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Comparative Zoology





**ANNUAL REPORT**  
**OF**  
**THE DIRECTOR**  
**OF THE**  
**MUSEUM OF COMPARATIVE ZOÖLOGY**  
**AT HARVARD COLLEGE**  
**TO THE**  
**PRESIDENT AND FELLOWS OF HARVARD COLLEGE**  
**FOR**  
**1913-1914.**

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**CAMBRIDGE, U. S. A.:**  
**PRINTED FOR THE MUSEUM,**

**1914.**

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:—

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|--|--|
| A. AGASSIZ. V. <sup>1</sup> General Report on the Expedition.                | C. A. KOFOID. III. <sup>3</sup> IX. <sup>9</sup> XX. <sup>20</sup> The Protozoa. |
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- <sup>1</sup> Bull. M. C. Z., Vol. XLVI., No. 4, April, 1905, 22 pp.
- <sup>2</sup> Bull. M. C. Z., Vol. XLVI., No. 6, July, 1905, 4 pp., 1 pl.
- <sup>3</sup> Bull. M. C. Z., Vol. XLVI., No. 9, September, 1905, 5 pp., 1 pl.
- <sup>4</sup> Bull. M. C. Z., Vol. XLVI., No. 13, January, 1906, 22 pp., 3 pls.
- <sup>5</sup> Mem. M. C. Z., Vol. XXXIII., January, 1906, 90 pp., 96 pls.
- <sup>6</sup> Bull. M. C. Z., Vol. L., No. 3, August, 1906, 14 pp., 10 pls.
- <sup>7</sup> Bull. M. C. Z., Vol. L., No. 4, November, 1906, 26 pp., 4 pls.
- <sup>8</sup> Mem. M. C. Z., Vol. XXXV., No. 1, February, 1907, 20 pp., 15 pls.
- <sup>9</sup> Bull. M. C. Z., Vol. L., No. 6, February, 1907, 48 pp., 18 pls.
- <sup>10</sup> Mem. M. C. Z., Vol. XXXV., No. 2, August, 1907, 56 pp., 9 pls.
- <sup>11</sup> Bull. M. C. Z., Vol. LI., No. 6, November, 1907, 22 pp., 1 pl.
- <sup>12</sup> Bull. M. C. Z., Vol. LII., No. 1, June, 1908, 14 pp., 1 pl.
- <sup>13</sup> Bull. M. C. Z., Vol. LII., No. 2, July, 1908, 8 pp., 5 pls.
- <sup>14</sup> Bull. M. C. Z., Vol. XLIII., No. 6, October, 1908, 285 pp., 22 pls.
- <sup>15</sup> Bull. M. C. Z., Vol. LII., No. 5, October, 1908, 11 pp., 2 pls.
- <sup>16</sup> Mem. M. C. Z., Vol. XXXVII., February, 1909, 243 pp., 48 pls.
- <sup>17</sup> Mem. M. C. Z., Vol. XXXVIII., No. 1, June, 1909, 172 pp., 5 pls., 3 maps.
- <sup>18</sup> Bull. M. C. Z., Vol. LII., No. 9, June, 1909, 26 pp., 8 pls.
- <sup>19</sup> Bull. M. C. Z., Vol. LII., No. 11, August, 1909, 10 pp., 3 pls.
- <sup>20</sup> Bull. M. C. Z., Vol. LII., No. 13, September, 1909, 48 pp., 4 pls.
- <sup>21</sup> Mem. M. C. Z., Vol. XLI., August, September, 1910, 323 pp., 56 pls.
- <sup>22</sup> Bull. M. C. Z., Vol. LIV., No. 7, August, 1911, 38 pp.
- <sup>23</sup> Mem. M. C. Z., Vol. XXXVIII., No. 2, December, 1911, 232 pp., 32 pls.
- <sup>24</sup> Bull. M. C. Z., Vol. LIV., No. 10, February, 1912, 16 pp., 2 pls.
- <sup>25</sup> Mem. M. C. Z., Vol. XXXV., No. 3, April, 1912, 98 pp., 8 pls.
- <sup>26</sup> Bull. M. C. Z., Vol. LIV., No. 12, April, 1912, 38 pp., 2 pls.
- <sup>27</sup> Mem. M. C. Z., Vol. XXXV., No. 4, July, 1912, 124 pp., 12 pls.
- <sup>28</sup> Bull. M. C. Z., Vol. LVIII., No. 8, August, 1914, 14 pp.

ANNUAL REPORT  
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THE DIRECTOR  
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FEB 20 1915  
MUSEUM OF COMPARATIVE ZOOLOGY  
CAMBRIDGE, MASS.



# MUSEUM OF COMPARATIVE ZOÖLOGY.

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## Faculty.

ABBOTT LAWRENCE LOWELL, *President.*

HENRY P. WALCOTT.

GEORGE L. GOODALE.

SAMUEL HENSHAW, *Director.*

JOHN E. THAYER.

## Committee on the Museum.

HENRY P. WALCOTT.

GEORGE L. GOODALE.

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## Officers.

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WALTER FAXON . . . . . *Curator of Crustacea and Mollusca.*

SAMUEL GARMAN . . . . . *Curator of Reptiles, Amphibians, and Fishes.*

WILLIAM BREWSTER . . . *Curator of Birds.*

OUTRAM BANGS . . . . . *Curator of Mammals and Associate Curator of Birds.*

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ROBERT W. SAYLES . . . *Curator of the Geological Collections.*

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THOMAS BARBOUR . . . . *Associate Curator of Reptiles and Amphibians.*

RALPH V. CHAMBERLIN . *Curator of Arachnids, Myriopods, and Worms.*

JOHN C. PHILLIPS . . . . *Associate Curator of Birds.*

FRANCES M. SLACK . . . *Librarian Emerita.*

GEORGE NELSON . . . . . *Preparator.*

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REGINALD A. DALY . . . *Sturgis Hooper Professor of Geology.*

EDWARD L. MARK . . . . *Hersey Professor of Anatomy.*

GEORGE H. PARKER . . . *Professor of Zoölogy.*

WILLIAM E. CASTLE . . . *Professor of Zoölogy.*

WILLIAM M. WHEELER . . *Professor of Economic Entomology.*

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WALLACE W. ATWOOD . . *Professor of Physiography.*

LOUIS C. GRATON . . . . *Professor of Mining Geology.*

JAY B. WOODWORTH . . . *Associate Professor of Geology.*

HERBERT W. RAND . . . *Assistant Professor of Zoölogy.*

PERCY E. RAYMOND . . . *Assistant Professor of Palaeontology.*

CHARLES T. BRUES . . . *Assistant Professor of Economic Entomology.*



## REPORT.

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TO THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE:—

DURING the Academic year 1913–1914, many of the courses of instruction in Zoölogy, Geology, and Physical Geography offered in Harvard University and in Radcliffe College were given in the Laboratories and Lecture Rooms of the Museum.

In Zoölogy twenty courses or half courses were taken by 453 students in Harvard University and nine courses or half courses by 68 students in Radcliffe College.

In 1912–1913 these courses and students were:—

*Harvard:* — 19 courses, 407 students;

*Radcliffe:*— 9 courses, 56 students.

The eighteen courses or half courses in Geology and Geography in Harvard University during 1913–1914 were taken by 367 students and the six half courses in Radcliffe College were taken by 48 students.

In 1912–1913 these numbers were:—

*Harvard:* — 17 courses, 268 students;

*Radcliffe:* — 3 courses, 23 students.

During the year, a long-hoped for plan of coöperation between the Boston Society of Natural History and the Museum has been effected. This Society, founded in 1830, at once assumed through its meetings, publications, library, and museum a position of importance. In the latter it accumulated, especially in the period of its first fifty years, valuable collections in natural history and ethnology. The establishment in 1859 of the Museum of Comparative Zoölogy, and later, in 1866, of the Peabody Museum, naturally led to the consideration of the duplication of resources and a desirable division of the field of work. In 1867, the Society voted to abolish the department of ethnology, and shortly afterwards presented their ethnological collections, including the valuable collection of the Boston Marine Society, to the Peabody Museum. A limitation as to the field to be covered in zoölogy was a matter

of frequent discussion between the Curators of this Museum and of the Boston Society during the eighties and again in 1896, when a tentative plan for the transfer of the Lafresnaye collection of birds from the Society to the Museum was abandoned, owing to financial considerations and to the objections of some of the more conservative and influential members of the Society. During 1913 and 1914, however, the subject was reconsidered and an agreement reached by which the Society will in large measure limit their activities to the natural history of New England, a field great enough to tax their resources for many years. Under this agreement, it is proposed eventually to transfer to this Museum all the so-called research material in zoölogy, other than that needed for the study of the New England fauna, and for the exhibition of a typical series of the principal animal types. In return, this Museum will give the Society any New England material it may require, with the exception of the types of species and such other specimens as are of more scientific value with series covering large geographical areas than with series from a limited faunal area. The Museum will also, through its collections and staff, aid in the increase and preparation of the exhibition series representing the animal kingdom throughout the world. Though progress in this work must necessarily be slow, it cannot fail to be advantageous to both institutions. The Museum has already received a large proportion of the Society's unmounted birds, the old Boston Museum collection of birds, some European fossils, and a part of the Owen Bryant Javan collections.

By a similar though less extensive coöperative interchange of resources, this Museum has received the George Baur Galapagos collection belonging to Clark University. This collection consists chiefly of birds and reptiles, with a smaller series of insects, arachnids, and shells, and the unique type of the bat, *Atalapha brachyotis* Allen. In return for this collection, the Museum has forwarded to Clark University a complete set of its Memoirs and Bulletins and will send future volumes as issued.

Some interesting field-work has been accomplished during 1913-1914, though as not infrequently happens, a notice of the results must be deferred until the following year. The report of an expedition to Arctic waters and of a most successful trip to the West Indies, both made possible by the aid of several friends of the Museum, will be given in the next Annual Report.

Dr. John C. Phillips conducted a collecting trip to the Sinai Peninsula and Southern Palestine during the spring (22 March-

12 May, 1914). He was accompanied by Mr. W. M. Mann and has most generously given to the Museum the specimens taken. These specimens are chiefly vertebrates, (mammals, birds, and reptiles), with smaller series of insects, myriopods, and other invertebrates. A partial examination of this material reveals a few novelties, but coming from a region entirely unrepresented in the Museum, it is especially valuable for comparative purposes.

On the courteous invitation of Dr. A. G. Mayer of the Carnegie Institution, Dr. H. L. Clark was a member of the expedition sent by the Institution to Torres Strait. Through Dr. Mayer's generous and considerate assistance, Dr. Clark enjoyed exceptional opportunities for collecting, not only in the region of Torres Strait, but at several points during the voyage. His time and interest were almost entirely devoted to the study and collection of echinoderms, of which he got together a large and valuable series, numbering about 2,700 specimens of 200 species; in addition, he collected a number of reptiles and some insects, mollusks, and other invertebrates. Dr. Clark also examined collections of echinoderms at several museums in New Zealand, Australia, and Hawaii.

Dr. H. B. Bigelow was again enabled, through the kindness of the U. S. Bureau of Fisheries, to enjoy the facilities of the U. S. F. S. GRAMPUS in working out some of the problems of interest, incident to a survey of the coastal waters between Marthas Vineyard and Halifax. Though unable to carry out his entire plan of operations in the north, Dr. Bigelow obtained full data as to temperatures, water samples, and ocean currents, at fifty-two stations, and made a large number of tows and hauls. As in his earlier GRAMPUS work, Dr. Bigelow has received much assistance in the determination of the plankton collections, and for this service thanks are due Drs. H. J. Hansen, C. O. Esterly, C. McL. Fraser, and Mr. E. L. Michael.

Dr. R. V. Chamberlin's field-work covered areas in Maine, New Hampshire, Minnesota, and among the Wasatch Mountains of Utah. His collections, chiefly myriopods and arachnids, embrace many novelties, as well as specimens from type localities necessary for the determination of the species of earlier authorities.

Prof. P. E. Raymond gave four months of the Museum year to an investigation of some of the Palaeozoic strata of Russia, Sweden, and Norway. He studied the stratigraphy and collected large series of fossils from deposits of Cambrian, Ordovician, and Silurian age. Professor Raymond also studied some of the Ordo-

vician fossils in several museums in England, France, Germany, Russia, Sweden, and Norway.

The Museum is indebted to Messrs. Bangs, Barbour, Bigelow, Brewster, Faxon, and Sayles for the care they have taken of the collections under their charge. Their reports and those of the other Curators give the usual details of the work accomplished and of the more important accessions received during the year.

The Museum is likewise indebted to Dr. L. E. Griffin for assistance in the determination and arrangement of its large series of stony corals, and also to Miss E. B. Bryant, who, by her own efforts and through exchanges, has added much material to the collection of Araneina. Miss Bryant has, as in recent years, given her time freely to the care and identification of this collection which is in a most satisfactory condition.

Dr. G. M. Allen has identified, catalogued, and labeled the mammalian accessions received during the year, has effected some important exchanges, and attended to the loan of material to specialists. He has completed the rearrangement of the fossil Primates, Cetacea, Edentata, and Marsupialia, and has incorporated these with the skeletal remains of recent forms; a similar rearrangement of the Ungulata has been begun. Dr. Allen has also reviewed the entire collection of recent Primates and has sorted over the alcoholic Rodentia, Carnivora, and Insectivora.

Mr. W. F. Clapp has continued his work upon the Mollusca during the whole year; he has revised the entire series of Cephalopoda, Pteropoda, and Heteropoda and made considerable progress with many genera of Gasteropoda, while the work on recent accessions has been kept well in hand. Mr. Clapp has also studied the Salpae, Heteropoda, and Pteropoda collected by the GRAMPUS.

Miss Elvira Wood worked for eight months upon the fossil crinoids, and the research series is now in excellent condition for study. She has also reviewed the fossil crinoids on exhibition in the Systematic Room.

Mr. J. D. Sornborger has worked throughout the year upon the rough mammalian skeletons and has made many ligamentous skeletons of birds from fresh material received from the Boston Park Commissioners.

The work of a Museum Preparator is subject to so many interruptions and changes that progress toward any special end is oftentimes disappointingly slow. The more notable results of Mr. George Nelson's work for the exhibition collections consist

of a fine pair of Elk (*Cervus canadensis*), obtained in Montana by Mr. William Dirrett, and a male Virginia Deer (*Odocoileus virginianus borealis*), taken in the Adirondacks, the gift of Mr. W. W. Barbour. Mr. Nelson has also revised a part of the Primates, both mounts and skeletons, on exhibition in the Systematic collection; these have been rearranged in three new cases.

Ill health during the year greatly curtailed the work of Mr. Walter R. Zappey, who died in Cambridge on the 20th of February, 1914. In his death, the Museum lost the services of an efficient and most conscientious Preparator. Owing to an early interest in birds, Mr. Zappey became a professional taxidermist. One result of his field-work, which had attracted the notice of Mr. Outram Bangs, was a paper on the birds of the Isle of Pines, published under their joint authorship. This paper was based on the material and notes made by Mr. Zappey during two visits to the island. Through the ever-ready generosity of Col. John E. Thayer, Mr. Zappey was associated with the Arnold Arboretum Expedition to Western China, in charge of Mr. E. H. Wilson, working during a part of the years 1907-1909 wholly in the interests of this Museum. The large and valuable series of vertebrates resulting from this expedition, (see Mem. M. C. Z., 40, no. 4), is evidence of Mr. Zappey's industry and ability. From December, 1909, until March, 1910, Mr. Zappey was in British East Africa with Mr. Childs Frick, and through Mr. Frick's kindness, the birds, small mammals, and a few of the large ungulates taken, were added to the collections of the Museum. From August, 1910, until his death, Mr. Zappey worked as Museum Preparator upon the research and exhibition collections of birds and mammals. His skill and faithfulness were as willingly given to the most tiresome drudgery incident to his position as to the mount of a rare mammal shot by himself in Asia or Africa. For Mr. Zappey's services as Preparator, the Museum is indebted to the generosity of Dr. John C. Phillips.

The constant generosity of Col. John E. Thayer has enriched the library and collections of the Museum. To the latter, he has given many mammals and insects, while his contributions to the ornithological department include specimens from the Antarctic and Arctic, as well as from tropical and temperate North America. Among Col. Thayer's gifts to the library are manuscripts and publications of great interest and value. The manuscripts include two autograph journals and sixty-eight letters of John J. Audubon, together with many letters of Mrs. Audubon and her

son Victor G. Audubon. The journals cover dates during 1820–1821 and 1840–1842; the earlier one is illustrated by a drawing showing the nomenclature of the external parts of a bird. The letters dating from 1829–1839 are addressed to the Havells, the engravers of the plates of Audubon's works. Of later date are a series of more than 150 plates, with colored illustrations of the eggs of North American birds, drawn from nature by William S. Morgan, for a proposed work of the late Dr. T. M. Brewer. A third item of interest among Mr. Thayer's gifts to the library consists of a copy of J. K. Townsend's *Ornithology of North America*, (Philadelphia. 1839), one of the scarcest publications on this subject.

Dr. J. C. Phillips's collections from Sinai and Palestine have been mentioned; his other contributions include many gallinaceous birds, as well as ducks and geese, selected to fill gaps in the Museum series; both of these groups are well represented owing very largely to Dr. Phillips's previous gifts.

From the Hon. W. Cameron Forbes, the Museum has received a second series of Philippine birds mostly taken by himself during his stay as Governor General of the Islands. These two donations give the Museum an excellent representation of Philippine birds. Mr. Forbes was also good enough to collect for the Museum a considerable series of birds during a trip to Cuba, Jamaica, and Guatemala.

To Mr. L. W. Swett the Museum is indebted for a large collection of North American Geometridae, a family of moths, to which he has paid especial attention during recent years. Mr. Swett's gift of a valuable series of types was recorded in the Report for 1912–1913; the collection presented this year numbers about 7,000 specimens and represents more than three fourths of the described North American species. Mr. Swett has also begun a complete rearrangement of the collection of Geometridae, incorporating his own series with those previously in the Museum, verifying the identifications, and revising the nomenclature.

By the kind thoughtfulness of the officials of the Department of Parks of the City of Boston, the Museum has received from time to time such mammals and birds as have died at the Franklin Park Zoo. A few of these were not previously in the collection, and all have furnished, either as skins or skeletons, specimens of scientific value.

Of the other gifts received from many donors the following deserve separate mention: —



From Miss L. S. Brewer, a number of ornithological books and pamphlets, including two volumes of colored drawings of eggs of North American birds; though unsigned, this series of drawings was evidently designed for the same work as the series given by Mr. Thayer.

From the heirs of Thaddeus William Harris, a number of scarce pamphlets.

From Dr. C. R. Eastman, several volumes of the reports of geological surveys and a collection of invertebrate fossils.

From Mr. C. T. Ramsden, many vertebrates and invertebrates from Cuba.

From the University of Michigan, through Dr. A. G. Ruthven, specimens of Onychophora and Myriopoda from Colombia.

From the Rev. John T. Gulick, a valuable collection of Hawaiian land shells.

From Prof. H. W. Foote, the Arachnida collected during a Yale Peruvian expedition.

From Mr. J. H. Emerton, Arachnida, including types of many new species.

From Prof. C. H. Eigenmann, a collection of Myriopoda brought together and studied by the late Prof. C. H. Bollman, at the time of his death the principal American authority on the group.

From Mr. F. C. Bowditch, a very large series of Chrysomelidae, a family of beetles, the special study of Mr. Bowditch.

From Mr. E. D. Harris, a series of tiger beetles belonging to the genera *Omus* and *Tetracha*.

From Mr. B. P. Clark, a number of Sphingidae (hawk moths) new to the collection.

From the British Association for the Advancement of Science, Committee on the Zoölogy of the Sandwich Islands, a large and especially valuable collection of insects, a part of the material used in the preparation of the *Fauna Hawaiiensis*.

From the Rev. George Schwab, a number of West African birds new to the collection.

From Col. John Caswell, mounted heads of several species of African big game (Ungulata).

From Mr. Copley Amory, apparatus for oceanographic work.

The principal additions by purchase are the George Schwab West African collection, (mammals, reptiles, amphibians, fishes, and invertebrates); the Mexican lower vertebrates and several groups of invertebrates collected by Mr. W. M. Mann, and the Brazilian Myriopoda also collected by Mr. Mann in 1911; a



small collection of insects from British Guiana; a series of Coleoptera and Lepidoptera (Geometridae) taken in the Black Mountains of North Carolina by Mr. William Beutenmüller, and additional series of Rotifera prepared by Mr. C. F. Rousselet.

The disastrous fire at Wellesley College in March 1914 destroyed the collection of Bryozoa obtained during the cruise of the ALBATROSS in the Eastern Pacific during the years 1904-1905. Miss Alice Robertson, who was engaged in the study of this material, lost her private library, together with all her notes and drawings, covering the work of many years. Regrettable as this loss must always be, it is not irreparable, as the results were unpublished, and new explorations, with renewed energies, will in time replace both collections and results.

A second loss of material which can only be termed irreparable must also be recorded, namely, a very large part of the Comatulæ obtained chiefly by the U. S. C. S. S. BLAKE during the several cruises of the years from 1877 to 1880. This valuable material, which was originally entrusted to Dr. P. H. Carpenter for study and report, was, owing to his death in 1891, sent by Mr. Agassiz to Dr. Cl. Hartlaub. Because of other duties, Dr. Hartlaub's study of these specimens was subject to many interruptions, so that his results were not published until April, 1912, (Mem. M. C. Z. 27, no. 4), though several of the plates had been prepared and printed many years earlier. After the issuance of Dr. Hartlaub's Memoir, he was asked in September, 1912, to return the collections on which his report was based, and later, in November, 1912, the specimens of *Actinometra echinoptera*, listed on p. 416-417, 440-443 of his Memoir, were, with few exceptions, received. Several later appeals for the return of the balance of the collection have proved ineffective, Dr. Hartlaub stating that his return included all that he had any knowledge of, though he is wholly unable to offer any very satisfactory reason for this unfortunate state of affairs. It is especially to be regretted that Dr. Hartlaub, when forwarding his manuscript for publication, did not make known that the material entrusted to him and upon which his report was based was not in his possession. Had he done so, the description of his many new species would have been withheld, and future investigators would have been spared the annoyance and uncertainty that will arise from the loss of the types of his new species. The types of three of the five species of *Antedon*, described by Pourtalès and referred to by Hartlaub in his Memoir, are also unfortunately missing from the collection of the Museum, a loss without doubt due to Dr. Hartlaub's neglect.

The echinoderms collected by the ALBATROSS during the expeditions of 1899-1900 and 1904-1905, and sent to the late Dr. Hubert Ludwig of Bonn for report, have been returned to the Museum; the collection is in good order.

The Library consists of 51,499 volumes and 47,716 pamphlets; 1,203 volumes and 1,148 pamphlets have been added during the year.

The publications of the year include one volume and five numbers of the *Memoirs*, thirteen numbers of the *Bulletin* and the *Annual Report*, a total of 1,622 (885 quarto, 737 octavo) pages, and 158 (117 quarto, 41 octavo) plates.

One number of the *Bulletin* was issued in the Geological series, eleven numbers of the *Bulletin* contain reports on collections of the Museum, and one number of the *Bulletin* and one number of the *Memoirs* represent field-work of two members of the Museum staff; of the other *Memoirs*, one number and Mr. Garman's volume on the *Plagiostomia* were issued under the provisions of Mr. Agassiz's Expedition Fund.

The Corporation granted the sum of \$300.— to assist in the publication of contributions from the Zoölogical and Geological Laboratories.

SAMUEL HENSHAW,  
*Director.*

## REPORT ON THE ZOÖLOGICAL LABORATORY.

BY E. L. MARK.

Again the Department has profited by the system of exchange of professors with other institutions. In the present instance Prof. H. W. Norris of Grinnell College, Grinnell, Iowa, was in residence here during the greater part of the year.

Tables follow, giving the numbers attending each course, both in Harvard (Table 1) and in Radcliffe (Table 2), grouped according to the classes to which the students belonged.

TABLE I.

Courses for 1913-1914	Graduates		Sen.	Jun.	Soph.	Fresh.	Out of course	Spec.	Uncl.	Total
	A. & S.	Ap. Sci.								
Zoölogy 1	1	1	16	40	55	58		4	11	186
" 2	1		26	44	40	17		1	9	138
" 3	2+2	2		14	10	6		2	2	38+2
" 4	2	3	1	5				1	1	13
" 5b	3	1	2	3			1	1	1	12
" 6	1+4								1	2+4
" 7a	2	2+1	2	3			1			10+1
" 7b	1	2	2	3			1			9
" 7c		2	2				1			5
" 7d		3								3
" 11	3	1		2					1	7
" 12	1+3									1+3
" 14a	6	2	2	1	1					12
" 17	1+2									1+2
" 20a	1									1
" 20b	1									1
" 20c	3	1								4
" 20d		3								3
" 20f		6								6
" 20g	1									1
Sums	30+11	29+1	53	115	106	81	4	9	26	453+12

Note: Numbers in italics indicate students who attended the lectures, but were not enrolled in the course. To make numbers directly comparable with those of previous years, these are not incorporated with the enrolled students.

TABLE II.

Courses 1913-1914	Gr.	Sen.	Jun.	Soph.	Fresh.	Spec.	Uncl.	Total
Zoölogy 1		2	4	8	20	4	1	39
" 3			1			2		3
" 4		1	3	1		1		6
" 5b		1	4			1		6
" 6			1					1
" 14a	1	1	3			1		6
" 17	1		1					2
" 20c	1	1				1		3
" 20g		1	1					2
Sums	3	7	18	9	20	10	1	68

The increase in the number of students in Zoölogy I, given by Professor Parker, taxed the laboratory facilities, even with an increase in the number of sections, almost to their limit. The chief assistants in the Harvard courses were Messrs. L. B. Arey and H. D. Fish; the subassistants Messrs. A. M. Eisenberg, H. R. Hunt, and F. X. Williams. The assistants in Radcliffe were Messrs. D. H. Wenrich and P. W. Whiting. As the tables show, the classes most largely represented were the Freshman and Sophomore.

Zoölogy 2, by Professor Castle, was given without laboratory work, and to Harvard students only. More students from the Junior and Sophomore classes were enrolled than from the other classes.

In Zoölogy 3, by Assistant Professor Rand, the laboratory work was limited, as in the preceding year, to the dissection of a fish, an amphibian, and a mammal. The assistant in the Harvard course was Dr. B. M. Patten; but during April and May his place was taken for a part of the time by Mr. W. J. Crozier, and for the remainder of the time by Mr. S. F. Haines. The Radcliffe assistant was Mr. L. B. Arey. Zoölogy 4 was also given, as usual, by Assistant Professor Rand, and to Radcliffe students as well as to Harvard students. The assistant in the Harvard course was Dr. B. M. Patten.

Zoölogy 5b and Zoölogy 12 were given by Professor Mark, the assistant in both courses being Mr. A. C. Redfield.

The course in Advanced Anatomy of Vertebrates, with Special Reference to the Segmentation of the Head, (Zoölogy 6) by Pro-

fessor Norris, was given with laboratory work to students in both Harvard and Radcliffe. The lectures were attended by four Harvard Graduate students not enrolled in the course.

The courses in Entomology — Zoölogy 7a to 7d — were given as usual by Professor Wheeler and Assistant Professor Brues, partly in Cambridge and partly at the Bussey Institution.

As in previous years, the zoölogical half of Zoölogy and Botany 11 was given by Professor Castle, and the botanical half by Professor East.

Zoölogy 14a was opened by Professor Parker to students in Radcliffe College, as Zoölogy 14b had been in the preceding year. Eight of those taking this course chose it as a thesis course. Six of those who took it as a laboratory course worked on the same subject that they took in Zoölogy 20c.

Zoölogy 17, by Assistant Professor Rand, was likewise conducted jointly for Harvard and Radcliffe.

On Saturday afternoons during the first half-year, Professor Parker gave at the Zoölogical Laboratory a course on zoölogy to twenty teachers in the Teachers' School of Science. The assistant in the laboratory was Mr. W. J. Crozier.

During the year, sixteen Harvard students were engaged in research. Of these there were enrolled one each in Zoölogy 20a and Zoölogy 20b under Professor Mark, four in Zoölogy 20c under Professor Parker, three in Zoölogy 20d under Professor Castle, six in Zoölogy 20f under Professor Wheeler, and one in Zoölogy 20g under Professor Rand. In Radcliffe there were five research students, of whom three were enrolled in Zoölogy 20c under Professor Parker and two in Zoölogy 20g under Professor Rand.

On Mr. Bradley Merrill Patten the degree of Ph. D. was conferred in February, 1914. His thesis was entitled A Quantitative Determination of the Orienting Reaction of the Blowfly Larva (*Calliphora erythrocephala* Meigen).

The Bermuda Biological Station for Research was opened June 12 and closed August 10. Five persons were enrolled, of whom three were from Harvard University. Two Harvard students at the Bermuda Station received aid from the Humboldt Fund to the amount of \$205.76.

The Harvard Table at the Marine Biological Laboratory, Woods Hole, was occupied by a Graduate student from July 5 to August 10. The Radcliffe Table was occupied by a member of the Class of 1914 and a Special student of Radcliffe.

A Graduate student of Harvard working at the Scientific Labora-

tory at the United States Bureau of Fisheries in Woods Hole received \$30. from the Humboldt Fund.

In November, 1913, Professor Parker gave on invitation one of the Harvey lectures before the New York Academy of Medicine. His subject was The Origin and Evolution of the Nervous System. He also gave one of the four addresses on The Scope of Biological Teaching in Relation to New Fields of Discovery delivered before the American Society of Naturalists at its meeting in Philadelphia in December, 1913. Professor Parker was appointed William Brewster Lecturer at Amherst College for 1913, where he delivered during April, 1914, four lectures on Biology and Social Problems.

The Zoölogical Club held twenty-two meetings. Twenty-one original papers were presented, and about a dozen reviews. The average attendance was seventeen.

REPORT OF THE STURGIS HOOPER PROFESSOR OF  
GEOLOGY.

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BY REGINALD A. DALY.

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During the year, the writer continued to act as chairman of the Department of Geology and to give instruction in Geology 4 (completed by 137 students), Geology 9 (completed by 3 graduate students), and Geology 20c (completed by 4 graduate students). He served also as convener of the Geological Conference.

The first half-year was largely occupied with the proof-reading of a book on Igneous Rocks and their Origin which had been completed in the preceding year; it was published in February, 1914.

The second half-year was chiefly devoted to the writing of a detailed report to the director of the Geological Survey of Canada on the geology of the Selkirk and Purcell mountain ranges at the Canadian Pacific Railway. The completed report was sent to the director in May; it is to be published as a memoir of the Canadian Survey.

On June 2nd I sailed for Europe, returning on September 30th. Field-studies and collections were made:—in the English Lake district; in Ayrshire, Fifeshire, the Northwest Highlands and other districts of Scotland; in southern Sweden; and in Lappland. The principal field work was performed on the genetic problem of the famous iron ores at Kiruna in Swedish Lappland. The rock collections made in Great Britain and Sweden will have value for advanced students in petrology. The usefulness of the Gardner Fund to the Department was again shown as it enabled the writer to secure a superb series of lantern slides and large photographic prints illustrating the geology of Scotland. This purchase was possible through the courtesy of Dr. J. S. Flett, the Director of the Geological Survey of Scotland, who permitted an unlimited selection from the thousands of fine official negatives belonging to that Survey. The professional benefit of the season was greatly enhanced by the masterly guidance of Dr. John Horne in the Scottish Highlands, and by the unexcelled kindness of the general manager of the mining company at Kiruna, Dr. Hjalmar Lundbohm, who by his interest and foresight expedited the investigations in that field.



REPORT OF THE DEPARTMENT OF GEOLOGY AND  
GEOGRAPHY.

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BY REGINALD A. DALY.

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In the past year no permanent changes were made in the personnel of this Department, which, however, then first felt the vitalizing benefit of the several additions to its staff which were described in the last report to the Director. The serious illness of Professor Woodworth in the autumn made it necessary to supply his place as instructor in Geology 8, an important course in general geology; the Department was fortunate in securing the services of Prof. A. C. Lane of Tufts College, who conducted that course until Professor Woodworth had recovered. The assistants appointed for the year were:—Messrs. W. P. Haynes, E. Wigglesworth, and Y. S. Bonillas (in Geology 4); and Messrs. C. F. Brooks and A. Wandtke (in Geology A, now Geology 1). Mr. Haynes acted also as assistant in Geology 5, as instructor in the summer course S15, and instructed in geology at Radcliffe College.

The reopening of the geographical courses was largely responsible for a notable increase in the amount of instruction given by the Department. In the winter session of the University the total number of takings was 367 (completed courses or half-courses of study); these were distributed through 18 courses and half-courses. In the preceding year the takings were 232, distributed through 15 courses and half-courses. The summer field-course in Montana was continued by Professor Woodworth (7 students), and a new summer course operating in Quebec and New Brunswick was conducted by Dr. Haynes (8 students) in 1914. Professor Woodworth supervised the work of one student in the research summer course, S20c. Owing to the continuous, intensive nature of all these summer courses, they are among the most valuable of those offered by this Department. Six half courses in Radcliffe College were completed by 48 students, as against 3 half-courses with 24 students in the preceding year.

Messrs. D. C. Barton, C. F. Brooks, and W. P. Haynes were successful in winning the degree of Doctor of Philosophy in the field of Geology and Geography.

Coöperation with the geological department of the Massachusetts Institute of Technology has been continued. For some years

the advanced courses of each institution have been open to graduate students in the other. During the past year a number of Institute students took advantage of this arrangement, which has again proved its value and practicality. The sessions of the Geological Conference in each institution have distinctly benefitted by the attendance of instructors and advanced students from the other institution. It is to be hoped that this coöperation may be still further systematized and strengthened; the hope is based on the cordial relations existing between the two departments concerned.

Mr. Robert W. Sayles continued to give his valued services as Curator of Exhibition Collections and has again showed his deep interest in the University by generously presenting needed material and considerable sums of money for the running expenses of the Geological Section of the Museum, as well as financially aiding the teaching work of the Department in a very substantial way. The Department is also indebted to Prof. Roland B. Dixon, acting for the Department of Anthropology, for the generous gift of many geological books, which form a useful addition to the small working library of the Division of Geology. Other gifts are noted in the sequel.

The Department is still very seriously handicapped by the lack of a thoroughly equipped departmental library. At present the Department has neither a librarian nor a secretary. The waste of time and energy on the part of the professors, as they are compelled to do much purely clerical work, is obvious. The most pressing need of the Department is doubtless that for an officer appointed by the Corporation to act as Librarian-secretary. That notable financial saving could thus be effected is already proved by geological departments in other institutions, as, for example, that at the Massachusetts Institute of Technology.

Mr. Edward Wigglesworth, Curator of the Gardner Collection of photographs, reports in tabular form on the state of the collection on July 1, 1914:—

	Photographs	Slides	Negatives
Accessions since last report	73	519	0
Unidentified views	150	0	155
Duplicates	116	0	0
Broken	0	0	0
Last accession number	7,415	7,423	0
Number now in collection	7,304	7,423	1,084
Card catalogued	0	7,139	0

By a vote of the Corporation, passed at the request of Mr. Gardner, the income of the fund may now be expended for process reproductions and enlargements; and any unexpended balance may be used for purchase of geological maps.

The more important additions to the collection during the year were as follows:—800 lantern slides purchased by Professor Atwood for use in his courses (in process of being catalogued); 78 lantern slides and photographs purchased from Dr. F. H. Lahee, illustrating details of local geology; 95 photographs of the southern Pacific Islands, from Prof. W. M. Davis. A large series of panoramic photographs of the Hawaiian volcanoes, taken by Mr. G. C. Curtis, has been received, for scientific use, from Mr. Sayles and placed in storage uncatalogued.

As a result of the recent vote of the Corporation allowing a wider use of the income of the fund, the following were purchased: Joubin's Map of the coral reefs of the world; Stille's *Geologische Charakterbilder*; Schuchert's Paleogeographic maps, complete (enlargements).

About 300 lantern slides have been loaned temporarily to Wellesley College to replace the collection which was destroyed in the recent fire at that college. Professor Barton has continued to use the collection in his course in the Teachers' School of Science.

During the year, three field investigations, supported by the accumulated income of the Shaler Memorial Fund, were begun. A grant was made to Prof. W. M. Davis, who, early in 1914, left Cambridge to study the coral reefs of the Pacific Ocean and has not yet (October 10, 1914) returned. A second grant was made to Professors Raymond and Twenhofel to cover their expenses in an extensive stratigraphic study of the Silurian system in Russia and Sweden. The third grant was made to Professor Atwood for an investigation of physiographic development in relation to the natural concentration of ores in the Butte district, Montana. The range of these problems and the standing of the investigators indicate the rich and steady harvest which may be expected from the employment of this permanent fund.

This year the Josiah Dwight Whitney scholarship, to the full value of its annual income, was granted to Mr. Alfred Wandtke, who spent the summer working on the geology of special localities in Montana and other western states.

Professors Wolff and Palache, of the Department of Mineralogy and Petrography, have continued to give their indispensable services freely to our own Department; not the least of their courtesies is that of giving hospitality to geological students who

have desired to use the Mineralogical library. These gentlemen at very considerable financial and personal sacrifice have built up and steadily cared for this excellent though small library, as a matter of absolute departmental necessity, yet with very little aid from the University corporation. Seeing the equally great need of the Department of Geology and Geography they have generously opened their library to its students, thereby seriously adding to the personal work and responsibility of the two professors, who still are doing the clerical work of the library.

Professor McAdie reports that for the Blue Hill Meteorological Observatory the year has been one of progress. The Observatory is back again in its old place of leadership in meteorological work in this country. The Mount Weather Observatory on which something like \$400,000 of public money had been expended has been abandoned by the Government at a time when advanced aerological work in this country was most needed. It is true the output has been incommensurate with the amount expended but none the less we regret the closing of an institution equipped to carry on certain work inaugurated at Blue Hill.

One course of instruction was offered at the Observatory for graduate students, namely Meteorology 20. One graduate student, preparing himself for work in a foreign Weather Service took the course. Also one candidate for Doctor's degree served as one of the Observatory staff. The Director gave three illustrated public lectures in Boston during the year.

Several undergraduates visited the Observatory and some familiarized themselves with the routine of the Observatory, the care of instruments and preparation of meteorological forms.

Gifts to the Observatory included the following:—from Mrs. A. Lawrence Rotch, the generous sum of \$1,574.53 for running expenses; from Professor E. C. Pickering (one-half cost of printing *Annals*, estimated) \$400.00; Mr. Livingston Davis, fire extinguishers; the Elizabeth Thompson Science Fund for experiments in connection with frost, \$150.00.

One of the professors of the Department has suggested the advisability of installing a modern seismograph in the Observatory. A space of 400 or even more square feet is available and there are certain excellent scientific reasons why a high grade seismological station should be maintained at this point in connection with the aerological records. It would add to the strength of the Department if such action could be taken. The study of earth waves should be correlated with the studies of air waves and ocean waves.

A few years ago Professor McAdie was able to show that a marked and peculiar disturbance recorded on the mareograph (self-recording tide gage) of the U. S. Coast Survey in San Francisco Bay, and thought to be due to a submarine earthquake, was in fact due to atmospheric causes. With a good mareograph in Boston harbor (and assistance of the Coast Survey could be depended upon) and a seismograph at Blue Hill in addition to the existing equipment, it would be possible to follow closely and correlate the larger vibrations which are transmitted through earth, water, and air at certain times, due to volcanic or tectonic disturbances.

Prof. H. L. Smyth gave his new, advanced course on the geology of iron ores to six students.

Professor Ward reports:— The courses in Meteorology and Climatology, hitherto designated Geology 1, 2, etc., have been given the designation of Meteorology 1, 2, etc. This change was desirable in view of the increase in the number of these courses, and because of the confusion which has frequently arisen on account of the use of the term Geology in connection with courses in Meteorology and Climatology. A new half-course on the Climatology of South America, given for the first time in 1913–1914, was elected by 9 students. This course replaces that on the Geography of South America, which has been withdrawn. The most important addition to the laboratory equipment was an Assmann Aspiration Psychrometer, purchased during the year. The large model of the United States showing mean annual isotherms and isohyetal lines was removed from the Geological Museum Exhibition Rooms and placed on the wall of Professor Ward's small lecture room, where it is more accessible to students of Climatology. Mr. Charles F. Brooks, Assistant in Meteorology, completed a thesis on the Snowfall of the Eastern United States, as a part of the work for his Ph.D. degree. Owing to the completion of the new extension of the Peabody Museum, it was desirable to move the window shelter in Room 43 from the east to a south window. During the winter, Professor Ward devoted much time to the preparation of a discussion of the weather element in American climates. This paper will shortly be published. In the summer of 1914, he prepared a series of lectures on the Climatology of the Eastern Hemisphere, for a new half-course in that subject.

Geology 8 was conducted by Professor A. C. Lane and Geology 12 by Mr. Haynes until about Dec. 1, when Professor Woodworth resumed his duties. Courses 4, 5, 8, and 16 were also given to students in Radcliffe College. In July–August, 1914, Professor

Woodworth conducted the Rocky Mountain Summer Course on the Sayles foundation. He also continued the work of the Harvard Seismographic Station in connection with the International Seismological Commission. Mr. G. M. Flint performed most of the usual routine work of the instrument room, fixing the records etc., except for Sundays and holidays when Professor Woodworth did the work. During July and August, 1914, in the absence of Mr. Flint the seismograph was kept running by Mr. Sydney Holmes, the janitor of the Geological Museum. Reports are in preparation by Professor Woodworth, on geological field-work done in connection with the N. Y. Geological Survey, and on hours at which earthquakes occur. At the close of the Summer School in Montana in August, 1914, Professor Woodworth went in the interests of the School to Butte and thence southward to Salt Lake City to look over the ground for a possibly better field for the instruction in aqueous and structural geology. He returned with the conviction that the present route of the travelling Summer School from Bozeman out and back — via the West Gallatin Cañon to Squaw Creek (cañon), thence by Spanish Creek to Cherry Creek and so by Pole Creek to the Madison River, through Norris to Eunis, thence to Virginia City and the Ruby Dredges; returning via the Axolotl Lakes and Old Baldy Mt. to Varney on the Madison River, with a side trip to the Ruby River, Bear Creek and the Sphynx Mt. overthrust, returning thence to Eunis,— affords the greatest opportunity for study of geological structure and rock types with the most suitable environment for a course composed of graduate and undergraduate students. The University is indebted to Mr. Peter Marek of Ruby Creek, Montana, for a large section of prismatic limestone donated to the Museum. A collection of Cambrian trilobites from Pole Creek was also acquired.

During the second term Professor Atwood gave the following courses in Physiography:—Geology A, an introductory course completed by 67 students; Geology 6, Physiography of the United States, with a class of 16 students. During the year, he continued his study of the San Juan Mountains which is being conducted under the auspices of the U. S. Geological Survey. He was especially fortunate while in the field in discovering evidence of glaciation during the Eocene period in the San Juan Mountains of Colorado. This is the first definite evidence of a glacial period in that epoch of the Earth's history. Professor Atwood presented a report of the discovery before the Geological Society of America,



and has a descriptive paper in process of publication. He also presented a paper before the joint meeting of the American Geographical Society and the Association of American Geographers on the Physiography of the San Juan Mountains. Professor Atwood has taken a supervisional charge for the University over the college work in Geography which is being offered at the Boston Normal College, and, with Mr. Sayles, has become associated with the establishment of the Children's Museum of Boston.

Several hundred new topographic maps have been added to the equipment, and about 30 small selected groups of such maps have been mounted together for laboratory work.

In the development of physiographic and geographic geology in the University it is highly desirable that a great deal of field work be done. The study of the local region is being worked more and more into the courses of instruction, but it is evident that a field school of geology and geography, conducted throughout the summer months, should be established and conducted on such a scale that the men could receive at least two months' instruction in the field, and could there be trained for practical or professional work in these subjects. This field school should be to this Department what the engineering camp is to the department of engineering. Such a school needs an endowment and certain scholarships to help deserving students to defray the necessarily heavy traveling expenses.

Professor Atwood believes that the engagement of graduate students, or, as it sometimes must be, undergraduate students as assistants in the courses of instruction is not altogether satisfactory. A young man well trained in the work of the department and appointed to a position as assistant or instructor for a term of two or three years would prove much more satisfactory, and would raise the efficiency in the instruction at very little increase in expense.

Professor Graton gave the following courses:—Geology 10, on ore deposits (15 students); Geology 20b, research on ore deposits (3 students, recorded as 8 full courses); Geology 18, on fuels, fluxes, etc., (assigned part of instruction, 4 students). He continued to act as secretary and manager of the Copper Producers' Association of New York, as director of the investigation on the secondary enrichment of ores (described in the last report), and as administrator of a research allotment from the funds of the Carnegie Institution of Washington. His field-work was carried on between August 1 and September 4, 1913, at Butte, Montana, and



Bingham and Park City, Utah; between January 5 and February 5, 1914, at Globe and Miami, Arizona. His personal researches were devoted to the microscopic character of ores, the secondary enrichment of sulphide ores, and the copper deposits of Shasta county, California. Professor Graton reports that no direct gifts to the section of mining geology have been made during the year, but notes certain advantages enjoyed at no expense to the University. Nearly half of the charge for labor connected with the great task of labeling and arranging the collections of the section was borne by Mr. Sayles, in exchange for numerous specimens transferred to the Museum. From the Secondary Enrichment Investigation fund the sum of \$17,750 was expended during the year, in addition to \$6,300 expended last year. This very extensive Harvard research places to the credit of this Department an enterprise of greater scope than anything of similar nature previously undertaken in this country, outside of government auspices.

Professor Graton specially feels the need of a department library.

Professor Raymond gave Palaeontology 1 (8 students), Palaeontology 2 (4 students), and Palaeontology 20 (3 students). In the research course Mr. Winthrop P. Haynes wrote his thesis, accepted in June for the Doctor's degree, and Mr. Richard M. Field did certain work on the photography of fossils by the use of the Roentgen rays, the results of which are being prepared for publication.

Through a grant from the income of the Shaler Memorial fund, Professor Raymond, accompanied by Associate Professor W. H. Twenhofel of the University of Kansas, was able to study the stratigraphy of the Cambrian, Ordovician, and Silurian formations of the Governments of St. Petersburg and Esthonia in Russia, and in the southern parts of Sweden and Norway. About four months were spent on this expedition, during which a great deal was learned about the relations of the various strata in the regions studied, and the correlation of those strata with the Ordovician and Silurian rocks of America. A report on the results of the trip is now in preparation.

The student palaeontological collection has received the following accessions; — a specimen of silicified wood and invertebrate fossils from France and Germany, from Dr. Donald C. Barton; a fossil fish and silicified wood from Italy through Professor Palache; a series of fossils and shells from the Holden collection through Professor Wolff, and a set of brachiopods from the Carboniferous of Ireland by purchase.

Mr. W. P. Haynes continued his efficient assistance in courses 4 and 5 in both Harvard and Radcliffe and acted as instructor in the summer course S15, as above noted. He completed his doctorate thesis on A Contribution to the Geology of the Region about Three Forks, Montana, which will be published.

Mr. D. C. Barton completed his doctorate thesis on Arkose, which he had studied in the field, with the aid of a grant from the Sheldon Fund.

Through the generosity of Mr. Sayles, the Division preparator, Mr. G. M. Flint, was employed for two months in the collection of material for the Geological Museum. Materials were obtained illustrating the following localities and subjects:— Berea, Ohio — grindstone industry; Fourche Mt., Magnet Cove, and Hot Springs, Arkansas — syenites, bauxite, novaculites, graptolitic shales; Oklahoma City and Arbuckle Mts., Okla. — economic materials; El Paso, Texas — economic materials, Cretaceous fossils; Bisbee, Arizona — unique cavern deposits, copper minerals; Tucson, Ariz., San Diego, Los Angeles, and San Francisco, Cal., Salt Lake City, Utah, Minneapolis, Minn.—economic materials; Tintic district, Utah — ores; Cobalt, Ontario — ore, tillite, fossils. About 800 specimens were collected during this long trip. Mr. Flint continued his invaluable services as the officer responsible for the care of equipment.

## REPORT OF THE MAMMALS.

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BY OUTRAM BANGS.

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As in recent years the most generous contributor to the collection is Col. J. E. Thayer. His gifts include 300 skins and skulls from along the Kolyma River, Siberia, collected by Johan Koren; 125 from Kerr Co., and Chisos Mountains, Texas, collected by F. B. Armstrong, and 125 from Pinte Mountains, Cal., collected by W. W. Brown, Jr.

Single specimens or small series of specimens have been received from Mrs. J. B. Rorer, Messrs. Outram Bangs, Thomas Barbour, J. T. Benson, H. B. Bigelow, C. T. Brues, T. M. Carnegie, W. E. Castle, John Caswell, H. L. Clark, L. H. Heilbronner, C. C. Little, J. L. Peters, J. B. Rorer, H. W. Smith, J. D. Sornborger, Roland Thaxter, and E. H. Wilson; the City of Boston (Department of Parks), the Boston Society of Natural History, Bussey Institution, and the Peabody Museum of American Archaeology and Ethnology.

Exchanges have been made with the American Museum of Natural History, the British Museum, the Muséum d'Histoire Naturelle (Paris) and with Mr. Chester Stock.

Two hundred specimens from Kamerun have been purchased of the Rev. George Schwab.

## REPORT ON THE BIRDS.

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BY WILLIAM BREWSTER.

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Within the year the Museum has acquired about sixteen hundred bird skins, mostly by gift. Hon. W. Cameron Forbes has given five hundred and thirty-five collected by him personally in the Philippine Islands, representing one hundred and ninety-four species or subspecies of which no less than seventy-one are new to the collection, besides one hundred and twenty more which he obtained in Cuba, Jamaica and Guatemala, during the spring of 1914. Among the latter are two Bahaman Swallows taken in northeastern Cuba — an interesting and novel instance of occurrence for the species.

Col. John E. Thayer has contributed four hundred and sixty-one specimens, of which one hundred were collected in Siberia by Johan Koren and three hundred near Colima, Mexico, by Gustav Glückert; the others coming chiefly from Alaska, Texas, and New Mexico. Thirty of the Mexican and several of the Siberian species were hitherto unrepresented in the collection.

Dr. John C. Phillips has presented one hundred and ninety skins, mostly of House Sparrows (one hundred and eighty-six in number) from various parts of Europe and America, which were obtained for the purpose of ascertaining to what extent — if any — the birds introduced into this country have since varied from Old World forms.

Rev. George Schwab has given ninety-seven birds collected in Kamerun and representing forty-seven species of which only seventeen were possessed by the Museum.

The Officials of the Boston Zoölogical Garden at Franklin Park have kindly sent, from time to time, various interesting birds which have died in captivity.

The Museum is indebted for gifts of small series of bird skins or for single specimens to Messrs. Outram Bangs, Thomas Barbour, Charles Bullard, R. T. Fisher, E. L. Mark, George Nelson, G. K. Noble, Harold St. John, R. W. Sayles, G. W. Stevens, F. S. Sturgis, W. M. Tyler, J. B. Woodworth, and the late W. R. Zappey.

Forty bird skins selected from duplicate series have been presented to the U. S. National Museum, eleven to Col. John E. Thayer and one to Dr. P. P. Suschkin of Charkow.

In exchange, twenty-nine bird skins have been sent to the American Museum and ten to the British Museum while four have been received from the American Museum, one hundred and fifty — representing one hundred and twenty-three species of African birds — from the Berlin Museum and eighteen from Mr. H. K. Coale.

For purposes of study two hundred and ten skins have been loaned to Messrs. Frank M. Chapman, J. T. Nichols, W. E. Clyde Todd, C. W. Richmond and H. C. Oberholser.

Thanks to the untiring zeal and excellent judgment with which Mr. Bangs has worked during the past six years, the entire collection of bird skins has been put in the best possible condition in every respect. For this devoted and efficient service Mr. Bangs is entitled to the very highest praise.

## REPORT ON THE REPTILES AND AMPHIBIANS.

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BY THOMAS BARBOUR.

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The work this year has been principally identifying specimens from the older collections and arranging the study series, for convenience, according to Boulenger's Catalogue of the reptiles in the British Museum. This work has been completed so far as the identified lizards and snakes is concerned. A card catalogue arranged systematically has been finished for these groups. This shows that 23 families of lizards are represented in the collection by 836 species and approximately 9,000 specimens; there are 110 types.

This enumeration does not include material on exhibition or in the storage tanks, and of this there is a large quantity. There are still some additional types which have not been located. Several recent exchanges and collections are as yet unentered.

A larger proportion of snakes than lizards is at present unidentified and uncatalogued.

Of the former there are 604 species, 61 types and about 4,400 specimens. It is the practice to number individually twenty-five specimens of a series and consider the rest duplicates. Until 1912 the material was numbered by lots, all individuals of one species from the same place bearing the same number. The Chelonia and Amphibia have not been rearranged, but considerable identification has been done in the groups.

Dr. A. G. Ruthven has examined material from Central and South America, and valuable specimens collected upon his recent expeditions have been received in exchange. Dr. L. Stejneger has also borrowed material for examination. By gift the Museum has received from Dr. J. C. Phillips a splendid collection from Sinai and Palestine containing several new species and others hitherto unrepresented in the collection; many varieties including the types of some new species from Mr. C. T. Ramsden, of San Carlos, Guantanamo; Bornean reptiles and amphibians from the Sarawak Museum through Dr. J. C. Moulton; Mexican reptiles from Colima, from Col. J. E. Thayer; reptiles and amphibians from

Bocas del Toro, Panama, from Mr. J. B. Rorer; many interesting species from Prof. F. W. Putnam. The N. Y. Zoölogical Society, and Messrs. Thomas Barbour, E. W. Forbes and R. G. Fuller have also presented specimens. Other specimens were collected by Dr. H. L. Clark in the islands in Torres Strait.

Valuable exchanges have been received from Mr. Julius Hurter, Sr., the Academy of Natural Sciences, Philadelphia; American Museum of Natural History; California Academy of Sciences; Zoölogical Museum, University of Michigan; U. S. National Museum; Museum of Natural History, Basle, Switzerland; British Museum of Natural History; the Zoölogical Museum of Amsterdam; Clark University of Worcester. The purchase of the Schwab collection from Kamerun and Mr. W. M. Mann's from the State of Hidalgo, Mexico, gave many additional species to the Department.



## REPORT ON THE FISHES.

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BY SAMUEL GARMAN.

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Additions to the department have been secured through the efforts of Messrs. G. M. Allen, Thomas Barbour, W. A. Brown, H. L. Clark, Samuel Garman, C. L. Hay, W. M. Mann, R. E. Merwin, George Nelson, G. H. Parker, J. C. Phillips, J. E. Thayer, and by purchases.

The routine work has been directed toward the improvement of the collections, by betterment of their condition, by identification, etc.; and the preparation for future publication, in order to make the collections more available for the student, whether general or special.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

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Two important accessions to the Department have been received by gift during the year; one from Mr. L. W. Swett consists of his entire series of North American Geometridae numbering some 7,000 specimens, the second, due to the kindness of the British Association Committee charged with the investigation of the fauna of the Hawaiian Islands, is a series of Hawaiian insects of various orders.

Other gifts have been received from Mr. F. C. Bowditch, (a large lot of Coleoptera, principally Chrysomelidae); Mr. B. P. Clark, (several rare Sphingidae); Walter Faxon, R. S. Fuller, J. W. Folsom, (types of Collembola); E. D. Harris, (Cicindelidae); C. W. Johnson, (Bermuda Diptera); Harold St. John, E. A. Schwarz, J. E. Thayer, (Mexican insects of several orders); W. M. Wheeler, (Ants); and Mr. L. H. Weld.

Accessions other than gifts, consist of some Mexican insects collected by Mr. W. M. Mann; Coleoptera and Lepidoptera from the Black Mountains of North Carolina and a series of North American Sphingidae (Denton mounts) for exhibition.

Some revisional work of arrangement has been done among the Coleoptera and considerable progress made in locating and labeling the types of Hymenoptera, Diptera, and Coleoptera.

## REPORT ON THE MYRIOPODS, ARACHNIDS, AND WORMS.

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BY RALPH V. CHAMBERLIN.

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During the year, the collections of chilopods and diplopods have been much increased by contributions from the following sources:—Dr. C. C. Adams, duplicates of a second valuable collection made by himself in the Flathead Lake region of Montana; Mr. G. F. Sutherland, material from Douglas Lake, Michigan; Miss E. B. Bryant and Mr. W. F. Clapp, specimens from New England; Mr. J. H. Emerton, specimens from New Jersey; Professor Welch, specimens from Kansas, and Dr. Thomas and Mr. F. K. Barbour, material from St. Lawrence Co., New York. Dr. C. G. Hewitt, several small lots from Canada; Mr. E. O. Essig, additions from the fauna of California; Profs. Roland Thaxter and C. T. Brues, material collected on Grenada and Trinidad; Dr. C. F. Baker and Mr. Nathan Banks, several lots from the Philippines; Prof. P. P. Calvert, specimens from Costa Rica; Mr. C. T. Ramsden, specimens from Cuba; and Dr. H. L. Clark, a small but valuable series from Australia. The material collected by the University of Michigan Expedition to Colombia in 1913 has been sent for identification.

The Mexican material purchased of Mr. W. M. Mann has proved especially interesting.

A notable addition to the collection of Arachnida was that of the entire lot of very important material secured by the Yale Peruvian Expedition of 1911. For this gift the Museum is indebted to Prof. H. W. Foote, the principal collector. Specimens have also been received from Miss E. B. Bryant from the New England fauna; from Mr. C. T. Ramsden, Cuba; Dr. Thomas and Mr. F. K. Barbour, New York; Mr. S. C. Chamberlin, Utah; and Dr. H. L. Clark, the Australian region.

Specimens of worms have been added by Drs. H. B. Bigelow and Thomas Barbour, and by Mr. W. F. Clapp.

During the year, my time was devoted largely to the continuation and essential completion of the work upon the North American

Lithobiomorpha. Several papers presenting results of revisions of sections of this group were prepared; and the rearranging and relabeling of the specimens was completed. In addition a study was made of the chilopod fauna of the West Indies and of part of that of Mexico and a report was prepared presenting some results of this investigation. Routine work involved the study of a considerable number of collections of myriopods sent in for identification.

About ten days of August were spent in field work in New Hampshire and Maine, attention being given primarily to the chilopods and diplopods. A week in March was given to collecting in Minnesota, chiefly in the neighborhood of Winona, the purpose being to clear up the identity of several species that had been described from that locality. For several weeks in June and July I was in the field, chiefly in the Wasatch Mountains of Utah, where the arachnids were made the special object of study, much valuable material in this group being secured. The arthropod fauna of several caves in these mountains was investigated.

## REPORT ON THE CRUSTACEA.

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BY WALTER FAXON.

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The list of accessions to the Department of Crustacea during the past year is a short one, yet it embraces many items of singular interest. Of the new material received by gift, the donors are Messrs. Outram Bangs, W. F. Clapp, M. E. Ellis, O. F. Nylander, R. C. Rush, J. E. Thayer (specimens from Colima, Mexico), Roland Thaxter (specimens from Trinidad, Grenada, and Tobago), and the United States National Museum (11 species, 79 specimens, of Isopoda from the ALBATROSS collections).

By purchase from J. Gabriel there has been added a mixed lot from Westernport, Victoria, and from W. M. Mann a crayfish from San Miguel, Mexico.

## REPORT ON THE ECHINODERMS.

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BY HUBERT LYMAN CLARK.

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The first five months of the Museum year were spent as a member of the party sent by the Carnegie Institution of Washington to Torres Strait. On the outward voyage, I had opportunities to collect echinoderms at Tahiti; Sydney, N. S. W.; and Green Island near Cairns, North Queensland. In Torres Strait, our headquarters were at Mer, the largest of the Murray Islands, but collections were also made at Thursday, Prince of Wales, Mulgrave, and Darnley Islands. On the homeward voyage, ten days were spent at the Hawaiian Islands, and successful collecting was done at Pearl Harbor and at Hilo. I was also able to visit the Museums and examine collections at Wellington, Sydney, Brisbane, Melbourne, Auckland, and Honolulu. The tangible results of the journey consist of nearly 2,700 echinoderms, including more than 600 crinoids, and representing two hundred different species. Of these at least seventy-five were new to the collections of the Museum and nearly fifty seem to be new to science. Small collections of reptiles, spiders, insects, mollusks, and Algae were also brought back. For the necessarily extended leave of absence, which made the trip possible, my thanks are sincerely offered to the Museum authorities. It is also a pleasure to thank Dr. A. G. Mayer, leader of the party, and R. Etheridge Esq., Curator of the Australian Museum, Sydney, for constant and oftentimes unusual courtesies and assistance.

Since January first, my time has been given to the identifying, labeling, and cataloguing, not only of the Australian material, but of the extensive additions to the collections from other sources. The total increase for the year consists of about 3,400 specimens, representing more than 300 species, of which 108 were new to the collections, including examples of 10 genera previously unrepresented. The principal additions are as follows:—In return for assistance in identification of material; from the United States National Museum, 159 specimens of 16 species of clypeastroids; from the Colombo Museum, Ceylon, 66 specimens of 30 species;

from the Irish Fisheries Board, Dublin, 70 specimens of 13 species; from Mt. Holyoke College, 7 specimens of 6 species. As gifts: from Mr. J. Gabriel, Melbourne, 57 specimens of 16 species; Mr. Alvin Seale, Manila, 89 specimens of 32 species; Mr. H. Farquhar, Wellington, N. Z., 19 specimens of 7 species; Mr. D. Thaanum, Hilo, Hawaii, 35 specimens of 15 species; Mr. John W. Mills, Miami, Fla., 48 specimens of 15 species; Mr. W. A. Brown, Darwin, South Australia, 3 holothurians. The incorporation of the new material into the collections necessitated an extensive rearrangement of the crinoids, starfishes, and brittle-stars.



## REPORT ON THE COELENTERATES.

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By HENRY B. BIGELOW.

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The most important accession received during the past year is the duplicate set of Medusae and hydroids collected by the GRAMPUS during the summer of 1912. A series of the genus *Stomolophus* from San Diego, California, presented by Dr. C. A. Kofoid, may also be mentioned.

During October, the stony corals were rearranged, with the expert assistance of Prof. L. E. Griffin, to whom thanks are due for his voluntary labors. Specimens have been loaned him for study.

The winter was spent on the report on the plankton and oceanography of the GRAMPUS cruise of 1913, of which a summary was given in my last report. Oceanographic stations were occupied in Massachusetts Bay at irregular intervals on the steamer BLUE WING, through the courtesy of the United States Bureau of Fisheries.

From July 15 to August 29, I was in charge of the U. S. Fisheries Schooner GRAMPUS on an oceanographic survey of the coastal waters between Marthas Vineyard and Halifax, accompanied, as in previous years, by Mr. W. W. Welsh as assistant. As in the past, the main efforts were directed to obtaining serial temperatures, serial water samples, measurements of ocean currents, and to the collection of plankton with qualitative and quantitative nets. The first field was George's Bank, across which two sections were drawn, one at the west, one at the eastern end, extending from the basin of the Gulf of Maine on the north to the continental slope on the south. We then ran a section across the eastern channel, between George's and Brown's Banks, interesting oceanographically, because it is the sole connection between the basin of the Gulf below the 100 fathom level on the one hand, and the deeps of the Atlantic on the other; and then via Brown's Bank, the Northern channel, and the coast bank to Shelburne, Nova Scotia. Off that port, on July 27, ocean currents were measured

hourly for twelve hours, thus covering an entire tide, both ebb and flood. We ran a section across the coastal shelf normal to the coast opposite Shelburne, and another partial one opposite Halifax, with special attention to the enclosed sinks which characterize this region.

The European war prevented a continuation of the work east of Halifax; and the time remaining was devoted to the Gulf of Maine, where the stations of the preceding years were repeated; and also to a section from Marthas Vineyard to the Gulf Stream, where two sets of the long trawl were made for tile-fish (*Lopholatilus chamaeleonticeps*), which proved to be present in its usual abundance.

During the summer, complete oceanographic observations were taken at 52 stations; 126 tows made with the horizontal plankton nets, and the quantitative net was used at 26 stations. No bottom trawling or dredging was done.

The plankton collections, though quantitatively as rich as those of 1913, were much more monotonous, as might be expected from the fact that most of our work was done in Boreal water. They are especially rich in copepods, amphipods, and Sagittae.

## REPORT ON INVERTEBRATE PALAEONTOLOGY.

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BY PERCY E. RAYMOND.

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As last year, most of my time in the Museum was devoted to the arrangement of the collection of trilobites. The specimens belonging to the Paradoxidae and Mesonacidae were studied and relabeled, and a paper on the ontogeny of Paradoxides written as a result of this study. A paper describing some of the more important of our extensive collection of trilobites from the Silurian of southeastern Wisconsin was also prepared, this paper involving a review of the classification of the Illaenidae.

Miss H. S. Clark aided in the preparation of the catalogue of a part of the collection of trilobites.

About six weeks were devoted to the identification and study of two collections made for the Geological Survey of Canada in previous years, the Museum receiving a set of duplicates in return for the identifications. As a result of this work, three papers were prepared which are now in press.

Having received a grant from the income of the Shaler Memorial fund, for an investigation of the Ordovician and Silurian strata of the Baltic provinces of Russia and Sweden, I spent the greater part of April in preparation for this trip, and sailed for Europe on April 28, returning to Cambridge, September 14. On this trip I was accompanied for a part of the time by Prof. W. H. Twenhofel of the University of Kansas. We studied the stratigraphy and collected the fossils of the Cambrian, Ordovician, and Silurian deposits in the Governments of St. Petersburg and Esthonia, and in the southern parts of Sweden and Norway. This work yielded valuable results in regard to the stratigraphy of the regions studied, and in relation to the correlation of these with similar strata in America. Considerable collections were made, most of which have not yet reached Cambridge. I also saw and studied in part the Ordovician fossils in the principal museums of London, Paris, Frankfort, Berlin, St. Petersburg, Stockholm, Upsala, Lund, and Christiania.

The following accessions have been received during the year:—

By donation:—two trilobites and two slabs of graptolites from Prof. A. C. Lane, and 44 invertebrates from British Columbia, from Mr. Edward Wigglesworth.

By exchange:—one trilobite from Prof. A. C. Lane, 17 trilobites from Dr. Olaf Holtedahl, 3 trilobites from Prof. Charles Schuchert and 1 trilobite from Mr. T. H. Clark.

By purchase:—100 specimens of brachiopods from Ireland and a large collection of invertebrate fossils from Montana.

## REPORT ON THE GEOLOGICAL COLLECTION.

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BY ROBERT W. SAYLES.

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There have been added to the collections devoted to dynamical and structural geology, 194 specimens. Special mention may be made of 75 specimens of cave deposits, mainly stalactites and stalagmites from Bisbee, Arizona, and Hamilton Furnace, Missouri, purchased of the Mineralogical Department. This splendid material was collected by the late Dr. John B. Sweet of Boston. A case has been devoted to comparative tillites from widely separated parts of the earth. This is the first exhibition in this country of its kind. Prof. W. W. Atwood has kindly given a striated pebble from the latest tillite reported, that found by him in the Lower Eocene of the San Juan Mountains, Arizona, in 1913. The sections of the cases in this room have been numbered to facilitate the finding of answers to the questions posted in the bulletin box. These questions and answers are for the aid of visitors in the understanding of the specimens and of geological processes. It is impossible for the visitor unless trained geologically to understand the meaning of all the exhibitions, without more explanation than is possible on the small specimen labels. This is especially true of geological specimens.

The room devoted to economic geology has received 860 specimens. Of these about 500 were given by Prof. H. L. Smyth. The kindness of his gift is much appreciated. These specimens are mainly examples of the metallic ores and minerals. The Mineralogical Department has also kindly given some specimens, mainly examples of the non-metallic ores and minerals. A collection of ornamental stones and marbles was purchased in Florence, Italy. By the direction of the Curator, the specimens were mounted on heavy plate glass, in order that the coloring, structure, and properties of light transmission of each specimen might be seen to good advantage. This work, the first of its kind, was very successfully done by Giovanni Montelatici, Director of the *Arte Musiva Fiorentina*. The case devoted to building stones and road materials is being filled rapidly. Mr. G. M. Flint has given much skilful assistance in the preparation of the specimens illustrative of economic geology.

The Curator spent the summer of 1913 in visiting Italy, the Austrian Tyrol, and Switzerland.

## REPORT ON THE LIBRARY.

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During the year from August 1, 1913, to July 31, 1914, inclusive, 1,203 volumes, 2,107 parts of volumes, and 1,148 pamphlets have been added to the Library.

The total number of volumes in the Library is 51,499, the total number of pamphlets is 47,716.

Six hundred and thirteen volumes have been bound.

## PUBLICATIONS

FOR THE YEAR 1913-1914.

(1 AUGUST, 1913-31 JULY, 1914).

MUSEUM OF COMPARATIVE ZOOLOGY.

## BULLETIN:—

## Vol. LIII.

- No. 10. A revision of the ants of the genus *Formica* (Linné) Mayr. By William Morton Wheeler. pp. 189. October, 1913.

## Vol. LIV.

- No. 19. Preliminary descriptions of two new forms of *Peripatus* from Haiti. By Charles T. Brues. pp. 6. August, 1913.
- No. 20. A revision of the American species of *Ceraurus*. By Percy E. Raymond and Donald C. Barton. pp. 22. 2 Plates. November, 1913.
- No. 21. A new genus of the Cheiruridae, with descriptions of some new species. By Donald C. Barton. pp. 12. 1 Plate. November, 1913.

## Vol. LVI.

- No. 2. The *Squantum* tillite. By Robert W. Sayles. pp. 38. 12 Plates. January, 1914.

## Vol. LVII.

- No. 2. The lithobiid genera *Nampabius*, *Garibius*, *Tidabius*, and *Sigibius*. By Ralph V. Chamberlin. pp. 68. 5 Plates. November, 1913.

## Vol. LVIII.

- No. 1. Notes on a collection of birds from the Sudan. By John C. Phillips. pp. 28. December, 1913.
- No. 2. Explorations in the Gulf of Maine, July and August, 1912, by the U. S. Fisheries Schooner *Grampus*. Oceanography and notes on the plankton. By Henry B. Bigelow. pp. 120. 9 Plates. February, 1914.
- No. 3. The Stanford expedition to Brazil, 1911, John C. Branner, Director. The Chilopoda of Brazil. By Ralph V. Chamberlin. pp. 74. 6 Plates. April, 1914.
- No. 4. Notes on the ontogeny of *Paradoxides*, with the description of a new species from Braintree, Mass. By Percy E. Raymond. pp. 22. 1 Plate. April, 1914.
- No. 5. Notes on the ontogeny of *Isotelus gigas* Dekay. By Percy E. Raymond. pp. 20. 3 Plates. April, 1914.
- No. 6. Notes on a collection of birds from Yunnan. By Outram Bangs and John C. Phillips. pp. 38. April, 1914.
- No. 7. Mammals from the Blue Nile valley. By Glover M. Allen. pp. 56. July, 1914.



## MEMOIRS:—

## Vol. XXXVI.

The Plagiostomia. (Sharks, skates, and rays). By Samuel Garman. pp. 528. 77 Plates. September, 1913.

## Vol. XL.

No. 6. Brewster's warbler (*Helminthophila leucobronchialis*) a hybrid between the golden-winged warbler (*Helminthophila chrysoptera*) and the blue-winged warbler (*Helminthophila pinus*). By Walter Faxon. pp. 8. August, 1913.

No. 7. A new Mylodon. By Glover M. Allen. pp. 30. 4 Plates. September, 1913.

No. 8. Notes on the crayfishes in the United States National Museum and the Museum of Comparative Zoölogy with descriptions of new species and subspecies to which is appended a catalogue of the known species and subspecies. By Walter Faxon. pp. 84. 13 Plates. July, 1914.

## Vol. XLIV.

No. 2. A contribution to the zoögeography of the West Indies, with especial reference to amphibians and reptiles. By Thomas Barbour. pp. 155. 1 Plate. March, 1914.

## Vol. XLVI.

No. 1. Hawaiian and other Pacific Echini. The Clypeastridae, Arachnoididae, Laganidae, Fibulariidae, and Scutellidae. By Hubert Lyman Clark. pp. 80. 22 Plates. June, 1914.

## REPORT:—

1912-1913. pp. 44. 2 Plates. December, 1913.

## ZOÖLOGICAL LABORATORY.

## CONTRIBUTIONS:—

238. PARKER, G. H., and STABLER, E. M.—On certain distinctions between taste and smell. *Amer. journ. physiol.*, August, 1913, **32**, p. 230-240.

239. PARKER, G. H., and BULLARD, C.—On the size of litters and the number of nipples in swine. *Proc. Amer. acad. arts & sci.*, September, 1913, **49**, p. 397-426.

240. KUTCHIN, H. L.—Studies on the peripheral nervous system of *Amphioxus*. *Proc. Amer. acad. arts & sci.*, October, 1913, **49**, p. 569-626, 8 pls.

241. SPAETH, R. A.—The mechanism of the contraction in the melanophores of fishes. *Anat. anzeiger*, 15 September, 1913, **44**, p. 520-524.

242. SPAETH, R. A.—The physiology of the chromatophores of fishes. *Journ. exper. zool.*, November, 1913, **15**, p. 527-585, 4 pls.

243. RAND, H. W., and BOYDEN, E. A.—Inequality of the two eyes in regenerating planarians. *Zool. jahrb. Allg. zool. u.-physiol.*, December, 1913, **34**, p. 69-80.

244. KORNHAUSER, S. I.—A comparative study of the chromosomes in the spermatogenesis of *Enchenopa binotata* (Say) and *Enchenopa* (*Campylenchia* Stål) *curvata* (Fabr.). *Arch. f. zellforsch.*, February, 1914, **12**, p. 241–298, pl. 18–22.
245. PARKER, G. H.—A note on sex determination. *Science*, 6 February, 1914, n. s., **39**, p. 215–216.
246. PARKER, G. H. The locomotion of Chiton. *Contrib. Bermuda biol. station*, April, 1914, no. 31, 2 pp.
247. PARKER, G. H. On the strength and the volume of the water currents produced by sponges. *Journ. exper. zool.*, April, 1914, **16**, p. 443–446.
248. RISSER, J.—Olfactory reactions in amphibians. *Journ. exper. zool.*, May, 1914, **16**, p. 617–652.
249. SHOHL, A. T.—Reactions of earthworms to hydroxyl ions. *Amer. journ. physiol.*, July, 1914, **34**, p. 384–404.

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##### CONTRIBUTIONS:—

27. CHESTER, W. M.—The structure of the gorgonian coral *Pseudoplexaura crassa* Wright and Studer. *Proc. Amer. acad. arts & sci.*, May, 1913, **48**, p. 735–773, 4 pls.
28. See p. 45, *Contrib. Zool. Lab.*, **240**.
29. HILTON, W. A.—The central nervous system of *Tunica nigra*. *Zool. jahrb. Anat.*, December, 1913, **37**, p. 113–130.
30. CROZIER, W. J.—Note on the pigment of a Bermuda nudibranch, *Chromodoris zebra* Heilprin. *Journ. physiol.*, February, 1914, **47**, p. 491–492.
31. See *supra*, *Contrib. Zool. Lab.*, **246**.
32. See *supra*, *Contrib. Zool. Lab.*, **247**.

#### BLUE HILL METEOROLOGICAL OBSERVATORY.

##### OBSERVATIONS AND INVESTIGATIONS:—

- MCADIE, ALEXANDER.—Introduction. 3 pp.  
 Observations [with summaries for years 1886–1910]. 50 pp.
- MCADIE, ALEXANDER.—The founder of the Observatory. A review of the scientific work of Abbott Lawrence Rotch. 14 pp.
- WELLS, L. A.—Features of the twenty-five years observations. 3 pp.
- BROOKS, CHARLES F.—The ice storms of New England. 8 pp.  
 2 pls.
- MCADIE, ALEXANDER.—Introduction of new units at Blue Hill Observatory. 6 pp.  
*Annals Astronomical observatory Harvard College*, 1914, **73**.

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Mammals [of the Arctic coast of East Siberia]. *Proc. N. E. zool. club*, 9 April, 1914, **5**, p. 49-66, pl. 1.

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The geographic races of the scaled quail. *Proc. N. E. zool. club*, 9 March, 1914, **4**, p. 99-100.

A new magpie-jay from western Costa Rica. *Proc. N. E. zool. club*, 13 March, 1914, **4**, p. 101-102.

Notes on the birds and mammals of the Arctic coast of East Siberia. Introduction. *Proc. N. E. Zool. club*, 9 April, 1914, **5**, p. 1-2.

Birds [of the Arctic coast of East Siberia]. [With J. E. Thayer]. *Proc. N. E. zool. club*, 9 April, 1914, **5**, p. 3-48, pl. 1.

A new song sparrow from Nova Scotia. [With J. E. Thayer]. *Proc. N. E. zool. club*, 29 May, 1914, **5**, p. 67-68.

The Bahama swallow in Cuba. *Auk*, July, 1914, **31**, p. 401.

See also p. 44, *Bull.* **58**, no. 6.

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The following Publications of the Museum of Comparative Zoölogy are in preparation:—

- LOUIS CABOT. Immature State of the Odonata, Part IV.  
E. L. MARK. Studies on Lepidosteus, continued.  
E. L. MARK. On Arachnactis.  
A. AGASSIZ and C. O. WHITMAN. Pelagic Fishes. Part II., with 14 Plates.  
H. L. CLARK. The "Albatross" Hawaiian Echini.

Reports on the Results of Dredging Operations in 1877, 1878, 1879, and 1880, in charge of ALEXANDER AGASSIZ, by the U. S. Coast Survey Steamer "Blake," as follows:—

- A. MILNE EDWARDS and E. L. BOUVIER. The Crustacea of the "Blake."  
A. E. VERRILL. The Alcyonaria of the "Blake."

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieutenant Commander Z. L. TANNER, U. S. N., Commanding, in charge of ALEXANDER AGASSIZ, as follows:—

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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, as follows:—

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PUBLICATIONS  
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There have been published of the BULLETIN Vols. I. to LIV.; of the MEMOIRS, Vols. I. to XXIV., and also Vols. XXVI. to XXIX., XXXI. to XXXIV., XXXVI. to XXXVIII., XLI., and XLIV.

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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 Tropical 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.

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