ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE

FOR

1905-1906.

CAMBRIDGE, U.S.A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1906.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUTENANT COMMANDER L. M. GARRETT, U. S. N., COMMANDING, PUBLISHED OR IN PREPARATION:—

A. AGASSIZ. V.[5] General Report on the Expedition.
A. AGASSIZ. I.[1] Three Letters to Geo. M. Bowers, U. S. Fish Com.
A. AGASSIZ and H. L. CLARK. The Echini.
F. E. BEDDARD. The Earthworms.
H. B. BIGELOW. The Medusæ.
R. P. BIGELOW. The Stomatopods.
S. F. CLARKE. The Hydroids.
W. R. COE. The Nemerteans.
L. J. COLE. The Pycnogonida.
W. H. DALL. The Mollusks.
C. R. EASTMAN. VII.[7] The Sharks' Teeth.
B. W. EVERMANN. The Fishes.
W. G. FARLOW. The Algae.
S. GARMAN. The Reptiles.
H. J. HANSEN. The Cirripeds.
H. J. HANSEN. The Schizopods.
S. HENSHAW. The Insects.
W. E. HOYLE. The Cephalopods.
C. A. KOFOID. III.[3] The Protozoa.
T. KRUMBACH. The Sagittae.
R. VON LENDENFELD and F. URBAN. The Sponges.
H. LUDWIG. The Holothurians.
H. LUDWIG. The Starfishes.
H. LUDWIG. The Ophiurans.
——— The Actinaria.
G. W. MÜLLER. The Ostracods.
JOHN MURRAY. The Bottom Specimens.
MARY J. RATHBUN. The Crustacea Decapoda.
HARRIET RICHARDSON. II.[2] The Isopods.
W. E RITTER. IV.[4] The Tunicates.
ALICE ROBERTSON. The Bryozoa.
B. L. ROBINSON. The Plants.
G. O. SARS. The Copepods.
H. R. SIMROTH. The Pteropods and Heteropods.
TH. STUDER. The Alcyonaria.
T. W. VAUGHAN. VI.[6] The Corals.
R. WOLTERECK. The Amphipods.
W. McM. WOODWORTH. The Annelids.

[1] Bull. M. C. Z., Vol. XLVI., No. 4, April, 1905, 22 pp.
[2] Bull. M. C. Z., Vol. XLVI., No. 6, July, 1905, 4 pp., 1 pl.
[3] Bull. M. C. Z., Vol. XLVI., No. 9, September, 1905, 5 pp., 1 pl.
[4] Bull. M. C. Z., Vol. XLVI., No. 13, January, 1906, 22 pp., 3 pls.
[5] Mem. M. C. Z., Vol. XXXIII., January, 1906, 88 pp., 96 pls.
[6] Bull. M. C. Z., Vol. L., No. 3, August, 1906, 14 pp., 10 pls.
[7] Bull. M. C. Z., Vol. L., No. 4, November, 1906, 26 pp., 4 pls.

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1906.

MUSEUM OF COMPARATIVE ZOÖLOGY.

Faculty.

CHARLES W. ELIOT, *President.*

HENRY P. WALCOTT. — GEORGE L. GOODALE.

SAMUEL HENSHAW, *Curator.* — ALEXANDER AGASSIZ, *Secretary.*

Committee on the Museum.

HENRY P. WALCOTT. — GEORGE L. GOODALE.

Officers.

SAMUEL HENSHAW	*Curator.*
WALTER FAXON	*Assistant in Charge of Crustacea and Mollusca.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER	*Assistant in Charge of Birds.*
W. McM. WOODWORTH	*Assistant in Charge of Worms.*
C. R. EASTMAN	*Assistant in Vertebrate Palaeontology.*
OUTRAM BANGS	*Assistant in Charge of Mammals.*
HUBERT L. CLARK	*Assistant in Invertebrate Zoölogy.*
HENRY B. BIGELOW	*Assistant in Invertebrate Zoölogy.*
FRANCES M. SLACK	*Librarian Emerita.*
MAGNUS WESTERGREN	*Artist.*
GEORGE NELSON	*Preparator.*

WILLIAM M. DAVIS	*Sturgis-Hooper Professor of Geology.*
EDWARD L. MARK	*Hersey Professor of Anatomy.*
GEORGE H. PARKER	*Professor of Zoölogy.*
ROBERT T. JACKSON	*Assistant Professor of Palaeontology.*
ROBERT DEC. WARD	*Assistant Professor of Climatology.*
JAY B. WOODWORTH	*Assistant Professor of Geology.*
WILLIAM E. CASTLE	*Assistant Professor of Zoölogy.*
DOUGLAS W. JOHNSON	*Assistant Professor of Physiography.*

Instructors and Assistants in the Laboratories of Zoölogy and Geology.

HERBERT W. RAND	*Instructor in Zoölogy.*
G. R. MANSFIELD	*Instructor in Geology.*
A. M. BANTA	*Austin Teaching Fellow in Zoölogy.*
E. D. CONGDON	*Austin Teaching Fellow in Zoölogy.*
C. O. ESTERLY	*Assistant in Zoölogy.*
J. W. EGGLESTON	*Assistant in Geology.*
F. H. SAWYER	*Assistant in Geology.*
F. H. LAHEE	*Assistant in Geology.*
E. J. SAUNDERS	*Assistant in Physiography.*
H. E. MERWIN	*Assistant in Physiography.*

REPORT.

To the President and Fellows of Harvard College:—

In the Academic year 1905–06, ten courses in Zoölogy were given by Professors Mark, Parker, Castle, and Dr. Rand to two hundred and fifty-one students in Harvard University, and seven courses were given to thirty-three students of Radcliffe College. The assistants in the University courses were Messrs. A. M. Banta, L. J. Cole, E. D. Congdon, I. A. Field, H. MacCurdy, A. S. Pearse, and H. E. Walter; in Radcliffe College the assistants were Messrs. M. Copeland, J. A. Long, and H. MacCurdy. Mr. E. D. Congdon held the Virginia Barret Gibbs scholarship, and five students connected with the Zoölogical Laboratory received aid from the income of the Humboldt Fund.

In the Department of Geology and Geography two courses were conducted by Professor Davis, the Sturgis-Hooper Professor of Geology; these courses were given as in former years, save that an additional amount of laboratory work was required in the course dealing with the physiography of the United States. The other courses were given by Professors Shaler, Ward, Woodworth, Jaggar, Johnson, and Drs. Smith and Mansfield; the assistants were Messrs. W. B. Barrows, H. N. Eaton, J. W. Eggleston, E. J. Saunders, F. H. Sawyer, S. A. Starratt, and E. E. White. These courses, nineteen in number, were taken by three hundred and eighty-seven students of Harvard University; four courses offered to students of Radcliffe College were taken by forty-three students. In the Summer School two courses were given by Dr. Mansfield and Mr. Eggleston to eighteen students. Mr. H. E. Merwin held the Josiah Dwight Whitney scholarship for the year.

For an important improvement to the building the Museum is indebted to the continued liberality of Mr. Agassiz. To facilitate the entrance of the public to the Exhibition Rooms Mr. Agassiz erected in 1886–87 a three-story staircase; to this structure he has

now added two stories. The Museum thus gains a more finished entrance and a large work-room; the latter will be devoted to the Research Collections of fossil Echinoderms. The Museum is also enabled by Mr. Agassiz's generosity to undertake the renovation of all the entrance and exhibition halls from cellar to roof, and to rebuild the large central case in the African Room.

For the Exhibition Rooms, new cases have been built in the Mesozoic Room and in the European Room; one case in the Indian Room has been enlarged. For the Research Collections additional cases have been provided for the Ornithological Department, the alcoholic reptiles, the Entomological Department, the lower invertebrates, and for the thalassographic collections.

From Mr. William Barbour of New York the Museum has received for present use five thousand dollars ($5000.). Mr. Barbour's generous gift will provide for the more efficient storage of our Research Collections, and for some desirable specimens for both research and exhibition.

Already we have bought from Mr. Barbour's donation a fine egg of the Great Auk, *Plautus impennis* (Plate 2). This egg, number 65 of Grieve's List, was originally the property of the Royal College of Surgeons, London ; later it was acquired by Mr. Robert Champley of Scarborough, England. The Museum bought it of Mr. Rowland Ward.

In connection with the egg of the Great Auk attention may be called to the following extract from the Sixth annual report of the Museum 1864, (1865). Prof. Louis Agassiz, Director of the Museum, wrote (p. 16–17) : " Among the most valuable accessions to the Museum, during the past year, I would mention . . . a perfect specimen of a mummyfied pinguin (Alca impennis), presented by Sir Alexander Bannermann, late governor of Newfoundland."

This specimen, so far as I know unique to-day, was secured on Funk Island, off Newfoundland, in 1863; it is figured on Plate 3.

Another most gratifying gift was received last June from the Rev. Henry W. Winkley of Branford, Conn.; it consists of a large series, some 1,600 species and varieties of land shells from all parts of the world, except New England. His New England Collection Mr. Winkley retains for study, but he writes that he thinks in time it too "will find its way to the Museum." The shells received are in excellent condition. Mr. Winkley, as a member of the Class of 1881, recalls with pleasure his under-

graduate work in the Museum, and gives the Collection as his contribution towards the twenty-fifth anniversary celebration of the Class.

It is hoped that Mr. Winkley's gift will prove an incentive to other graduates to associate their college work with the interests of science and the Museum.

For a number of years the late Mr. Roland Hayward was deeply interested in the Entomological Department of the Museum; he frequently enriched its collections and gave his time freely to their study. Mr. Hayward died April 11, 1906, and bequeathed the Museum his entire collection of Coleoptera, a collection especially rich in the Carabidae, with a large number of types and determined species of Bembidium, Tachys, and Amara.

The thanks of the Museum are due to Prof. J. W. Judd for a carefully labelled series of Dolomitic rocks from the Tyrol; to Mr. John E. Thayer for an interesting collection of mammals from Sonora, Lower California, and contiguous regions; and to Prof. Roland Thaxter for a large number of insects, principally Coleoptera, collected during his stay in South America.

The Museum is likewise indebted to Dr. Frank Springer for a fine series of the crinoid, *Talarocrinus patei*, from the St. Louis group, Breckenridge Co., Kentucky, and to Dr. Leon J. Cole for some interesting invertebrates from the Tortugas.

All departments of the Museum, but especially the Entomological and those under the charge of Mr. Garman, have received many and valuable accessions from the continued interest of Mr. Thomas Barbour.

By purchase the Museum has acquired 224 specimens of Ammonites, an invaluable addition to its already rich series of fossil Cephalopods. These important fossils are from the Inferior Oolite of England, many of them from the famous Bradford Abbas quarry, a locality no longer available. The collection has been monographed by Mr. S. S. Buckman in supplements to his Memoir on Inferior Oolite Ammonites of the British Islands (Palaeontographical Society, London); more than three-fourths of the specimens are types; the Museum thus shares Mr. Buckman's types with the Woodwardian Museum (Cambridge, England).

The Museum has also purchased of Mr. A. E. Wight a considerable collection of Jamaican invertebrates and lower vertebrates.

To Messrs. Faxon, Brewster, Woodworth, and Bangs the

Museum is under obligations for the care they have taken of their several Departments. The special reports of the assistants give the usual details of the year's work.

For the Exhibition Collections Mr. Agassiz has given a magnificent Manchurian Tiger (*Felis mongolica*), a Bald-headed Chimpanzee (*Anthropopithecus tchego*), and three Hartebeests, Coke's, Swayne's, and the Cape (*Bubalis cokei*, *B. swaynei*, and *B. caama*).

The Museum will also receive as a gift from Mr. Agassiz a male Okapi. Though properly an accession of next year the exceptional interest attached to the Okapi and the fact that this specimen is the first of the species to be shown in a museum in this country seems sufficient reason for its mention here. Moreover, competent authorities consider this the finest example of the species hitherto mounted in England.

It was mounted by Mr. Rowland Ward, and is well shown in Plate 1.

The Okapi is related to the Giraffe, having paired hoofs, large ears, and a fairly long neck; the legs and haunches are striped instead of being spotted; the male has a pair of single bony horns covered with skin; it is found in the forests of the Congo.

Stimulated by Mr. Agassiz's generous gifts a thorough rearrangement of the exhibition rooms devoted to the Europaeo-Siberian and to the African Faunas has been undertaken; for the European Room this rearrangement is practically completed, and for the African Room it is well under way. The new cases, built from base to ceiling, with large panes of glass and without the usual cross-bars, give a much improved appearance to the rooms, while the simple expedient of placing the brackets on the upright next the glass allows a far more effective display.

There are two Exhibition Rooms yet to be opened to the public; these are the room devoted to the Mesozoic Fauna and the one for Animals under domestication.

It is expected that these rooms will be opened during the year 1906–07. The vertebrates for the Mesozoic Room are already in place, but the invertebrates are yet to be selected, mounted, and labelled.

By devoting a room to animals under domestication, the Museum realizes one of the plans of its founder. During his early work here, Professor Agassiz personally, and with the aid of his assistants, accumulated much valuable osteological material

of domesticated animals; a selection from this material will be utilized for the new room.

Dr. C. B. Davenport, Mr. E. N. Fischer, Mr. F. P. Lothrop, and Mr. H. F. Otis have shown their interest in this exhibit by presenting a number of fowls and pigeons; these have been mounted by the Museum preparator, Mr. George Nelson.

For exhibition among the special collections Dr. W. E. Castle has presented a series of fourteen guinea-pigs; this series, which shows graphically the principle of alternative inheritance, has been most skilfully mounted by Mr. Nelson.

Mr. Nelson has continued his work on the reptiles for exhibition; two of the more noteworthy examples of his handiwork are the Python and the Cobra in the Indian Room.

There are 42,421 volumes and 36,322 pamphlets in the Library of the Museum, an increase of 1,264 volumes and 1,289 pamphlets over the numbers previously reported.

The publications for the year are listed on pages 34–35; these include a volume and two numbers of the Memoirs, seventeen numbers of the Bulletin, and the Annual Report, a total of 893 (731 octavo, 162 quarto) pages and 161 (51 octavo, 110 quarto) plates. Four of the numbers of the Bulletin and all of the Memoirs are reports on the scientific results of expeditions fostered by Mr. Agassiz; seven numbers of the Bulletin are based principally upon Museum collections, three numbers are Contributions from the Zoölogical Laboratory, and three numbers, issued in the Geological series, are similar Contributions from the Geological Department. The Corporation has continued an appropriation of $350.00 to assist in the publication of the Contributions from the Zoölogical and Geological Laboratories.

SAMUEL HENSHAW.

REPORT ON THE ZOÖLOGICAL LABORATORY.

By E. L. Mark.

The number of students attending the several courses in Zoölogy during the Academic year 1905–06 is shown, as usual, in the following table, the numbers printed in italics referring to students registered in the Lawrence Scientific School.

Courses 1905–06.	Grad.	Sen.	Jun.	Soph.	Fresh.	Spec.	Total.
Zoölogy 1	3	6+*2*	15+*5*	31+*7*	32+*3*	8+*8*	95+ *25* = 120
" 2	1	2+*1*	10+*1*	10+*4*	3+*1*	1+*3*	27+ *10* = 37
" 3	3	3+*1*	5+*4*	2+*3*		*2*	13+ *10* = 23
" 4	2	1	2	*1*			5+ *1* = 6
" 6	3		2	*1*			5+ *1* = 6
" 11*a*	10	3+*1*					13+ *1* = 14
" 11*b*	9	2+*1*					11+ *1* = 12
" 13	6	2					8 = 8
" 15	7	2					9 = 9
" 20	14	1		*1*			15+ *1* = 16
Sums	58	22+*6*	34+*10*	43+*17*	35+*4*	9+*13*	201+*50* = 251

The corresponding information about students of Radcliffe College attending courses in Zoölogy is given in the second table.

Courses. 1905–06.	Grad.	Sen.	Jun.	Soph.	Fresh.	Spec.	Total.
Zoölogy 1	2	3	3	2	3	3	16
" 2	1			2			3
" 3	1		1			1	3
" 4	1	1		1		1	4
" 6	1	1		1			3
" 15	1		1				2
" 20	2						2
Sums	9	5	5	6	3	5	33

Assistant Professor R. T. Jackson was on leave of absence during the year and the courses in Palaeozoölogy were not given.

It is especially gratifying to record the promotion of Assistant Professor Parker to be Professor of Zoölogy, and the promotion of Dr. Rand to a seat in the Faculty of Arts and Sciences.

Zoölogy 1 was conducted by Assistant Professor Parker essentially as in the year 1904–05. The chief assistant in Harvard University was Mr. L. J. Cole; the sub-assistants were Messrs. E. D. Congdon, A. S. Pearse, and H. MacCurdy. In Radcliffe College the assistant was Mr. J. A. Long.

Zoölogy 2 was given by Assistant Professor Castle, substantially as in previous years. Mr. I. A. Field was chief assistant, and Mr. A. M. Banta, sub-assistant in the Harvard class. Mr. H. MacCurdy had charge of the laboratory work in Radcliffe College.

Dr. Rand was in charge of Zoölogy 3, and conducted the course in the same way as in the previous year, making satisfactory use of occasional "quizzes." The lighting of the laboratory was much improved. The assistant in Harvard College was Mr. H. E. Walter; in Radcliffe, Mr. M. Copeland.

As announced in the Report for 1904–05, several of the courses (Zoölogy 5, 10, 11, and 13) have been expanded or altered in scope. The changes there announced as proposed changes have been carried out so far as they relate to the year 1905–06.

The course in technique (Zoölogy 4) was carried on as usual by Professor Mark with the aid of Dr. Rand, who had charge of the laboratory instruction and gave a few lectures on the histology of Glossiphonia, the animal studied in this course.

Zoölogy 6 (Organogeny of Vertebrates) was given for the first time; it is in future to alternate with Zoölogy 5. The laboratory work was confined to the study of the development of the more important organs in the chick up to the fifth day of incubation, and was in charge of Dr. Rand. The lectures were given by Professor Mark; the subject was treated in a comparative way.

In Zoölogy 11*a* and 11*b*, given by Assistant Professor Castle, three of the Graduate students enrolled in the course, attended the lectures without doing the laboratory work, and were allowed to count the two half courses without laboratory as the equivalent of one half course. Several of the investigations, which were chiefly on questions of heredity, will be presented for publication.

The work by one of the students in these courses, together with that carried on by students in Courses 10 and 11 in previous years and by the instructor, has been published as one of the Contribu-

tions (No. 177) from this laboratory; that by another student is nearly ready for publication, and that of a third is incorporated with work done in Zoölogy 20 for a doctor's thesis.

With the expansion of former Zoölogy 13 into two half courses (13 and 14), given by Assistant Professor Parker, it is planned to divide the field and to give the new courses in alternate years. During the past year Zoölogy 13 has been given, the lectures and laboratory exercises being limited to epithelial and nervous tissues.

Zoölogy 15, which alternates with 16, was given by Assistant Professor Parker as in 1903–04, except for the revision of the lectures. Five graduates besides those enrolled in the course, attended the lectures. Of the nine topics assigned for investigation, four have yielded results for publication.

Of the sixteen students enrolled in Zoölogy 20, eleven carried on their work under the immediate supervision of Professor Mark, three under Assistant Professor Parker, one under Assistant Professor Castle, and one under Professor Mark and Assistant Professor Parker, jointly. Two graduate students in Radcliffe College also carried on special researches under Professor Mark.

Besides the doctors' theses presented by five of these, papers are completed or well advanced by most of the others.

The degree of Doctor of Philosophy was conferred in June, 1906, on the following students in Zoölogy, the title of the thesis immediately following the name in each case: Henry Bryant Bigelow: *Studies on the Nuclear Cycle of Gonionemus murbachii Mayer;* Leon Jacob Cole: *An Experimental Study of the Image-Forming Powers of Various Types of Eyes;* Arthur Day Howard: *The Visual Cells in Vertebrates, chiefly in Necturus maculosus;* John Hancock McClellan: *The Development of the Excretory System of Amia calva;* Hansford MacCurdy: *The Influence of Selection on Color Pattern in Guinea Pigs and Rats;* Samuel Ottmar Mast: *Light Reactions in Lower Organisms.* I. *Stentor coeruleus;* Herbert Eugene Walter: *The Reactions of Planarians to Light.*

During the year Assistant Professor Parker published Contributions Nos. 168, 169, 171, and 173. Assistant Professor Castle has published, besides Contributions Nos. 175–177, brief articles and reviews in Science and in the American Naturalist.

Two numbers of the Contributions from the Bermuda Biological Station for Research have been published during the year:

No. 7. Barbour, Thomas. — Notes on Bermudian Fishes. Bull. Mus. Comp. Zoöl. Harvard Coll., Vol. 46, No. 7, p. 107–134, 4 pls. September, 1905.

No. 8. Blackman, Maulsby W. — The Spermatogenesis of the Myriapods. IV. On the Karyosphere and Nucleolus in the Spermatocytes of Scolopendra subspinipes. Proc. Amer. Acad. Arts and Sci., Vol. 41, No. 13, p. 331–344, 1 pl. September, 1905.

During the summer of 1906, six students worked at the United States Fisheries Bureau at Woods Hole, two of them being employed as assistants in the Bureau. Five students received aid from the Humboldt Fund during the summer of 1906, amounting to $137.14; four of them while working at Woods Hole, and one at Cambridge.

The meetings of the Zoölogical Club were held on the afternoons of Wednesdays throughout the year, the subjects presented being usually announced in the Calendar. There were twenty-five meetings, and fifty-five papers were presented, twenty-five of them being summaries of original work, the most of which was done in this Laboratory.

Contributions from the Zoölogical Laboratory from July 1, 1905, to July 31, 1906.

168. Parker, G. H. — The Reversal of the Effective Stroke of the Labial Cilia of Sea-Anemones by Organic Substances. Amer. Journ. of Physiol., Vol. 14, No. 1, p. 1–6. July, 1905.

169. Parker, G. H. — The Movements of the Swimming-Plates in Ctenophores, with Reference to the Theories of Ciliary Metachronism. Journ. of Exp. Zoöl., Vol. 2, No. 3, p. 407–423. August, 1905.

170. Blackman, M. W. — The Spermatogenesis of the Myriapods. III. The Spermatogenesis of Scolopendra heros. Bull. Mus. Comp. Zoöl. Harvard Coll., Vol. 48, No. 1, p. 1–137, 9 pls. October, 1905.

171. Parker, G. H. — The Stimulation of the Integumentary Nerves of Fishes by Light. Amer. Journ. of Physiol., Vol. 14, No. 5, p. 413–420. November, 1905.

172. Carpenter, F. W. — The Development of the Oculomotor Nerve, the Ciliary Ganglion, and the Abducent Nerve in the Chick. Bull. Mus. Comp. Zoöl. Harvard Coll., Vol. 48, No. 2, p. 139–229, 7 pls. January, 1906.

173. Parker, G. H. — Double Hens' Eggs. Amer. Nat., Vol. 40, No. 469, p. 13–25. January, 1906.

174. Smith, G. — The Eyes of Certain Pulmonate Gasteropods, with special Reference to the Neurofibrillae in Limax maximus. Bull. Mus. Comp. Zoöl. Harvard Coll., Vol. 48, No. 3, p. 231–283, 4 pls. April, 1906.

175. Castle, W. E., and Forbes, A. — Heredity of Hair-Length in Guinea-Pigs and its Bearing on the Theory of Pure Gametes. Publ. Carnegie Inst. Washington, No. 49, p. 1–14. May, 1906.

176. Castle, W. E. — The Origin of a Polydactylous Race of Guinea-Pigs. Publ. Carnegie Inst. Washington, No. 49, p. 15–29. May, 1906.

177. Castle, W. E., Carpenter, F. W., Clark, A. H., Mast, S. O., and Barrows, W. M. — The Effects of Inbreeding, Cross-breeding, and Selection upon the Fertility and Variability of Drosophila. Proc. Amer. Acad. Arts and Sci., Vol. 41, No. 33, p. 729–786. May, 1906.

178. Pearse, A. S. — Reactions of Tubularia crocea (Ag.). Amer. Nat., Vol. 40, No. 474, p. 401–407. June, 1906.

179. Mark, E. L., and Copeland, M. — Some Stages in the Spermatogenesis of the Honey Bee. Proc. Amer. Acad. Arts and Sci., Vol. 42, No. 5, p. 101–112, 1 pl. June, 1906.

REPORT OF THE STURGIS-HOOPER PROFESSOR OF GEOLOGY.

By William M. Davis.

My return to Cambridge was delayed until after the beginning of the Academic year on account of the journey around the east coast of Africa with the party of the British Association on their way home from the meeting in Cape Colony, the Transvaal, and Rhodesia. I reached Cambridge, November 4. During the winter a significant share of time was given to the preparation of articles embodying the results of observations in South Africa. The chief topics treated were: the Dwyka glacial formation, concerning which reports were made at the meeting of the National Academy in New Haven (November) and at the meeting of the Geological Society of America in Ottawa (December); the origin of the Veld, or the interior highland plain of South Africa; and the topographic development of the east and west Cape Colony ranges, which present many striking analogies with the Appalachians of Pennsylvania. Public lectures on the African excursion were given on several occasions.

The two courses of instruction remained unchanged from former years, except that an increasing amount of laboratory work was added to the course on the physiography of the United States in the second half-year.

The latter half of the summer of 1906 was spent in Mexico, in connection with the meeting of the International Geological Congress. Excursions were made to western Mexico, under the leadership of Sr. Ordoñez, to visit the modern volcano of Jorullo, famous from its description by Humboldt; to various points on the central plateau; and to the eastern slope and coast, where a good understanding was gained of the chief topographic features there developed.

Publications. August 1, 1905–July 31, 1906.

Glaciation of the Sawatch Range, Colorado. Bull. Mus. Comp. Zoöl., 1905, Vol. 49, p. 1–12, 1 pl.

The Wasatch, Canyon, and House Ranges, Utah. Bull. Mus. Comp. Zoöl., 1905, Vol. 49, p. 13–56, 3 pls.

The Geographical Cycle in an Arid Climate. Geogr. Journ., 1906, Vol. 27, p. 70–73.

The Sculpture of Mountains by Glaciers. Scott. Geogr. Mag., 1906, Vol. 22, p. 76–89.

The British Association in South Africa. The Nation, Nov. 16 and 23, 1905.

An Inductive Study of the Content of Geography. Bull. Amer. Geogr. Soc., 1906.

Incised Meandering Valleys. Bull. Geogr. Soc., Phila., 1906, Vol. 4, No. 4, p. 1–11.

A Day in the Cévennes. Appalachia, 1906, Vol. 11, p. 110–114, pl. 16–17.

REPORT OF THE DEPARTMENT OF GEOLOGY AND GEOGRAPHY.

By Jay B. Woodworth.

With profound regret I record the death on the 10th of April, 1906, of Professor Shaler, the organizer and long-time senior professor as well as guiding spirit of this Department. His remains were interred in Mt. Auburn Cemetery, Cambridge, near those of him whom he called his Master, Louis Agassiz. The annual reports of the Museum of Comparative Zoölogy afford the most satisfactory though incomplete list of Professor Shaler's literary and scientific writings.

The following report is upon the work of the staff of the Geological Section of the University Museum for the year 1905–06 exclusive of that of the Sturgis-Hooper Professor of Geology.

The accompanying table shows the number of students attending the several courses given by the Department. In estimating the resort to the Museum the number of students taking Courses 10 and 20*b*, given in the Rotch Building, should be deducted, and students in Mining 28, conducted in the Advanced Geological Laboratory should be added.

Students of Radcliffe College completed elementary courses in the laboratories of the Department, as follows: Course A, 7 students; Course B, 4; Course 5*a*, equivalent to Geology 4 of old plan, 23; Course 5*b*, equivalent to Geology 5, old plan, 9. It has been arranged to conduct the Radcliffe courses in Geology 4 and 5 upon the same plan as these courses in Harvard University next year.

During the first half of the year, Professor Shaler gave as usual his lectures on Dynamical and Structural Geology to the class in Course 4, and as well his lectures on Palaeontology in Course 14. He began a course known as Comparative Geology (23 of the list), which, however, he was unable to complete. In its offering of courses for 1906–07 the Department decided to withdraw Courses 23 and 14 in Palaeontology. Professor Shaler was assisted in Geology 4 by Dr. P. S. Smith; in Course 14 by Mr.

S. A. Starratt, who resigned early in the year and was replaced by Mr. W. M. Barrows, Austin Teaching Fellow, also assistant in Course 23.

Courses 1905–06.	Harvard College.	L.S.S.	Graduate School.	Bussey.	Total.
Elementary					
A[1]	40	19	2	1	62
B[2]	23	14	0	0	37
1[1]	5	2	0	0	7
2[2]	9	6	0	0	15
4[1]	44	46	2	0	92
5[2]	17	33	1	1	52
	—138	—120	—5	—2	—265
Advanced					
7[2]	8	8	3	0	19
8[1]	8	15	3	0	26
10*	5	13	3	0	21
14[1]	13	5	0	0	18
16[2]	6	4	2	0	12
19[1]	3	1	1	0	5
22	0	0	3	0	3
23	3	2	0	0	5
	—46	—48	—15	—0	—109
Graduate					
20 *a*	0	0	2	0	2
20 *b**	0	4	1	0	5
20 *c*	0	2	2	0	4
20 *d*	1	0	0	0	1
20 *e*	1	0	0	0	1
	—2	—6	—5	—0	—13
	186	174	25	2	387

* Given in the Rotch Building.

Dr. P. S. Smith, Instructor in Geology, gave, with the aid of Mr. E. J. Saunders, the Elementary Course in Physiography (A) and assisted Professor Shaler in Course 4 during the first half-year. At the close of this period he resigned in order to engage in the geological work of the U. S. Geological Survey. Owing to changes in the personelle of the Department, Dr. D. W. Johnson, of the Massachusetts Institute of Technology was appointed an Assistant Professor to give Courses A and 6, and Dr. G. R. Mansfield was promoted from an assistantship to be Instructor in charge of Course 22 and Mining 28. Courses 9 and 17 formerly given by Dr. Jaggar have been withdrawn.

An elementary summer course in Dynamic and Structural Geology attended by nine students was given in Cambridge by Mr. J. W. Eggleston. An elementary course in the Physiography

of the Lands was given by Dr. Mansfield to a class of nine persons.

Professor R. T. Jackson was absent in Europe during the year and Course 11 was therefore not offered.

Professor Ward reports that a falling off in the attendance of students upon the courses in Meteorology and Climatology is directly traceable to the assignment of the elementary lectures to afternoon hours. A more detailed account will be found in a report to the President. The meteorological observatory, completed in June, 1905, was used for the first time by the students in Course B, during the spring of 1906. A standard shelter has been erected on the roof, and the ordinary thermometers, thermograph, hydrograph, and rain-gauge are at present in working order out of doors. A barograph and a mercurial barometer are installed within. The shelter and platform have been protected, so far as possible, against damage by lightning in accordance with the most approved methods, and the instrument room, in the attic beneath the platform, has been changed in several respects in order to diminish the risk of fire. This work was done in 1905–06, under the direction of the Inspector of Grounds and Buildings.

Geology B has been strengthened by the extension of the period of laboratory work from two to four hours a week. In Geology 1, practical work with nephoscopes was introduced. In Geology 19, laboratory work was substituted for theses, with excellent results. In Geology 20*e*, Mr. K. S. Johnson, constructed a series of charts of relative humidity for the United States, and these were shown at the Kimberley meeting of the South African Association for the Advancement of Science, and are to be published in the Report of the Association. A paper on Tornado Insurance, written by Mr. H. E. Simpson, during the year 1904–05, has been published in The Monthly Weather Review, December, 1905. Mr. E. J. Saunders assisted Professor Ward in Course B.

Professor J. B. Woodworth reports that during the year he planned and carried out with the assistance of Messrs. J. W. Eggleston, F. H. Sawyer, and H. N. Eaton, the laboratory and field work in Geology 4; the lectures and laboratory work in Geology 5, where again he was assisted by Mr. Eggleston, together with Messrs. E. E. White and Sawyer. Mr. Woodworth also gave Course 8 and 16. In Course 20*c* Mr. E. S. Bryant worked

on the glacial geology of the Franklin sheet, and Mr. H. N. Eaton made a map of the Carboniferous strata and enclosed volcanics, extending east and west of South Attleboro on the Providence quadrangle which together with a brief report is being prepared for publication. Instruction was also given by Professor Woodworth to students in Radcliffe College. Considerable time was devoted to installing and arranging collections in the exhibition room of the Geological Museum. A still larger share of his time was consumed in his duties as chairman of the Department.

The laboratory materials were increased as follows: stretched conglomerates from Tiverton and Newport, R. I., collected by G. R. Mansfield; a collection of Miocene fossils from Yorktown, Va., made by J. B. Woodworth during the April recess; specimens of Knox dolomite from Newport, Tenn., from H. S. Gale, U. S. Geol. Surv.

July was devoted by Professor Woodworth to the N. Y. geological survey, mainly in completing the glacial map of the Schuylerville quadrangle. On the 23d of August he proceeded by sea to Vera Cruz in order to attend the International Congress of Geologists held in Mexico.

Professor Jaggar conducted the advanced field courses, Geology 22 and Mining 28, as usual, with the assistance of Dr. Mansfield. Students of Course 22 mapped areas hitherto unexplored by this class between Lawrence and Topsfield. A voluntary course of lectures on the Structural Provinces of the United States was given in the autumn of 1905 to advanced students. In February, 1906, Professor Jaggar gave a course of four public lectures in the Colonial Theatre, Boston, under the auspices of the Twentieth Century Club, on The Earth as a Living Organism. In the spring of 1906 Mr. H. G. Ferguson made experiments on rill erosion in the laboratory of experimental geology. Mr. Ferguson spent the summer of 1905 in Iceland and has since published in the Journal of Geology an account of Miocene glacial deposits there. Dr. G. R. Mansfield completed a thesis for the doctorate of Philosophy entitled Origin and Structure of the Roxbury Conglomerate. This essay is to be published as a Bulletin of the Museum. Professor Jaggar finished during the year his share on the text and maps of the Sturgis-Spearfish Folio of the Geologic Atlas of the United States, issued by the U. S. Geological Survey. This production is the outcome of two seasons' field work in the northern mining district of the Black

Hills, South Dakota. In April, 1906, he went to Naples on behalf of Mr. Alexander Agassiz, to make notes and collections at the scene of the recent eruption of Vesuvius. September 1, 1906, Dr. Jaggar resigned his assistant professorship.

The subcommittees of the Department present the following reports: —

The Committee on The Gardner Collection of Photographs (Messrs. Ward and Woodworth) report as follows: —

State of the Collection, July 1.	Photographs.	Slides.	Negatives.
Accessions since last report	47	433	99
Unidentified views	253	30	0
Duplicates	144	51	0
Broken	0	0	0
Condemned	0	0	0
Last accession number	5701	4741	0
Number now in collection	5629	5056	1236

The accessions include a set of films and lantern slides representing views in Montana taken by J. B. Woodworth, a series of photographs from New Zealand brought to the Department by Professor Davis, lantern slides purchased of the Palestine Exploration Society, and several gifts of isolated photographs. Mr. Charles M. Farnham was employed at intervals during the year in renovating the slides. Mr. Farnham made considerable progress in the numbering of the negatives and films; but owing to the lack of the necessary assistance the usual cataloguing of new views was not maintained. The regular duties of the present teaching staff of the Department preclude giving the necessary time to this work. A person with the requisite knowledge of geography and geology to insure the correct description and cataloguing of the rich materials annually brought to this collection is a pressing need of the Department.

The Committee on the Geological Museum (Messrs. Woodworth, Wolff, and Jaggar) report that through the generous interest of Mr. R. W. Sayles, the Corporation received the gift of five thousand dollars, the income of which is "preferably to be devoted to the acquisition, preparation, and maintenance, of collections suitable for a museum of geology and geography." It should be stated that the Museum stands in immediate need of several thousand dollars for the construction of exhibition

cases. By a transfer of large specimens and certain models already in the teaching collections of the department, the cases so far constructed have been temporarily partially filled with the nucleus of a collection, some of which will naturally be replaced by better and newer material as soon as it can be obtained. The labelling of the exhibits has been begun. A printed card of the size indicated in the accompanying example ($4\frac{1}{2} \times 1\frac{1}{2}$ in.) has been adopted as suitable for recording the leading data concerning the numerous specimens which will enter into the exhibition.

SMALL DINOSAUR FOOT PRINT on red shale.

Belleville, N. J.
Newark series, Upper Triassic.
Am. Jour. Sci., Vol. 1, p. 481, 1895.
Coll. J. B. W.

The Committee has received the following gifts: — Glaciated pebbles and tillite from the Carboniferous Dwyka conglomerate of South Africa, collected in 1905 by Professor W. M. Davis; sand-blasted parts of trees from the dunes of Ipswich, Mass., collected by Mr. Albert P. Morse; ashes from the eruption of Mont Pelée, Martinique, May 20, 1903, gift of Mrs. N. S. Shaler.

The Committee on the Josiah Dwight Whitney Scholarship (Professors Davis, Jaggar, and Woodworth) recommended that a scholarship of $200 be awarded to Mr. Howard E. Merwin, a student in the Lawrence Scientific School, for defraying the expense of ten weeks' work during the summer of 1906 upon the ancient Pleistocene shore lines of Vermont, which task Mr. Merwin has satisfactorily carried out, and a report is now in preparation.

Publications. August 1, 1905-July 31, 1906.

By R. T. Jackson.

A new species of fossil Limulus from the Jurassic of Sweden. Arkiv för Zoologi, 1906, Vol. 3, No. 11, 7 pp.

By R. DeC. Ward.

The Climatic Zones and their Subdivisions. Bull. Amer. Geogr. Soc., 1906, Vol. 38, p. 385–396.

Suggestions concerning a more rational Treatment of Climatology. Report 8th Internat. Geog. Congress, 1906, p. 277–293.

The Hygiene of the Zones. Bull. Geogr. Soc. Phila., 1906, Vol. 4, No. 2, p. 29–55.

The Classification of Climates. Bull. Amer. Geogr. Soc., 1906, Vol. 38, p. 401–412, 465–477.

By J. B. Woodworth.

Professor Shaler. The Harvard Illustrated Magazine, Vol. 7, April, 1906, p. 133–136 (with portrait).

Book-review in "The Nation."

Administrative report of work done in New York in 1903. Embodied in Report of the State Geologist, Dr. J. M. Clarke. 57th Annual Report of the N. Y. State Museum, Albany. 1904. p. 8–12. Also in 1904. Do. 58th Annual Report. Albany, 1905, p. 18–19. Also in 1905. Do. 59th Annual Report. Albany, 1906, p. 20.

By T. A. Jaggar, Jr., and C. Palache.

Description of Bradshaw Mountains Quadrangle. U. S. G. S., Geol. Atlas, Folio 126, 1905. 3 geological maps.

By G. R. Mansfield.

Post-Pleistocene Drainage Modifications in the Black Hills and Bighorn Mountains. Bull. Mus. Comp. Zoöl., 1906, Vol. 49, p. 57–87, 4 pls.

REPORT ON THE MAMMALS.

By Outram Bangs.

During the past year the Department of Mammals has received upwards of three hundred specimens, mostly by gift. Two exchanges were made, one with Mr. E. R. Warren for a series of mammals from Colorado, the second with the West Australian Museum for a few Australian mammals. A most interesting and important addition is the specimens collected in Sonora, Chihuahua, Lower California, Cerros, and Guadalupe Islands by W. W. Brown, Jr., and presented by Mr. John E. Thayer.

Specimens have been loaned Knud Andersen of the British Museum, Walter L. Hahn of the Smithsonian Institution, and H. W. Henshaw, E. W. Nelson, and W. H. Osgood of the Biological Survey, Washington.

I have published during the year: —

In the Bulletin of the Museum of Comparative Zoölogy: —

The Mammals and Birds of the Pearl Islands, Bay of Panama, in joint authorship with John E. Thayer. Vol. 46, No. 8, p. 135–160. September, 1905.

Vertebrata from the Savanna of Panama. Introduction, Mammalia, (with John E. Thayer, Aves). Vol. 46, No. 12, p. 209–224. January, 1906.

In the Proceedings of the Biological Society of Washington: —

Breeding Birds of the Sierra de Antonez, North Central Sonora, in joint authorship with John E. Thayer. Vol. 19, p. 17–22. Feb. 26, 1906.

The names of the Passenger Pigeon and the Mourning Dove. Vol. 19, p. 43–44. Feb. 26, 1906.

Notes on Birds from Costa Rica and Chiriqui, with Descriptions of New Forms and New Records for Costa Rica. Vol. 19, p. 101–112. July 30, 1906.

REPORT ON THE BIRDS.

By William Brewster.

During the past year the following specimens have been purchased: a South American Condor (*Sarcorhamphus gryphus*, female) taken in Patagonia; nine species, including seventeen specimens of Linnaean topotypes; an albino Towhee (probably *Pipilo maculatus megalonyx*) taken at Pyramid Lake, Nevada; a young albino Bluebird (*Sialia sialis*) from Sherborn, Massachusetts; a pair of Kirtland's Warblers (*Dendroica kirtlandi*) with nest and five eggs, from Big Bend, Michigan; the nest and two eggs of Clarke's Nutcracker (*Nucifraga columbiana*) collected in British Columbia.

There have been acquired by gift: from Mr. William Barbour, an egg of the Great Auk (*Plautus impennis*); from Messrs. J. W. Hastings and L. J. de G de Milhau, a series of forty-one eggs with a few nests of birds from Iceland; from Mr. William A. Jeffries, the type of the Violet-throated Hummingbird (*Trochilus violajugulum*) taken at Santa Barbara, California; from Mr. Thomas Barbour, a Northern Shrike (*Lanius borealis*) from Brookline, Massachusetts, an egg of Leach's Petrel (*Oceanodroma leucorhoa*) from Little Duck Island, Maine, a Bahama Parrot (*Amazona bahamensis*) from the Bahamas, and a Golden Eagle (*Aquila chrysaëtos*) from Norway; from Dr. John Bryant, a European Wigeon (*Anas penelope*, male) taken at Swan Island, South Carolina; from Mr. George Nelson, an American Robin (*Merula migratoria*, male) from Arlington Heights, Massachusetts, and a nest of the Golden-winged Warbler (*Helminthophila chrysoptera*) taken in Lexington, Massachusetts; from Mrs. G. H. Robbins, a Passenger Pigeon (*Ectopistes migratorius*, male) killed in Carlisle, Massachusetts, about thirty years ago; from Mr. Walter Ela, an immature male Bald Eagle (*Haliaeetus leucocephalus*) from Wareham, Massachusetts; from Mr. Samuel Henshaw, a young Yellow-throated Vireo (*Vireo flavifrons*) and a Domestic Pigeon (*Columba livia*) both from Cambridge, Massachusetts; from Mr. Leon C. Cole, an egg of the

Noddy (*Anous stolidus*) from the Tortugas; from Mr. William Brewster, a male Redstart (*Setophaga ruticilla*) from Cambridge, Massachusetts; and from Dr. H. L. Clark, a collection of alcoholic birds, 35 species, 112 specimens.

The rearrangement of the general collection of skins in the new cases has been continued; the families dealt with include, following Sharpe's Hand List, the Chionididae to the Pandionidae. The alcoholic birds have been overhauled and in part rearranged and relabelled.

I have published during the year: —

In the Auk: —

Occurrence of the Lapwing (*Vanellus vanellus*) and the Turkey Buzzard (*Cathartes aura*) in Newfoundland.

Notes on the breeding of Bachman's Warbler, *Helminthophila bachmanii* (Aud.) near Charleston, South Carolina, with a description of the first plumage of the species.

In the Memoirs of the Nuttall Ornithological Club:

Birds of the Cambridge Region of Massachusetts.

REPORT ON THE REPTILES, BATRACHIANS, AND FISHES.

By Samuel Garman.

Considerable additions to the collections in these departments have been received from Señor Anastasio Alfaro, Messrs. Outram Bangs, Thomas Barbour, Owen Bryant, H. L. Clark, George C. Deane, R. L. Ditmars, Eugene N. Fisher, Charles H. Gilbert, Harris Kennedy, Trevor Kincaid, F. A. Lucas, Arthur S. Pearse, Wirt Robinson, F. G. Shaupp, John E. Thayer, W. McM. Woodworth, the New York Zoölogical Society, and the U. S. National Museum.

The specimens from the New York Zoölogical Society, being fresh, gave opportunity for improving the exhibition series; other specimens were secured in the Boston markets. A fine series of West Indian Reptiles, Batrachians, and Fishes were obtained by purchase from Mr. Alex. E. Wight, and considerable other very desirable material was presented by Mr. Thomas Barbour. Among outgoing shipments were those to Prof. C. H. Eigenmann, Prof. Theo. Gill, Prof. Chas. H. Gilbert, Dr. J. W. Spengel, and Dr. B. G. Wilder. Certain types loaned to Professor Gilbert were returned in good order.

Aside from filling up the new cases, made necessary by increase of the storage Reptilia, few changes have been made in the alcoholic series. Loss by leakage, breakage, or evaporation has been small in amount. The greater portion of the work for the year has been devoted to preparation of the memoir on the Plagiostomes.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

THE additions to the Entomological Department have been many and important. The first to be noted is the collection of Coleoptera of America north of Mexico, bequeathed to the Museum by the late Roland Hayward of Milton. During his life Mr. Hayward was at all times a generous contributor to the Department, and the collection devised by will containing as it does the results of his well-directed efforts, is most appropriately placed with the types of earlier authorities which he so faithfully studied.

From Professor Roland Thaxter's South American collecting the Department will benefit largely. Professor Thaxter has already given a considerable series of insects, principally Coleoptera; he intends from time to time to add to this series as the material is assorted. For other acceptable additions to the collections of the Department acknowledgments are due Miss E. B. Bryant, Miss Louisa Goldsmith, Messrs. Outram Bangs, Thomas Barbour, H. B. Bigelow, F. E. Blaisdell, Frederick Blanchard, William Brewster, Henry Brooks, Owen Bryant, August Busck, H. L. Clark, J. E. Clarke, T. D. A. Cockerell, Manton Copeland, B. R. Curtis, Walter Deane, J. H. Emerton, H. C. Fall, B. H. Hall, J. G. Jack, C. W. Johnson, A. P. Morse, J. G. Needham, H. A. Purdie, Wirt Robinson, E. B. Williamson, C. C. Willoughby, J. B. Woodworth, and W. McM. Woodworth.

From A. E. Wight we have purchased a large series of Jamaican insects of all orders, and from George B. King a collection of Formicidae from all parts of the world; other purchases include the specimens collected by the Rev. P. H. Goldsmith in Mexico and small series of beetles from Adana, Asia Minor, and another from Western Africa.

The services of Mr. Nathan Banks were engaged for one month and were devoted to the Arachnida; a large amount of miscellaneous material was sorted, labelled, and identified and the bulk of the Araneina is now in good order. The Museum is indebted

to Prof. W. M. Wheeler of the American Museum of Natural History for a critical revision of all our recent Formicidae and to Mr. T. D. A. Cockerell for his study of a number of fossil Hymenoptera; the results of Mr. Cockerell's work are published in Bulletin, Vol. 50, No. 2, June, 1906.

The rearrangement of the Noctuidae has been continued.

REPORT ON THE CRUSTACEA AND MOLLUSCA.

By Walter Faxon.

The most noteworthy addition to the Conchological Department during the past year consists of a large and fine collection of terrestrial shells from all parts of the globe. This collection was given to the Museum by Henry W. Winkley of the Class of 1881, Harvard College, as his contribution to his class's twenty-fifth anniversary donation. Other contributions have come from Messrs. Thomas Barbour, L. J. Cole, and the Rev. R. K. Smith. For new material added to the collection of Crustacea the Museum is indebted to Dr. A. E. Ortmann and Messrs. E. B. Williamson and E. A. Andrews.

REPORT ON THE WORMS.

By W. McM. Woodworth.

The most important collections received during the year are the worms collected by Mr. Agassiz during the cruise of the "Albatross" in the Eastern Pacific. Of these the Nemerteans have been sent to Professor W. R. Coe, who has promised two Reports, one on the pelagic forms and one on the reef and shore forms. Gifts have been received from Messrs. T. Barbour and S. Henshaw.

The Annelids collected by Mr. Agassiz on the "Blake," 1877–80, which were sent to Professor Ehlers, have been returned. A Report upon them by Doctor Hermann Augener forms No. 4 of Volume 46, of the Bulletin. Prof. F. W. Gamble has returned the Arenicolidae loaned to him. To Mr. W. F. Lanchester, University of Dundee, has been sent all gephyrean material from the Pacific. The Report on the Nemerteans collected by Mr. Agassiz on the "Albatross" in 1891, which is almost completed, will appear under the joint authorship of Professor Coe and myself.

REPORT ON THE LOWER INVERTEBRATES.

By Hubert Lyman Clark.

Since taking up my duties at the Museum in December, 1905, my time has been occupied almost exclusively with the collections of Echinoderms. These collections have been looked over and arranged systematically, preparatory to labelling and cataloguing, and are found to contain about thirty-two thousand specimens. The contents of the large jars and trays of unidentified Echinoderms have been sorted and placed in their proper places in the collections. The work of labelling and cataloguing the starfishes is well under way, but has been delayed by the fact that much of the material has never been identified, while even when specimens are labelled it is frequently desirable to verify the identification. Considerable time has been given to the critical study of the collection of over fifteen hundred sea-urchins of the Cidaridae, and to the preparation of a report on the same. There have been few additions to the collections during the year; the more important are my own collection of Echinoderms, 171 species, 1,494 specimens and twenty-eight species of Sponges (U. S. Fish Commission Steamer "Albatross" 1891 expedition) and seven species of Corals (U. S. Fish Commission Steamer "Albatross" 1904–05 expedition) presented by the U. S. National Museum.

REPORT ON THE DEPARTMENT OF VERTEBRATE PALAEONTOLOGY.

By Charles R. Eastman.

Departmental work has proceeded about the same as heretofore, chief attention being devoted to fossil fishes. The collection of fossil mammals, however, received a useful addition in a series of casts presented by the Peabody Museum (Yale University) through Prof. Charles Schuchert; these casts, seventy-one in number, represent specimens described by Dr. Joseph Leidy, and were made many years ago by Mr. Kaeppler for Prof. O. C. Marsh. To Prof. Bashford Dean, of the American Museum of Natural History, the Department also is indebted for excellent casts of Polypterus, Neoceratodus, Dinomylostoma (dental plates), and a chimaeroid egg-capsule from the Cretaceous of Laramie, Wyoming, described by Dr. Theodore Gill in Science, 1905, Vol. 22, p. 601.

A large specimen of Dapedoglossus from the Green River Eocene of Wyoming was acquired by purchase, and two smaller specimens were presented by Mr. Thomas Barbour. Several Miocene fishes from Hazen, Nevada, collected by Mr. N. H. Darton of the United States Geological Survey, were presented by Mr. Darton, and a collection of over one hundred fish-bearing nodules from the Devonian of Boyle Co., Kentucky, were procured partly by gift, from Mr. Moritz Fischer. A small example of the very rare Pycnodont occurring at Monte Bolca, *Pycnodus platessus* Ag., was bought of Deyrolle, *ex. coll.* Huguenin *et* Homo.

The following publications were issued during the year: —

Fossil Avian Remains from Armissan. Mem. Carnegie Museum, 1905, Vol. 2, p. 131–138, pl. 13–16.

Greek Ideas of Vulcanism. Pop. Sci. Monthly, 1905, Vol. 67, p. 555–560.

Les idées grecques sur le volcanisme. Revue Scient., (5) Vol. 4, p. 609–612.

Anaximander, Earliest Precursor of Darwin. Pop. Sci. Monthly, 1905, Vol. 67, p. 701–706.

Dipnoan Affinities of Arthrodires. Amer. Journ. Sci., 1906, (4) Vol. 21, p. 131–143.

Structure and Relations of Mylostoma. Bull. Mus. Comp. Zoöl., 1906, Vol. 50, No. 1, p. 1–29, 5 pls.

Palaeontology. Amer. Nat., 1906, Vol. 40, p. 525–528.

Also several short articles in Science.

REPORT ON THE LIBRARY.

During the year from August 1, 1905, to July 31, 1906, inclusive, 1,264 volumes, 1,837 parts of volumes, and 1,289 pamphlets have been added to the Library.

The additions noted above include 180 volumes and 67 pamphlets purchased from the estate of the late Professor Nathaniel Southgate Shaler.

The total number of volumes in the Library is 42,421, the total number of pamphlets is 36,322.

Five hundred and fifty-seven volumes have been bound; one thousand five hundred and one pamphlets have been separately bound.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE YEAR 1905–1906.

Bulletin: —

Vol. XLIII.

No. 4. Reports on the Results of Dredging, under the Supervision of Alexander Agassiz, in the Gulf of Mexico and the Caribbean Sea, and on the East Coast of the United States, 1877 to 1880, by the U. S. Coast Survey Steamer "Blake," Lieut. Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., Commanding. XLII. Westindische Polychaeten. Von Hermann Augener. pp. 108. 8 Tafeln. May, 1906.

Vol. XLVI.

No. 7. Notes on Bermudian Fishes. By Thomas Barbour. pp. 28. 4 Plates. September, 1905.

No. 8. The Mammals and Birds of the Pearl Islands, Bay of Panama. By John E. Thayer and Outram Bangs. pp. 26. September, 1905.

No. 9. Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific, in Charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U. S. N., Commanding. III. Craspedotella, a New Genus of the Cystoflagellata, an Example of Convergence. By Charles Atwood Kofoid. pp. 5. 1 Plate. September, 1905.

No. 10. Reports on the Results of Dredging, under the Supervision of Alexander Agassiz, in the Gulf of Mexico and the Caribbean Sea, and on the East Coast of the United States, 1877 to 1880, by the U. S. Coast Survey Steamer "Blake," Lieut. Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., Commanding. XLI. Zur Anatomie von Pentacrinus decorus Wy. Th. Von August Reichensperger. pp. 34. 3 Plates. December, 1905.

No. 11. New Plagiostomia. By Samuel Garman. pp. 8. January, 1906.

No. 12. Vertebrata from the Savanna of Panama. By Outram Bangs, Thomas Barbour, Samuel Garman, and John E. Thayer. pp. 22. January, 1906.

No. 13. Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific, in Charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U. S. N., Commanding. IV. Octacnemus. By William E. Ritter. pp. 22. 3 Plates. January, 1906.

No. 14. Certain Scopelids in the Collection of the Museum of Comparative Zoölogy. By CHARLES H. GILBERT. pp. 11. 3 Plates. April, 1906.

Vol. XLVIII.

No. 1. The Spermatogenesis of Scolopendra heros. By MAULSBY W. BLACKMAN. pp. 138. 9 Plates. October, 1905.

No. 2. The Development of the Oculomotor Nerve, the Ciliary Ganglion, and the Abducent Nerve in the Chick. By FREDERICK WALTON CARPENTER. pp. 91. 7 Plates. January, 1906.

No. 3. The Eyes of Certain Pulmonate Gasteropods, with Special Reference to the Neurofibrillae in Limax maximus. By GRANT SMITH. pp. 54. 4 Plates.

Vol. XLIX (Geological Series, Vol. VIII).

No. 1. Glaciation of the Sawatch Range, Colorado. By W. M. DAVIS. pp. 12. 1 Plate. December, 1905.

No. 2. The Wasatch, Canyon, and House Ranges, Utah. By W. M. DAVIS. pp. 44. 3 Plates. December, 1905.

No. 3. Post-Pleistocene Drainage Modifications in the Black Hills and Bighorn Mountains. By GEORGE ROGERS MANSFIELD. pp. 32. 4 Plates. March, 1906.

Vol. L.

No. 1. Structure and Relations of Mylostoma. By C. R. EASTMAN. pp. 30. 5 Plates. May, 1906.

No. 2. Fossil Hymenoptera from Florissant, Colorado. By T. D. A. COCKERELL. pp. 28. June, 1906.

Memoirs:—

Vol. XXVI.

No. 5. Reports on the Scientific Results of the Expedition to the Tropical Pacific, in Charge of Alexander Agassiz, in the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., Commanding. VIII. The Pelagic Tunicata. By WILLIAM E. RITTER and EDITH S. BYXBEE. pp. 22. 2 Plates. August, 1905.

Vol. XXX.

No. 2. 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. XXXI. The Radiating Organs of the Deep Sea Fishes. By ROBERT VON LENDENFELD. With an Appendix on the Structure of the Bud-like Organs of Malthopsis spinulosa Garman. By EMANUEL TROJAN. pp. 50. 11 Plates. 1 Chart. August, 1905.

Vol. XXXIII.

Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific, in Charge of Alexander Agassiz, by the U. S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U. S. N., Commanding. V. General Report of the Expedition. By ALEXANDER AGASSIZ. pp. 14, 76. 96 Plates. January, 1906.

Report:—

1904–1905. pp. 38. December, 1905.

[B]

INVESTED FUNDS OF THE MUSEUM.

In the Hands of the Treasurer of Harvard College, Sept. 1, 1905.

Sturgis-Hooper Fund	$108,720.83
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	5,554.58
Willard Peele Hunnewell Memorial Fund	5,000.00
	$600,012.52

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, on 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 may 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 Woods Hole, Bermuda, or the Tortugas.

Applications for the tables reserved for advanced students at the Woods 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.

PLATE 1.

OKAPI.

M. C. Z. 11,083 Male. Ituri Forest, Congo Free State. Gift of Alexander Agassiz.

PLATE 2.

GREAT AUK OR GARE-FOWL.

M. C. Z. 5,100. Gift of William Barbour.

PLATE 3.

GREAT AUK OR GARE-FOWL.

M. C. Z. 1,503. Funk Island, off Newfoundland. Gift of Sir Alexander Bannermann.

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE.

There have been published of the BULLETIN Vols. I. to XLII., and also Vols. XLIV. to XLVII.; of the MEMOIRS, Vols. I. to XXIV., and also Vols. XXVIII., XXIX., XXXI. to XXXIII.

Vols. XLIII., XLVIII., XLIX., and L. of the BULLETIN, and Vols. XXV., XXVI., XXVII., XXX., XXXIV., XXXV., and XXXVI. of the MEMOIRS, are now in course of publication.

The BULLETIN and MEMOIRS are devoted to the publication of original work by the Professors and Assistants of the Museum, of investigations carried on by students and others in the different Laboratories of Natural History, and of work by specialists based upon the Museum Collections and Explorations.

The following publications are in preparation: —

Reports on the Results of Dredging Operations from 1877 to 1880, in charge of Alexander Agassiz, by the U. S. Coast Survey Steamer "Blake," Lieut. Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., Commanding.

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieut. Commander Z. L. Tanner, U. S. N., Commanding, in charge of Alexander Agassiz.

Reports on the Scientific Results of the Expedition to the Tropical Pacific, in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., Commanding.

Reports on the Scientific Results of the Expedition to the Eastern Pacific, in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from October, 1904, to April, 1905, Lieut. Commander L. M. Garrett, U. S. N., Commanding.

Contributions from the Zoölogical Laboratory, Professor E. L. Mark, Director.

Contributions from the Geological Laboratory.

These publications are issued in numbers at irregular intervals; one volume of the Bulletin (8vo) and half a volume of the Memoirs (4to) usually appear annually. Each number of the Bulletin and of the Memoirs is sold separately. A price list of the publications of the Museum will be sent on application to the Librarian of the Museum of Comparative Zoölogy, Cambridge, Mass.