897. [Feb., 1898.]
- LXXXIII. WOODWORTH, W. McM. — Contributions to the Morphology of the Turbellaria. II. On some Turbellaria from Illinois. *Bull. Mus. Comp. Zoöl.*, Vol. XXXI. No. 1, pp. 1-16. 1 Pl. October, 1897.
- LXXXIV. PORTER, J. F. — *Trichonympha*, and other Parasites of *Termes flavipes*. *Bull. Mus. Comp. Zoöl.*, Vol. XXXI. No. 3, pp. 47-68. 6 Pls. October, 1897.
- LXXXV. WAITE, F. C. — Variations in the Brachial and Lumbo-Sacral Plexi of *Necturus maculosus Rafinesque*. *Bull. Mus. Comp. Zoöl.*, Vol. XXXI. No. 4, pp. 71-92. 2 Pls. November, 1897.
- LXXXVI. DAVENPORT, C. B., AND PERKINS, HELEN. — A Contribution to the Study of Geotaxis in the Higher Animals. *Jour. of Physiol.*, Vol. XXII. Nos. 1 and 2, pp. 99-110. Sept. 1, 1897.
- LXXXVII. PARKER, G. H., AND TOZIER, C. H. The Thoracic Derivatives of the Postcardinal Veins in Swine. *Bull. Mus. Comp. Zoöl.*, Vol. XXXI. No. 6, pp. 133-144. 4 text figures. March, 1898.
- LXXXVIII. GOTO, S. — The Metamorphosis of *Asterias pallida*, with Special Reference to the Fate of the Body Cavities. *Jour. Coll. Science*, Vol. X. Pt. 3, pp. 239-278. Pls. 19-24. June, 1898.
- LXXXIX. NEAL, H. V. — The Segmentation of the Nervous System in *Squalus acanthias*. A Contribution to the Morphology of the Vertebrate Head. *Bull. Mus. Comp. Zoöl.*, Vol. XXXI. No. 7, pp. 147-294. 9 Pls., 11 text figures. May, 1898.

- XC. LEWIS, MARGARET. — Studies on the Central and Peripheral Nervous System of Two Polychæte Annelids. Proc. Amer. Acad. Arts and Sci., Vol. XXXII. No. 14, pp. 225-268. 8 Pls. April, 1898.
- XCI. HAMAKER, J. I. — The Nervous System of *Nereis virens* Sars. A Study in Comparative Neurology. Bull. Mus. Comp. Zoöl., Vol. XXXII, No. 6, pp. 89-124. 5 Pls. June, 1898.
- XCII. FIELD, WILLIAM L. W. — A Contribution to the Study of Individual Variation in the Wings of Lepidoptera. Proc. Amer. Acad. Arts and Sci., Vol. XXXIII., No. 21, pp. 389-396. 5 text figures. June, 1898.
- XCIII. MARK, E. L. — Preliminary Report on *Branchiocerianthus urceolus*, n. g. et n. sp. Bull. Mus. Comp. Zoöl., Vol. XXXII. No. 8, pp. 145-154. 3 Pls. August, 1898.

In Press.

- LINVILLE, H. R. — Maturation and Fertilization in Pulmonate Gastropods.
- TOWER, W. L. — The Nervous System of the Cestode *Monezia expansa*. 6 Pls.
- FOLSOM, J. W. — The Anatomy and Physiology of the Mouth Parts of the Collembolan *Orchesella cincta* L. 4 Pls.
- BANCROFT, F. W. — Oogenesis in *Distaplia occidentalis* Ritter (MS.), with Remarks on other Species. 6 pls.
- WAITE, F. C. — Structure and Development of the Antennal Glands in *Homarus americanus* Milne-Edwards. 6 Pls.
- GALLOWAY, T. W. — Observations on Non-sexual Reproduction in *Dero vaga*. 5 Pls.
- RAND, H. W. — Regeneration and Regulation in *Hydra viridis*. Numerous figures.
- GALLOWAY, T. W. — Effect of Temperature on Growth of Tadpoles.

Dr. Davenport has spent considerable time in the completion of the second volume of his work on "Experimental Morphology," which is now in the hands of the publisher. He shared in the production of Contribution No. LXXXVI., and has contributed articles and reviews to "L'Année biologique," and "The American Naturalist." During the present summer he is Director of "The Biological Laboratory of the Brooklyn Institute of Arts and Sciences, located at Cold Spring Harbor, L. I., N. Y."

Dr. Parker has published, in collaboration with Mr. C. H. Tozier, Contribution No. LXXXVII., and has written book notices and

reviews for "The American Naturalist." He has in preparation two papers, one "On Longitudinal Division in *Metridium* and the consequent Arrangement of Mesenteries," the other "The Photo-mechanical Changes in the Retinal Pigment of *Gammarus*." In co-operation with a student of Radcliffe College he is also preparing an article on "The Coronary Blood Vessels of Fishes."

Dr. Castle has in progress a paper dealing with the Anatomy and Classification of the Genus *Clepsine*, which has been the outgrowth of studies begun in connection with the class work in Zoölogy 4.

I have written a short article on "A Table of Ocular Micrometer Values," *Jour. of Applied Microscopy*, Vol. I. No. 1, p. 4, and a preliminary account of the external anatomy of a new and interesting deep-sea Actinian dredged by Mr. Agassiz in the Gulf of Panama. It is the last of the Contributions published, being No. XCIII.

The opportunities for the study of Marine Zoölogy which the instructors and students of the Department have so long enjoyed at the private laboratory of the Director at Newport, and which the demands of his own investigations have now compelled him to withdraw, are in a measure supplied by the facilities offered at the U. S. Fish Commission Laboratory at Wood's Hole; but the Department cannot fail to recognize, more clearly than ever, the great advantage which the Newport Laboratory has been to it in affording such exceptional opportunities for work and the collection of material for study in the laboratories at Cambridge.

REPORT ON THE MAMMALS AND BIRDS.

 BY WILLIAM BREWSTER.

THE past year has been uneventful in this department. The only acquisitions have been a Newfoundland Caribou (*Rangifer terræ-novæ* Bangs), male, bought of and mounted by J. H. Clark; a skin, a skull, and an alcoholic specimen of a buff-colored variety of the House Mouse (*Mus musculus*), and a skin of the Yellow-bellied Flycatcher (*Empidonax flaviventris*) taken at Lanesborough, Berkshire County, Massachusetts, June 1, 1898, presented by Walter Faxon; two eggs of a "large species of Black Tern" from the Fiji Islands, presented by Mr. Agassiz; a nest of the Kingbird (*Tyrannus tyrannus*), from Jaffrey, New Hampshire, presented by Miss Bertha Parker; and a nest and one egg of the Redstart, (*Setophaga ruticilla*), from Lincoln, Massachusetts, presented by W. McM. Woodworth.

The Assistant has published the following articles and notes.

In "The Auk": —

Geotrygon chrysea again at Key West.

Occurrence of the Spotted Screech Owl (*Megascops aspersus*) in Arizona.

Lewis's Woodpecker Storing Acorns.

Revival of the Sexual Passion in Birds in Autumn.

In "The Osprey": —

Notes on the American Three-toed Woodpecker (*Picoides americanus*).

In the "Boston Evening Transcript": —

A Letter criticising the Management of the Park Systems.

REPORT ON THE REPTILES AND FISHES.

BY SAMUEL GARMAN.

ONE of the most valuable additions to the collections in these Departments was received from the Fiji Island Expedition of 1896, Fishes and Reptiles taken by Professor Agassiz and Messrs. Woodworth and Mayer. The specimens are in fine condition, and supply much wanted material for the Faunal Exhibition Rooms. Other contributions were received from Outram Bangs, Esq., Mr. Harry Clayton, Prof. C. H. Eigenmann, Dr. W. H. Furness, Mr. I. T. Jones, Mr. J. M. Mackaye, E. Montanus, Esq., Prof. A. P. Morse, Prof. G. H. Parker, Lieutenant Wirt Robinson of the U. S. Army, Rev. Robert K. Smith, and Dr. J. H. Wright. Several specimens desired for special dissections were received from the United States National Museum, through the kindness of Hon. C. D. Walcott. Certain duplicates were given out for students' use, and others were made subjects of special studies by Mr. Reginald H. Howe, and by Mr. F. Schuyler Mathews, the last illustrating a number of the species in a recently published work.

Some changes have been made in the alcoholic specimens of the Exhibition Rooms, and preparations made for others, rendered necessary by the bleached condition of specimens that have been exposed to the light for considerable periods. The tendency to bleach, to lose the markings and become uniform pale or white leads to the greater part of the deterioration; the evaporation from jars once properly closed amounts to little; the discolored label is easily replaced, but the faded specimen must be discarded for a new and fresh one. On account of the oily tissues of many species, discoloration continues in the alcohol for many years, though constantly growing less in amount.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

BY SAMUEL HENSHAW.

ACKNOWLEDGMENTS of gifts of specimens are due Miss Helen W. Leach, Miss Clara Osterberg, Messrs. A. Agassiz, A. L. Babcock, Outram Bangs, Frederick Blanchard, J. W. Blankinship, F. C. Bowditch, Charles Bullard, H. K. Burrison, P. P. Calvert, W. E. Castle, J. R. Chadwick, C. B. Cory, W. W. Dodge, W. G. Farlow, Walter Faxon, W. F. Fiske, J. W. Folsom, G. L. Goodale, Roland Hayward, G. H. Horn, J. G. Jack, R. T. Jackson, D. S. Jordan, A. H. Kirkland, E. L. Mark, A. G. Mayer, C. J. Maynard, A. P. Morse, J. G. Needham, F. W. Putnam, Wirt Robinson, S. H. Scudder, and W. McM. Woodworth.

Among the more valuable additions are the specimens brought from the Fijis by Mr. Agassiz and his assistants, a series of Odonata and Coleoptera from the Pacific States, and a collection of more than 2,400 exotic Hesperidæ presented by Mr. Scudder. Mr. Scudder has also given the first series of the parasitic Diptera and Hymenoptera, described in his Butterflies of New England.

The condition of the collection is excellent, and its use by specialists constant. A moderate estimate shows that a third of the Assistant's time is given to aid those who personally consult the collection, or who ask for comparisons and identifications.

As in former years Miss Parker's time has been devoted wholly to a constant and careful inspection of the collection, and to labelling and mounting.

A revisional rearrangement of the Nymphalidæ of the Lepidoptera Rhopalocera, of the Cetonidæ, and of portions of the Cerambycidæ and Tenebrionidæ, has been completed. Some work in identification and arrangement has also been done in the Ichneumonidæ, Meloidæ, and Coccidæ. A final rearrangement of the Georyssidæ, Parnidæ, Heteroceridæ, and of part of the Chrysomelidæ of the Leconte collection of Coleoptera has been completed.

The biological series of Myrmeleonidæ, Hemerobridæ, and Phryganidæ have been rearranged.

A large part of the alcoholic material has been assorted and arranged.

Considerable time has been given to searching out and properly labelling the types among the Odonata. The department is especially rich in these types, but they are indicated in many ways and in various places. As found these types are marked with a red label bearing the legend Type, and a citation of the place of original description is added.

REPORT ON THE MOLLUSCA AND CRUSTACEA.

BY WALTER FAXON.

MOLLUSCA. — Two collections of extraordinary value have been given to the Museum during the past year. Professor R. E. Call of Chicago has transferred to Cambridge his collection of shells, amounting to some 40,000 specimens, all identified, numbered, and catalogued. This collection is composed in the main of the land and fresh-water shells of North America, and for these it is wellnigh complete. The specimens were collected chiefly by Professor Call himself, and were selected with a view to illustrating the geographical range and variation of the different species. The worth of the collection is the greater since it has served as the basis for the various conchological memoirs that have been published by Professor Call.

The other gift that deserves special mention is a collection of marine East Indian shells (estimated at no less than 3,000 specimens), brought together over fifty years ago by Mr. Balestier of Singapore, and presented to the Museum by the heirs of the late Warren Delano. The shells comprised in this collection are still unidentified, but are remarkable for their perfection and beauty.

The Rev. R. K. Smith of Kansas City has added to the special collection of New England shells noticed in my Report for 1895–96, and has also given to the Museum a small lot of shells obtained during a recent visit to England and Wales. Mr. Agassiz has presented some *Achatinellæ* from Oahu, Hawaiian Islands, and a miscellaneous collection of shells from the Fiji Islands. For other gifts the Museum is indebted to Messrs. G. M. Allen, J. H. Blake, and R. H. Johnson.

CRUSTACEA. — A collection made at the Fiji Islands in 1897–98 has been received from Mr. Agassiz. Various small lots of North American Crayfishes have been presented by Prof. H. Garman of Lexington, Ky., Prof. E. W. McBride of McGill University,

Montreal, and Messrs. R. C. Osburn and E. B. Williamson of Columbus, O. Mrs. Annie T. Slosson has sent Isopoda from Miami, Fla. Material has also been received through exchanges made with the United States National Museum, and M. Henry Coutière of Paris. At M. Coutière's solicitation, our whole collection of Alpheidæ, except a few type specimens too precious to be exposed to the risks of so long a journey, was sent to Paris to be used in monographing the family. They have all been promptly returned, identified by M. Coutière. Miss M. J. Rathbun of the U. S. National Museum staff, has revised the perplexing group of "Fiddler Crabs" (*Uca* or *Gelasimus*), and in this connection has determined all the specimens in this Museum. I have identified the Portunidæ (answering to near 480 catalogue numbers), and a good part of the Grapsoid crabs. An article on the Crayfishes in the United States National Museum and the Museum of Comparative Zoölogy, including a revision of the Crayfishes of the Southern Hemisphere (the Parastacinæ), prepared by me in 1896, has been published this year by the United States National Museum (Proc. U. S. Nat. Mus., Vol. XX. pp. 643-694, Pl. 62-70, Feb., 1898).

REPORT ON VERMES.

BY W. McM. WOODWORTH.

OWING to the Assistant's absence from Cambridge during a large part of the year, but little progress was made in the arrangement of the collections. A generous share of the Turbellarian material collected by the Biological Experiment Station of the University of Illinois, and recently reported upon by its Assistant, has been received from that institution. The Department is indebted to Mr. H. Lyster Jameson for two small collections of European Turbellaria supplementing the larger collection presented by him last year. Thanks are also due to Messrs. R. W. Hall and R. H. Johnson, and to Lieut. Wirt Robinson, for additions to the collections.

The Museum collection of Gordiacea loaned to Dr. T. H. Montgomery has been returned by him, and his report on the collection published as one of the Bulletins of the Museum.

The authorities of the Zoological Department of Columbia University have loaned to the Assistant the splendid collections of West Coast Nemerteans of the Columbia expedition to Puget Sound. With the collection have also been loaned the preparations, drawings, and notes of the late B. B. Griffin, who had begun the study of the collection. It will be the endeavor of the Assistant to complete the work so well begun by Mr. Griffin.

Good progress has been made with the work on the "Albatross" Nemerteans, which has been interrupted by long absences from Cambridge.

The Assistant has published Some Planarians from the Great Barrier Reef of Australia. Bull. Mus. Comp. Zool., Vol. XXXII. No. 4, pp. 63-67. 1 Plate, April, 1898.

REPORT ON THE DEPARTMENT OF VERTEBRATE
PALÆONTOLOGY.

BY CHARLES R. EASTMAN.

THE greater part of July and August, 1897, was passed by the Assistant in Iowa and Illinois, making collections of fossil fishes. Very gratifying success attended the operations at the State Quarry Fish-bed, near North Liberty, Iowa, where, as stated in the last Report, arrangements had been made with Professor Calvin whereby the Museum was able to participate with the Iowa State Geological Survey in its further exploitation. A force of quarrymen was engaged to blast out several hundred cubic yards of the cherty ledge at the base of an abandoned working alongside the Iowa River, after which the blocks were broken up on the spot and the fossils extricated in the rough. In all, ten boxes, weighing about three quarters of a ton in the aggregate, were shipped to Cambridge as the Museum's share, and their contents were carefully prepared out from the matrix during the past winter and spring.

Scientifically the material obtained from the State Quarry Fish-bed is of very great interest, not only on account of its excellent state of preservation, which allows the preparation of beautiful histological sections, but also because of the unique assemblage of Dipnoan remains. There are also a number of important geological problems bearing upon the deposit, some of which are discussed in the current volume of the Annual Report of the Iowa State Geological Survey. Some preliminary notes on the character of the fish fauna are also presented in the same Report, but the results of its detailed investigation have not as yet been published.

Collections belonging to several private individuals were examined by the Assistant in various places, but as the owners were unwilling to part with them except on an integral basis, it was not deemed expedient to increase our stock of duplicates to so large an extent for the sake of a much smaller proportion of choice desiderata.

From the vicinity of Rock Island, Illinois, some very striking vertebrate fossils were obtained, among which was a remarkably perfect head of *Dinichthys pustulosus*, found several years ago by Mr. A. S. Tiffany, of Davenport, and obtained by the Museum in exchange with Prof. J. A. Udden, of Augustana College. Several more or less fragmentary crania from equivalent strata (Hamilton limestone) near Milwaukee were also examined by the Assistant, with the result that the complete osteology has at length been worked out for this species. This led to a comparison of the osteology in as many other species and congeners, hitherto uninvestigated, as were accessible, the leading features of which have been prepared for a forthcoming Bulletin.

Finally, among the accessions of fossil fishes, a visit to Rochester enabled the Assistant to procure from Ward's Natural Science Establishment a number of especially desirable specimens, selected with a view toward completing our representation of Palæozoic forms. From Ward's also was purchased a fine mounted skeleton of the European Cavern Bear, which has been placed on exhibition in the room devoted to late Tertiary faunæ.

One of the most notable acquisitions of the year is the large and beautifully preserved ovulite from Northern China, identifiable as *Struthiolithus chersonensis*. Found originally some four years ago by a Chinese peasant, from whom it was purchased by Rev. W. P. Sprague, an American missionary residing in Kalgan, it remained in the possession of the latter until the spring of 1897, when it was brought to this country by a returning fellow missionary, Rev. J. P. Roberts, and was by him offered for sale to a number of scientific institutions. Efforts to conclude a transaction in Boston and Cambridge proved unsuccessful in the first instance, and after a time Mr. Roberts departed, taking the egg with him. Finally, after considerable correspondence, as well as a personal visit to Hartford by the Assistant, its purchase was effected and the specimen brought back to Cambridge. It is described in Vol. XXXII. No. 7 of the Museum Bulletin. Not long afterwards a plaster cast of the type was received as the gift of Professor Alexander Brandt, of Charkow, who described the first and only other specimen yet discovered.

During the year considerable progress has been made in the investigation of certain groups of Palæozoic fishes in the collection, together with others borrowed from various sources, and the re-

sults have been prepared for publication. With our accumulating stores of fossil vertebrates, and especially fishes, most of which have passed through a careful sorting-out process before entering the Museum, this Department promises to become in time one of the foremost centres for prosecuting investigations in comparative palæichthyology.

Plans have been perfected for another collecting trip during the early autumn, to include visits at Milwaukee, Burlington, and various well known localities in Iowa, Illinois, and Ohio. A few exchanges of material have also been arranged for.

Additions to the Collection during the Year.

1897. Mounted skeleton of *Ursus spelæus* Blumb., from Bone Cavern of Germany. Purchased. Received September 10.

1897. Calvin Collection. Second large instalment of fossil fishes from the State Quarry Bed (Upper Devonian) of Johnson County, Iowa, collected during the field operations for this year. Received September 13.

1898. *Struthiolithus chersonensis* Brandt. Fossil egg from superficial deposits in the vicinity of Kalgan, China. Purchased January 5.

1898. Cranium and dorso-median plate belonging to *Dinichthys pustulosus* Eastm., from Hamilton Limestone, Rock Island, Illinois. Also a few tritons of *Ptyctodus calceolus* N. and W. Exchange with Professor J. A. Udden, of Rock Island. Received January 11.

1898. A small collection of Saurian and Mastodon remains obtained by Dr. George J. Englemann some years ago along the Missouri River. Transferred from Peabody Museum, February 1.

1898. A select assortment of fossil fishes, principally Palæozoic, purchased of Ward's Natural Science Establishment, Rochester. Received February 7.

1898. Cast of tooth of fœtal Mammoth found within the body of adult at Niederweningen, near Zurich, Switzerland. Presented by Dr. G. J. Pfeiffer. Received February 5.

1898. Cast of type specimen of *Struthiolithus chersonensis* Brandt. Presented by Professor A. Brandt, of Charkow, Russia. Received March 2.

1898. Upper dental plate selected as type of *Ptyctodus ferox* Eastm., from Hamilton Limestone, Milwaukee, Wisconsin. Presented by Mr. E. E. Teller, of Milwaukee. Received March 11.

Papers Published during the Year.

Agassiz's Work on Fossil Fishes (Amer. Naturalist, Vol. XXXII. pp. 177-185), March.

On Remains of *Struthiolithus chersonensis* from Northern China, with Remarks on the Distribution of Struthious Birds (Bull. Mus. Comp. Zool., Vol. XXXII. pp. 127-144), August.

Dentition of Devonian *Ptyctodontidæ* (Amer. Naturalist, Vol. XXXII. pp. 473-488, 545-560), July-August.

Some new Points in Dinichthyid Osteology (Paper read before Amer. Assoc. Adv. Sci., Boston Meeting), August. Published in Amer. Naturalist, Vol. XXXII. pp. 747-768, October.

Discovery of a second fossil Egg of *Struthiolithus* (Geol. Mag., Vol. V. pp. 434-439), October.

REPORT ON INVERTEBRATE PALÆONTOLOGY.

BY ALPHEUS HYATT.

THE revision of the genera of fossil Cephalopods has been continued during the past official year and completed through the Triassic period, the fossils rearranged and placed in better shape as regards labelling, especially those of the Schary and other Palæozoic collections.

Representative species of all the genera have been selected, mounted, and are now in large part ready for exhibition in the Stratigraphic Collection.

The Department is indebted to Dr. R. T. Jackson for a large amount of work done in selecting materials for exhibition in the Stratigraphic Collection, and in superintending the work of mounting and labelling them.

He has also spent considerable time upon the Brachiopoda, rearranging parts and greatly improving the condition of the collection as a whole.

Part of the time of two Assistants has been available, and this has been spent in mounting and labelling fossils for exhibition, as described above.

Mr. Charles Schuchert reports progress on the Palæozoic Starfishes which he borrowed for study.

The following papers have been published:—

The Zoölogical Section (F) of the American Association for the Advancement of Science, by R. T. Jackson. *Science*, Vol. VIII. No. 195, pp. 395-403.

Fossil Cephalopods in the British Museum (Review), by R. T. Jackson. *Amer. Naturalist*, Vol. XXXII. No. 382.

Localized Stages in Growth, by R. T. Jackson. *Proc. Am. Ass. Adv. Sci.*, 1898, Vol. XLVII. pp. 359, 360.

Ink and Paper for Museum Labels, by R. T. Jackson. *Proc. Am. Ass. Adv. Sci.*, 1898, Vol. XLVII. pp. 378, 379.

REPORT ON THE LIBRARY.

BY MISS F. M. SLACK.

DURING the year ending September 1, 1898, the Library has received 641 volumes, 2,422 parts, and 118 pamphlets.

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	26	46	17
Exchange	182	750	63
Purchase	15	285	1
A. Agassiz	89	1,341	37
Library of Theodore Lyman	100	0	0
Binding Parts	229	0	0
	641	2,422	118

The whole number of volumes in the Library is now :—

Museum Library	23,933
Whitney Library	5,000
	28,933
Volumes of bound pamphlets	3,026
	31,959

The whole number of pamphlets is :—

Bound	17,965
Unbound, Museum Library	300
“ Whitney Library	5,000
	23,265

LIBRARY OF THEODORE LYMAN.

In addition to the one hundred volumes counted in the increase of the Library, Mr. Lyman's books included the following :—

291 volumes of duplicates, the greater part of which being better bound than ours, were placed on the shelves, and the volumes withdrawn placed among duplicates.

63 volumes of bound pamphlets, chiefly duplicate.

A set of Challenger Reports.

A set of Museum Publications,

A set of Louis Agassiz's works.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1897-98.

Of the Bulletin:—

Vol. XXVIII. (Geological Series, Vol. III.)

No. 4. A Visit to the GREAT BARRIER REEF of AUSTRALIA in the Steamer "Croydon," during April and May, 1896. By A. AGASSIZ. pp. 56. 42 Plates. April, 1898.

No. 5. The GEOLOGICAL HISTORY of the ISTHMUS OF PANAMA and Portions of COSTA RICA. Based upon a Reconnoissance made for A. AGASSIZ. By R. T. HILL. pp. 138. 19 Plates. June, 1898.

[Vol. XXVIII. is complete.]

Vol. XXXI. (October, 1897—May, 1898) contains:—

No. 1. Contributions from the Zoölogical Laboratory. LXXXIII. Contributions to the MORPHOLOGY of the TURBELLARIA. II. On some TURBELLARIA from Illinois. By W. McM. WOODWORTH. pp. 16. 1 Plate. October, 1897.

No. 2. On the Relations of certain PLATES in the DINICHTHYIDS, with Descriptions of New Species. By C. R. EASTMAN. pp. 28. 5 Plates. October, 1897.

No. 3. Contributions from the Zoölogical Laboratory. LXXXIV. TRICHONYMPHA, and other PARASITES of TERMES FLAVIPES. By J. F. PORTER. pp. 24. 6 Plates. October, 1897.

No. 4. Contributions from the Zoölogical Laboratory. LXXXV. Variations in the BRACHIAL and LUMBRO-SACRAL PLEXI of NECTURUS MACULOSUS RAFINESQUE. By F. C. WAITE. pp. 24. 2 Plates. November, 1897.

No. 5. Reports on the DREDGING OPERATIONS in the "Albatross" in 1891. XXII. The ISOPODA. By H. J. HANSEN. pp. 38. 6 Plates and Chart. December, 1897.

No. 6. Contributions from the Zoölogical Laboratory. LXXXVII. The Thoracic Derivatives in the POSTCARDINAL VEINS in SWINE. By G. H. PARKER and C. H. TOZIER. pp. 14. March, 1898.

No. 7. Contributions from the Zoölogical Laboratory. LXXXIX. The SEGMENTATION of the NERVOUS SYSTEM in SQUALUS ACANTHIAS. A Contribution to the MORPHOLOGY of the VERTEBRATE HEAD. By H. V. NEAL. pp. 54. 9 Plates. May, 1898.

[Vol. XXXI. is complete.]

Vol. XXXII. contains:—

- No. 1. Studies from the Newport Marine Laboratory. XLI. On DACTYLOMETRA. By A. AGASSIZ and A. G. MAYER. pp. 12. 13 Plates. April, 1898.
- No. 2. On Some MEDUSÆ from AUSTRALIA. By A. AGASSIZ and A. G. MAYER. pp. 8. 3 Plates. April, 1898.
- No. 3. The GORDIACEA of certain American Collections. With particular Reference to the North American Fauna. By T. H. MONTGOMERY, JR. pp. 40. 15 Plates. April, 1898.
- No. 4. Some PLANARIANS from the GREAT BARRIER REEF of AUSTRALIA. By W. McM. WOODWORTH. pp. 6. 1 Plate. April, 1898.
- No. 5. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "Albatross." XXIII. Preliminary Report on the ECHINI. By A. AGASSIZ. pp. 18. 13 Plates and Chart. June, 1898.
- No. 6. The NERVOUS SYSTEM of NEREIS VIRENS SARS. A Study in Comparative Neurology. By J. J. HAMAKER. pp. 48. 5 Plates. July, 1898.
- No. 7. On Remains of STRUTHIOLITHUS CHERSONENSIS from Northern China, with Remarks on the Distribution of STRUTHIOUS BIRDS. By C. R. EASTMAN. pp. 17. 1 Plate. July, 1898.
- No. 8. Reports on an EXPLORATION off the WEST COASTS of MEXICO, CENTRAL and SOUTH AMERICA, and off the GALAPAGOS ISLANDS, in charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. TANNER, U. S. N., Commanding. XXIV. Preliminary Report on BRANCHIOCERIANTHUS URCEOLUS, a New Type of Actinian, by E. L. MARK. 8 pp. 3 Plates. August, 1898.

[Vol. XXXII. to be continued.]

Of the Memoirs:—

Vol. XXIII. contains:—

- No. 1. Reports on an EXPLORATION off the WEST COASTS of MEXICO, CENTRAL and SOUTH AMERICA, and off the GALAPAGOS ISLANDS, in charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. TANNER, U. S. N., Commanding. XXI. DIE MEDUSEN. Von OTTO MAAS. pp. 92. 15 Plates. September, 1897.

[Vol. XXIII. to be continued.]

[B]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1898.

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
Virginia Barret Gibbs Fund	5,000.00
	<hr/>
	\$585,737.11

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 Overseers. 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 Virginia Barret Gibbs Scholarship Fund, of the value of \$250, is assigned annually with the approval of the Faculty of the Museum, at the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about \$300) can be applied for the benefit of one or more students of Natural History, either at the Museum, the United States Fish Commission Station at Wood's Hole, or elsewhere.

Applications for the tables reserved for advanced students at the Wood's Hole Station should be made to the Faculty of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

[C]

I WILL give to the President and Fellows of Harvard College for the use of the Museum of Comparative Zoölogy all the collections which I have at present deposited in the Museum, or which I may acquire hereafter, as well as such books as are not for the present reserved for my use, on the following terms. Hoping hereafter to devote my time to explorations and to the publication of the Reports of these explorations in the Bulletin and Memoirs of the Museum, I ask : —

1. That the assistants at the Museum Library supervise, as heretofore, the distribution of these publications both to societies and to individuals as I may direct.

2. That I be allowed to take from the exchanges for my use such books as I may select.

3. That the janitor and servants of the Museum continue to render to me such service as they were accustomed to give me while officially connected with the Museum.

4. That I be allowed to use the Museum Library, the greater part of which is my personal property, in the same manner as heretofore, and that such books as I may select and retain in my room be considered for the present my private property, subject to the same use as is now customary by the officers and students at the Museum.

5. That I be allowed to occupy the room where I now work to continue the preparation of the reports of the "Albatross" expedition, and of such expeditions as I may hereafter undertake.

6. That the Museum continue to pay the salary of my secretary, and that her services be at my disposal, as they have been in the past, either during my residence at Cambridge or at Newport, or during my absences from Cambridge.

7. That my artists be allowed to occupy the rooms they now use, or some other equally convenient place, to prepare the illustrations for the above mentioned Reports.

8. That I be allowed to continue the arrangement now existing between myself and Messrs. W. McM. Woodworth and A. G. Mayer, or their successors, by which they may devote such time as they do not give to the Museum to the interests of my explorations, either at the Museum or as Assistants during my explorations.

That any Assistants I may find it necessary to employ on the care of the collections made during my expeditions, or on the preparation of the material for publication, be assigned suitable quarters in the Museum building.

9. That I be allowed to store the outfit used on my expeditions in the basement of the Museum.

Upon receiving from the Corporation notice of their acceptance of the above conditions, I will execute a deed of gift covering the collections and books referred to in this letter.

I, ALEXANDER AGASSIZ of Cambridge, in consideration of one dollar and other good and valuable considerations to me paid by the President and Fellows of Harvard College, the receipt whereof is hereby acknowledged, do hereby give, grant, and convey to the said President and Fellows the following described articles of personal

property now belonging to me and contained in or used in connection with the Museum of Comparative Zoölogy, viz.: —

Such collections as I have brought together on various expeditions to the West Indies, Central America, and in the Pacific.

The collections made by Mr. Garman and myself at Lake Titicaca.

The collection of Corals from the Great Barrier Reef of Australia, made by Prof. H. A. Ward.

The zoological collections purchased from Prof. Ward, the greater part of which are on exhibition in the Systematic and Faunal Rooms.

The osteological collections obtained from Messrs. Gerard and Ward, which are partly on exhibition and partly stored in the work-rooms.

My collections of Japanese Vertebrates and Invertebrates.

The collection of Casts and Models purchased from Messrs. Emerton, Damon Fritsch, Kappeler, Cope, from the Royal Museum at Brussels, and others.

The collection of Blaschka Models of Marine Invertebrates.

The Microscopes and other Laboratory apparatus which I have at various times given to the Zoölogical and the Geological Departments.

The collections of Fossil Invertebrates, comprising the Day collection from the Niagara Limestone of Wisconsin, the Dyer collection of Invertebrates from Ohio, the Gebhard collection from Schoharie, the Taylor collection of Fossil Cephalopods, the Terrell collection of Fossil Fishes, the Walcott collection from the Trenton Limestone, as well as a number of smaller collections purchased from dealers in the United States.

The Shary collection of Silurian Fossils, the Haeberlein collection of Jurassic Fossils, and a small collection of Fossil Vertebrates obtained from Mr. Rossignol.

The collections of Western Fossil Vertebrates made for me by Messrs. Garman, Sternberg, and others, as well as the collection of South American Fossil Edentates and the Fossils purchased from Prof. Ward.

All the copies remaining on hand of the volumes of the Bulletin (Vols. IV. to XXXII.) and of the Memoirs (Vols. III. to XXIII.) of the Museum which I printed for the use of the Museum. All the publications received in exchange for the Bulletins and Memoirs of the Museum, about 3,500 volumes, now in the Museum Library (except those specifically reserved and deposited in my work-room), and the books which I have purchased during the past twenty years, about 5,000 volumes.

To have and to hold the premises to the said President and Fellows of Harvard College, their successors and assigns, to their use forever.

Witness my hand and seal this thirty-first day of March, 1898.

(Signed) ALEXANDER AGASSIZ. (Seal.)