

HARVARD UNIVERSITY



Library of the
Museum of
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
1919-1920.

CAMBRIDGE, U. S. A.:
PRINTED FOR THE MUSEUM.
1920.

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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| <p>A. AGASSIZ. V.⁵ General Report on the Expedition.</p> <p>A. AGASSIZ. I.¹ Three Letters to Geo. M. Bowers, U. S. Fish Com.</p> <p>H. B. BIGELOW. XVI.¹⁶ The Medusae.</p> <p>H. B. BIGELOW. XXIII.²³ The Siphonophores.</p> <p>H. B. BIGELOW. XXVI.²⁶ The Ctenophores.</p> <p>R. P. BIGELOW. The Stomatopods.</p> <p>O. CARLGREN. The Actinaria.</p> <p>R. V. CHAMBERLIN. XXXI.³¹ The Annelids.</p> <p>H. L. CLARK. XXXIII.³³ The Holothurians.</p> <p>H. L. CLARK. XXXII.³² The Starfishes.</p> <p>H. L. CLARK. XXX.³⁰ The Ophiurans.</p> <p>S. F. CLARKE. VIII.⁸ The Hydroids.</p> <p>W. R. COE. The Nemerteans.</p> <p>L. J. COLE. XIX.¹⁹ The Pycnogonida.</p> <p>W. H. DALL. XIV.¹⁴ The Mollusks.</p> <p>C. R. EASTMAN. VII.⁷ The Sharks' Teeth.</p> <p>S. GARMAN. XII.¹² The Reptiles.</p> <p>H. J. HANSEN. The Cirripeds.</p> <p>H. J. HANSEN. XXVII.²⁷ The Schizopods.</p> <p>W. E. HOYLE. The Cephalopods.</p> <p>W. C. KENDALL and L. RADCLIFFE. XXV.²⁵ The Fishes.</p> | <p>C. A. KOFOID. III.³ IX.⁹ XX.²⁰ The Protozoa.</p> <p>C. A. KOFOID and J. R. MICHENER. XXII.²² The Protozoa.</p> <p>C. A. KOFOID and E. J. RIGDEN. XXIV.²⁴ The Protozoa.</p> <p>P. KRUMBACH. The Sagittae.</p> <p>R. VON LENDENFELD. XXI.²¹ The Siliceous Sponges.</p> <p>R. VON LENDENFELD. XXIX.²⁹ Hexactinellida.</p> <p>G. W. MÜLLER. The Ostracods.</p> <p>JOHN MURRAY and G. V. LEE. XVII.¹⁷ The Bottom Specimens.</p> <p>MARY J. RATHBUN. X.¹⁰ The Crustacea Decapoda.</p> <p>HARRIET RICHARDSON. II.² The Isopods.</p> <p>W. E. RITTER. IV.⁴ The Tunicates.</p> <p>G. O. SARS. The Copepods.</p> <p>F. E. SCHULZE. XI.¹¹ The Xenophyphoras.</p> <p>HARRIET R. SEARLE. XXVIII.²⁸ Isopods.</p> <p>H. R. SIMROTH. Pteropods, Heteropods.</p> <p>E. C. STARKS. XIII.¹³ Atelaxia.</p> <p>TH. STUDER. The Alcyonaria.</p> <p>JH. THIELE. XV.¹⁵ Bathysciadium.</p> <p>T. W. VAUGHAN. VI.⁶ The Corals.</p> <p>R. WOLTERECK. XVIII.¹⁸ The Amphipods.</p> |
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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, 90 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.

⁸ Mem. M. C. Z., Vol. XXXV., No. 1, February, 1907, 20 pp., 15 pls.

⁹ Bull. M. C. Z., Vol. L., No. 6, February, 1907, 48 pp., 18 pls.

¹⁰ Mem. M. C. Z., Vol. XXXV., No. 2, August, 1907, 56 pp., 9 pls.

¹¹ Bull. M. C. Z., Vol. LI., No. 6, November, 1907, 22 pp., 1 pl.

¹² Bull. M. C. Z., Vol. LII., No. 1, June, 1908, 14 pp., 1 pl.

¹³ Bull. M. C. Z., Vol. LII., No. 2, July, 1908, 8 pp., 5 pls.

¹⁴ Bull. M. C. Z., Vol. XLIII., No. 6, October, 1908, 285 pp., 22 pls.

¹⁵ Bull. M. C. Z., Vol. LII., No. 5, October, 1908, 11 pp., 2 pls.

¹⁶ Mem. M. C. Z., Vol. XXXVII., February, 1909, 243 pp., 48 pls.

¹⁷ Mem. M. C. Z., Vol. XXXVIII., No. 1, June, 1909, 172 pp., 5 pls., 3 maps.

¹⁸ Bull. M. C. Z., Vol. LII., No. 9, June, 1909, 26 pp., 8 pls.

¹⁹ Bull. M. C. Z., Vol. LII., No. 11, August, 1909, 10 pp., 3 pls.

²⁰ Bull. M. C. Z., Vol. LII., No. 13, September, 1909, 48 pp., 4 pls.

²¹ Mem. M. C. Z., Vol. XLII., August, September, 1910, 323 pp., 56 pls.

²² Bull. M. C. Z., Vol. LIV., No. 7, August, 1911, 38 pp.

²³ Mem. M. C. Z., Vol. XXXVIII., No. 2, December, 1911, 232 pp., 32 pls.

²⁴ Bull. M. C. Z., Vol. LIV., No. 10, February, 1912, 16 pp., 2 pls.

²⁵ Mem. M. C. Z., Vol. XXXV., No. 3, April, 1912, 98 pp., 8 pls.

²⁶ Bull. M. C. Z., Vol. LIV., No. 12, April, 1912, 38 pp., 2 pls.

²⁷ Mem. M. C. Z., Vol. XXXV., No. 4, July, 1912, 124 pp., 12 pls.

²⁸ Bull. M. C. Z., Vol. LVII., No. 8, August, 1914, 14 pp.

²⁹ Mem. M. C. Z., Vol. XLII., June, 1915, 397 pp., 109 pls.

³⁰ Bull. M. C. Z., Vol. LXI., October, 1917, 28 pp., 5 pls.

³¹ Mem. M. C. Z., Vol. XLVIII., July, 1919, 514 pp., 80 pls.

³² Mem. M. C. Z., Vol. XXXIX., No. 3, February, 1920, 46 pp., 6 pls.

³³ Mem. M. C. Z., Vol. XXXIX., No. 4, September, 1920, 40 pp., 4 pls.

ANNUAL REPORT
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CAMBRIDGE, U. S. A.:
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MUSEUM OF COMPARATIVE ZOÖLOGY.

Faculty.

ABBOTT LAWRENCE LOWELL, *President.*

HENRY P. WALCOTT.

GEORGE L. GOODALE.

SAMUEL HENSHAW, *Director.*

JOHN E. THAYER.

Committee on the Museum.

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

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

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

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

REPORT.

TO THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE:—

MOST of the instruction and the opportunities for research in Zoölogy, Geology, and Geography in Harvard University and in Radcliffe College during the Academic year 1919-1920 were given, as in recent years, in the Laboratories and Lecture Rooms of the Museum.

The sixteen courses or half courses in Zoölogy were taken by 317 students in Harvard University, and the seven courses or half courses were taken by 88 students in Radcliffe College.

In 1918-1919 these courses and students were:—

Harvard:— 14 courses, 222 students.

Radcliffe:— 6 courses, 81 students.

In Geology and Geography thirty courses or half courses were taken by 504 students in Harvard University and eight courses or half courses were taken by 126 students in Radcliffe College.

In 1918-1919 these courses and students were:—

Harvard:— 19 courses, 333 students.

Radcliffe:— 2 courses, 23 students.

The field-work undertaken during the year, while limited in the aggregate, has given some interesting results. Prof. P. E. Raymond spent six weeks on the borders of Lake Champlain in Vermont and New York, collecting in the Chazy and nearby formations. On Isle La Motte, Vermont, he secured the largest known Palaeozoic sponge and some corals from the oldest known coral reef. Professor Raymond also discovered an apparently new locality for Palaeozoic fossils in Topsfield, and collected a number of specimens from some of the already known localities in the vicinity of Boston.

For somewhat more than three months, February to June 1920, the U. S. Fisheries Steamer ALBATROSS carried on a successful exploration in the Gulf of Maine and adjacent waters. As in recent years, the scientific work of the ALBATROSS in the Gulf of Maine was under Dr. H. B. Bigelow's direction, and he was in

personal charge during a part of this season's cruise. The work included a general hydrographic survey of the Gulf of Maine, Georges Bank, and the continental shelf south of Cape Sable, with the usual trawl- and net-hauls, temperature and tidal data, etc.

Mr. E. R. Dunn spent the summer of 1919 in the mountains of Virginia, North Carolina, Alabama, and Tennessee, and secured a large series of reptiles and amphibians. Mr. Dunn's work in Costa Rica during July, 1920, will be noticed in the Report for 1920-1921.

Mr. W. S. Brooks worked with Dr. Thomas Barbour during the winter and early spring, collecting in Cuba and among the Florida Keys; they secured many desirable mammals, birds, reptiles, amphibians, and fishes. Mr. Brooks also spent several weeks on Anticosti where he collected a few mammals and birds and a small series of shells and insects. Prof. Theodore Lyman kindly aided Mr. Brooks's work in Anticosti.

Dr. G. M. Allen visited Haiti during August and early September, 1919, and though unsuccessful in his search among the cave-deposits, the main object of his trip, he collected a few bats, and a number of reptiles, three of the latter proving new species. The field-work of Dr. Allen and Messrs. Dunn and Brooks was due to the generous assistance of Dr. Thomas Barbour, who also provided for some additional work upon the collections.

The ornithological and conchological departments have benefited by the voluntary work of Messrs. T. E. Penard and E. G. Humphrey, to whom the thanks of the Museum are due. The excellent condition of the large collection of Araneae is owing to the interest and care bestowed upon it by Miss E. B. Bryant.

The William Brewster bequest constitutes not only the most important accession received during the year, but one of the chief scientific acquisitions received since the foundation of the Museum in 1859.

The terms of the bequest are printed as Appendix A (*infra*, p. 42).

The bequest includes:— 1. Collection of mounted birds and bird skins. 2. Collection of nests and eggs. 3. Collecting apparatus. 4. Books, pamphlets, prints, and Audubon portrait.

5. Manuscript journals, note books, etc. 6. \$60,000. — to establish a fund for the ornithological department. (The income available on the termination of certain life interests).

The series of bird skins and mounted birds, approximately 40,000 in number is almost wholly American; it represents Mr. Brewster's personal collecting, chiefly in New England, in the middle west, the Southern States, and in Trinidad, supplemented by material acquired by exchange and purchase. Though the greater part of the collection is from a somewhat limited number of localities, there are few of the states from Maine to Washington that are not more or less adequately represented, while the large series of many of the species will allow many advantageous exchanges. The whole collection is thoroughly catalogued and its excellent condition is well known to ornithologists.

The Brewster collection of nests and eggs is also very large and fills a want most generally felt, as the oölogical side of ornithology has been inadequately developed. The T. M. Brewer collection received in 1875, though of considerable historical value, is made up very largely of single, end-blown eggs; the Brewster collection, on the other hand, consists of entire clutches conserved with much nicety.

The additions to the Library, while principally relating to birds, include many volumes dealing with other lines of zoölogical work, travels and voyages, and complete files of *Forest and Stream*, *Rod and Gun*, and a number of similar serials. Among the ornithological items are most of the earlier short-lived serials, not easily obtained today, many authors' separates, chiefly systematic and faunal, and a very considerable number of the numerous popular books of recent years. The Brewster accessions, recorded to 1 August, number 1,701 titles.

Mr. Brewster's journals and note-books record with unusual felicity his field observations for a term of forty-nine years. The Museum hopes to publish his *Concord Notes* and those relating to the *Birds of Lake Umbagog*. About one half of the latter was practically ready for the printer at the time of Mr. Brewster's death, and it is to be regretted that the funds of the Museum and the copy prepared by members of the Museum staff awaiting publication, preclude a prompt issuance of the same.

The income of the Brewster Fund, when available, will enable the department of ornithology to secure some of the desirable specimens which are from time to time offered for sale.

So large an acquisition as the Brewster collection of bird skins, and the proper interpolation of the same in the Museum series, could not be accomplished readily at any time, and it is owing to the kindness of Dr. E. L. Mark, who has allowed the storage of very many of the Brewster cases in the central space of the large zoölogical laboratory adjacent to the ornithological collections, that the immediate use of the Brewster collection of bird skins is possible. It is only through Dr. Mark's good offices, the invasion of rooms devoted to departments other than ornithology, and the closing of one of the exhibition rooms, that the temporary storage of the Brewster collection has been brought about. And this crowded and unsatisfactory condition, though emphasized by the Brewster bequest, is not confined to the ornithological department. It is true with hardly an exception in all departments; the great gift of the Nathan Banks entomological collections would add little to the scientific resources of the Museum were they not still in charge of their generous donor; the recent additions to the department of invertebrate palaeontology are stored, rather than conveniently arranged for reference and study; the collections of recent Echini, one of the great treasures of the Museum, are housed in part in the basement, in part on the fifth floor, with the work room of the Curator on the second floor, and the collections of lower vertebrates are similarly disunited.

Relief from this condition can be obtained by the removal of zoölogical instruction from the Museum to a nearby biological laboratory building, an event of three-fold consequence: facilities for research would be enlarged, an ever present and ever increasing menace to the Museum collections would be eliminated, and it would provide for the growth and expansion of lines of work which should not be carried on in a building containing typical historical material, coincident from the beginning of systematic zoölogy to the present day.

For an accession of unique interest and value, the Museum is indebted to the American Museum of Natural History. At the second meeting of the American Association for the Advancement

of Science, held in Harvard Hall, Cambridge, 14 August, 1849, Prof. Louis Agassiz read a paper "On the fossil remains of an elephant found in Vermont" stating that the specimens which were found "a few weeks ago, in the construction of the Rutland and Burlington Railroad, upon the slope of Mount Holly * * * had been presented to the museum of the Lawrence Scientific School by Mr. Samuel Henshaw, of Boston. * * * He considered this a very valuable contribution to the scientific school; but he was sorry to say that it was in itself the museum, which was just beginning to be formed." Professor Agassiz mentions a *tooth* and *tusk* only; in 1852, however, Dr. J. C. Warren, in his "Mastodon giganteus of North America," records as received from the same locality and donor "some vertebræ and ribs," and in the second edition of his work, (Boston, 1855), Dr. Warren gives an excellent figure, (Plate 28B), of the tooth. The whole of this Vermont material was doubtless in Dr. Warren's hands for study, and remained in the Warren Museum, Chestnut Street, Boston, until 1906, when the late Mr. John P. Morgan presented the Warren Collection to the American Museum. The identity of the Vermont material was established by Mr. Walter Granger, and the American Museum, with a nice sense of right which recalls the position taken by Sir Joseph Banks in restoring natural history collections to France, sent the *tooth* to Cambridge, and most generously added the specimens originally given to Dr. Warren, in order that all the specimens of "the first true elephant found in a fossil state in the Northern American States" might be kept together. The *tusk* mentioned by Professor Agassiz has not been traced, and quite possibly may have disintegrated. Thus, though the collections forming the museum of the Lawrence Scientific School came by heritage to the Museum of Comparative Zoölogy, the first recorded specimen in the collection of the School dates as a Museum of Comparative Zoölogy accession from July, 1920, more than sixty years after the laying of the corner stone of the present Museum in June, 1859.

The Museum is indebted to Mrs. Margaret Stearns for the C. A. Stearns collection of shells, a collection of more than 2,000 species, with many specimens exceptional for size and beauty. The series from Lower California is of distinct scientific value as a record

of the work of one of the ablest students of Pacific Coast Mollusca, the late R. E. C. Stearns.

The collections of mammals, birds, reptiles, and amphibians, have received many additions, the generous gifts of Dr. Thomas Barbour. A second series, 350 species, of Japanese shells, choice specimens selected from the stock of Y. Hirase, is also the gift of Dr. Barbour. An excellent series of nearly 300 skins of mammals, largely with skulls, chiefly from western North America, is the gift of Dr. L. C. Sanford.

The Museum is indebted to Dr. R. V. Chamberlin for a collection of fossils from Utah; to Prof. C. C. Nutting for a collection of echinoderms; to the American Museum of Natural History for twenty-two species of land mollusks from the Belgian Congo; to the Bermuda Biological Station for Research, Dr. E. L. Mark, Director, for many marine mollusks from Bermuda; to Dr. R. C. Murphy for a collection of arachnids from the Guano Islands of Peru; to Mr. F. C. Bowditch for a large series of Chrysomelidae; to Mr. G. H. Edwards for the tooth of a fossil elephant from Montana; to Mr. Heyward Cutting for an Alaskan Moose, and to Col. John E. Thayer for a series of small mammals from New Mexico.

From Dr. L. C. Sanford the Museum has received in exchange a series of 73 species, 101 specimens of bird skins, and from the U. S. National Museum, 59 species, 192 specimens; both series contain many species new to the collection of the Museum; those from the United States National Museum were obtained by Mr. H. C. Raven in Celebes, Dr. Sanford's from many localities not well represented in most collections.

These accessions and those received during recent years show a growth that justifies the hope that the Museum will, in the near future, afford adequate facilities for the systematic study of the birds of the World. In the Sharpe Hand List 2,647 genera of recent birds are recognized; the Museum collection at present contains specimens of 2,204 genera.

Dr. G. M. Allen worked three days each week upon the collections of Mammals. He continued his study of the fossils collected in the early Eighties by Messrs. Garman, Clifford, and Sternberg, in the Tertiary formations of the Middle North American states.

He also attended to the usual exchanges and loans, supervised the use of the collection by graduate students and others, and completed a study of the Dogs of the American Aborigines, and one on the cranium of a new fossil cetacean.

Mr. James L. Peters was employed for five months assisting Mr. Bangs in the arrangement and identification of the collection of bird skins.

Mr. W. F. Clapp's work upon the collection of mollusks has been divided between the care of accessions, old and new, several thousand lots, and a continuance of a study preparatory to a report on the Mollusca collected by Dr. W. M. Mann in the Solomon Islands.

Mr. George Nelson, whose skill and versatility as a Museum Preparator has been noted in many recent reports, has mounted for exhibition a number of mammals, birds, and reptiles, prepared, mounted, and repaired many skins and skeletons of birds and mammals, developed, restored, and cast many fossils; his knowledge and expertness in photographic work, and his mechanical handiwork have been most serviceable. Mr. Nelson's selection by Dr. L. C. Sanford, as the Preparator to make over and remount the Audubon Great Auk, was a deserved recognition of his unusual ability, and the result is most satisfactory and gratifying alike to Mr. Nelson, Dr. Sanford, and the Museum.

Mr. Richard Bliss, whose death occurred at Newport, 7 January, 1920, served as a Museum Assistant for several years, aiding Professor Agassiz in the care of the ichthyological collections. Professor Agassiz's most interesting letter answering Mr. Bliss's application for admission as a special student at the Museum is printed as Appendix B (*infra* p. 42, 43).

Additional letters of Louis Agassiz to Prof. Benjamin Peirce and Dr. J. B. Holder, the latter the gift of Mrs. C. F. Holder, have been received during the year.

The Library contains 57,414 volumes, and 59,986 pamphlets; 1,610 volumes and 2,278 pamphlets have been received during the year. Mr. Brewster's bequest included, in addition to the books and pamphlets already mentioned, William Stone's admirable copy of Healey's portrait of Audubon, and a few Auduboniana given Mr. Brewster by Audubon's granddaughter, Miss Maria Audubon. From Mr. Banks the entomological section of the

Library has received many additions of recent books and author's separates, and Prof. W. M. Davis, Sturgis Hooper Professor of Geology, *emeritus*, following the policy of his distinguished predecessor, adds each year many volumes and pamphlets to the Whitney Library.

A profile plaque of Prof. Jules Marcou by Max Daudet is the kind gift of Mrs. Powell. A volume of the records of the Harvard Natural History Society, with much contemporaneous correspondence, has been received from Dr. R. M. Field.

Miss E. L. Anthony resigned her position in the Library in September, 1919. Her term of employment began in 1869; for some years she assisted in the conchological department but most of the time she served faithfully in the Library. Her Museum associates were glad to join in testifying their regard and to wish her many years of contentment.

The publications of the year include one number of the *Memoirs*, eight numbers of the *Bulletin*, and the *Annual Report*, a total of 749 (46 quarto and 703 octavo) pages, illustrated by 25 (6 quarto and 19 octavo) plates. The number of the *Memoirs* contains a report on the collection of Asteroidea (Star-fishes) obtained during the expedition to the Eastern Tropical Pacific, in charge of Mr. Agassiz, by the U. S. Fish Commission Steamer ALBATROSS, in 1904-1905. One of the *Bulletins* contains a report on the birds collected during the expedition of the ALBATROSS in the Tropical Pacific in 1899-1900; the other *Bulletins*, seven in number, are reports based on Museum collections.

SAMUEL HENSHAW,
Director.

REPORT ON THE ZOÖLOGICAL LABORATORY.

BY E. L. MARK.

During the year 1919-1920 the courses of instruction in Zoölogy were substantially the same as in the period immediately preceding the entrance of the United States into the War, and were given by the same instructors. The number of students who completed each of the courses is given, as heretofore, in tabular form. Table I shows for each course the number of Harvard students from each of the classes of Harvard College and other schools represented, and Table II the same for each of the classes of Radcliffe College.

TABLE I.

Courses 1919-1920	Graduates		Sen.	Jun.	Soph.	Fresh.	Uncl.	OcC.	Sp.	Med.	Total
	A. & S.	Ap. S.									
Zoölogy 1	4	—	13	24	50	43	17	8	7	—	166
" 3	2+3	—	1	14	13	8	22	5	2	—	67+3
" 4	5	2	2	3	—	—	2	2	—	—	16
" 5a	+2	—	1	1	—	—	—	1	—	—	3+2
" 7a	2	1	—	—	—	—	—	3	—	—	6
" 7c	2	2+3	—	—	—	—	—	3	—	1	8+3
" 10	—	1	—	—	—	—	—	—	—	—	1
" 12	3	—	—	2	—	—	—	—	—	—	5
" 14b	6	1	—	2	1	—	—	1	—	—	11
" 17	5	1	1	2	1	—	—	1	—	—	11
" 20a	2	—	—	—	—	—	—	—	—	—	2
" 20b	—	—	1	1	—	—	—	—	—	—	2
" 20c	5	—	—	—	—	—	—	—	—	—	5
" 20e	2	—	—	—	—	—	—	2	—	—	4
" 20g	1	—	—	—	—	—	—	—	—	—	1
" Special	1	—	—	—	—	—	—	—	—	—	1
Sums	40+5	8+3	19	49	65	51	41	26	9	1	309+8

Note: Numbers in italics refer to students attending the lectures, but not enrolled in the course.

TABLE II

Courses 1919-1920	Sen.	Jun.	Soph.	Fresh.	Uncl.	Sp.	Total
Zoölogy 1	10	9	13	9	5	2	48
" 3	3	1	1	—	1	1+1	7+1
" 4	4	7	1	—	1	—	13
" 5a	2	5	1	—	1	—	9
" 14b	1	5	1	—	—	—	7
" 17	2	1	—	—	—	—	3
" 20g	—	1	—	—	—	—	1
Sums	22	29	17	9	8	3+1	88+1

The assistants in the courses were:—Zoölogy 1, *Harvard*: chief-assistants, Messrs. S. W. Chase and H. G. Coar, sub-assistants, Messrs. J. F. Fulton, Jr., A. S. Gilson, Jr., V. Obreshkove, and G. C. Wheeler. *Radcliffe*: assistants, Messrs. S. W. Chase, H. G. Coar, and G. C. Wheeler. Zoölogy 3, *Harvard*: chief-assistant, Mr. C. S. Simkins, sub-assistants, Messrs. A. S. Gilson, Jr., and L. C. Wyman; *Radcliffe*, assistant, Mr. E. R. Dunn. Zoölogy 4, *Harvard*, assistant, Mr. J. M. D. Olmsted: *Radcliffe*, assistant, Mr. J. F. Fulton, Jr. Zoölogy 5a, *Harvard* and *Radcliffe*, assistant, Mr. C. S. Simkins. Zoölogy 12, *Harvard*, assistant, Mr. J. M. D. Olmsted.

Courses 7a, 7c, and 10 were given at the Bussey Institution, all others in Cambridge. Of the Harvard students in Zoölogy 14b, five took the course with work in the laboratory; of the Radcliffe students, one. In Zoölogy 17, four Harvard students and one Radcliffe student took the course with work in the laboratory.

The University Extension Course in Elementary Zoölogy,—fifteen lectures accompanied with laboratory exercises—was given by Professor Parker, during the first half year. Eight persons attended the course, five of whom took the examination. The assistants were Messrs. S. W. Chase, and H. G. Coar.

The privileges of the Laboratory were granted during the first half year to Professor A. O. Gross of Bowdoin College, who worked chiefly under the direction of Professor Parker, and for a short

period during the second half year to Professor T. Kawamura of Kyoto University, Japan, also working under Professor Parker.

The aggregate research work carried on was counted as equivalent to courses as follows: — in Harvard, Zoölogy 20a and 20b, under Professor Mark, four and one half courses; Zoölogy 20c, under Professor Parker, eight and three fourths courses; Zoölogy 20e and 20g, under Associate Professor Rand, four and one half courses; in Radcliffe College, Zoölogy 20g under Associate Professor Rand, one half course.

The degree of Doctor of Philosophy was conferred during the year on four persons: in February, 1920, on Vasil Obreshkove, whose thesis was entitled "The photic reactions of tadpoles in relation to the Bunsen-Roscoe law," and on James Montrose Duncan Olmsted, whose thesis was entitled "Experiments on the olfactory and gustatory organs of *Amiurus nebulosus* (Lesueur)"; in June on Edward Frederick Adolph, whose thesis was entitled "A quantitative study of the interrelations of oxygen and carbon dioxide with haemoglobin in blood"; and on Herbert Greenleaf Coar, whose thesis was entitled "The shell of *Balanus eburneus*: A contribution to the study of the operculate Cirripedia." In June Samuel Wood Chase was recommended for the degree of Ph.D. to be conferred at mid-year 1921, he having presented a thesis — "The mesonephros and urogenital ducts of *Necturus maculosus*, Rafinesque" — which was approved, and having passed the doctor's examination on June 9, 1920.

Two students and the Director spent about six weeks at the Bermuda Biological Station, which was open from the twenty-first of June till the sixth of August.

The Harvard Table at the Marine Biological Laboratory, Woods Hole, was shared by two graduate students, that of Radcliffe College by a graduate and an undergraduate, of the class of 1922, of Radcliffe College.

Aid to the amount of \$370.00 was furnished from the Humboldt Fund to Harvard research students at the Bermuda Station and the Woods Hole Laboratory, the payments, however, fall within the fiscal year 1920-1921.

The Zoölogical Club held twenty-four meetings during the year, at which twenty-five original papers and five reviews were pre-

sented. The average attendance was about eighteen. Messrs. Vasil Obreshkove and S. W. Chase were secretaries.

The Contributions from the Zoölogical Laboratory and from the Bermuda Biological Station for Research for the year 1919-1920 are listed on p. 35; other papers under the authors' names. Numbers 77 to 111, January, 1918 to October, 1919, of the Contributions from the Bermuda Station have been bound as volume five.

REPORT OF THE STURGIS HOOPER PROFESSOR OF GEOLOGY.

BY REGINALD A. DALY.

Apart from the time devoted to teaching and the duties of a department chairman, the year was spent in laboratory and field research. Two papers on the hypothesis of a recent, eustatic shift of sea-level to the amount of about twenty feet, another on the systematic warping of the earth's crust in the belts marginal to the Pleistocene ice-caps, and a fourth on the relation of the planetesimal hypothesis to the earth's history and constitution were written and published. Laboratory studies on the 1919 collection of Samoan rocks and on the chemical precipitation of limestone were begun. A special investigation of recently published theories of mountain-building was also begun.

During the summer a field revision of data bearing on the post-Glacial warping of the Atlantic coast region was made. De Geer's measurement of uplift at Mount Desert, Maine, was confirmed. It was found that the zero isobase crosses the Nova Scotia coast between Yarmouth and Digby and runs across northern Nova Scotia to a point on the Strait of Northumberland, north of Pictou. It lies between Port-aux-Basques and St. George's Bay in southwestern Newfoundland, and between Cape Bonavista and Twillingate in eastern Newfoundland. As a result of deceptive field appearances and of hasty field work at Signal Hill in 1900, the writer published the statement that St. John's was uplifted (see Bull. M. C. Z., 1902, 38, p. 258). This assertion is quite wrong, all the coast around the city showing evidence of recent subsidence. Many points studied both on the east and west shores of Newfoundland as well as on the Canadian and Newfoundland Labrador coast showed that the island has been tilted toward the south, with maximum uplift of 425 to 450 feet at its northern extremity. The 1900 measurement of uplift at and near Battle Harbor, Labrador, was confirmed.

REPORT ON THE DEPARTMENT OF GEOLOGY AND GEOGRAPHY.

BY REGINALD A. DALY.

The year's changes in the teaching force of this department included: the much regretted resignation of Professor Atwood, to assume his new duties as President of Clark University; the absence of Professor Graton, on Federal service at Washington; the voluntary service of Professor W. M. Davis (*emeritus*) in giving advanced instruction in physiography; and in the appointment, as assistants, of Messrs. T. H. Clark, E. C. French, N. E. A. Hinds, P. E. James, A. Wandke, and R. F. Webb. Professor Smyth conducted the course Geology 10, ordinarily given by Professor Graton.

The number of enrollments of students in each course is given in the following table.

Harvard:

Geology	4	—	Professor Daly; Messrs. Clark, Hinds, James, and Webb	168
"	5	—	" Woodworth; Mr. Clark	72
"	9	—	" Daly	1
"	10*	—	" Smyth; Mr. Wandke	4
"	12	—	" Woodworth	7
"	13*	—	" Smyth	14
"	14	—	" Raymond	6
"	15	—	" Woodworth	5
"	16	—	" "	7
"	17*	—	" Smyth	4
"	18a*	—	Professors Wolff and Palache; Mr. Wandke	6
"	19	—	Professor Woodworth	4
"	20c	—	" Daly	2
"	20d*	—	" Wolff	1
"	20e	—	" Woodworth	1
Geography	1	—	" Atwood	46
"	6	—	" "	24
"	7	—	" "	11

* Not included in recent Reports.

Geography	19	—	Professor Atwood	. . . . .	8
"	20a	—	Professors Davis and Atwood	. . . . .	7
Meteorology	1	—	Professor Ward; Mr. French	. . . . .	48
"	2	—	" "	. . . . .	8
"	4	—	" "	. . . . .	2
"	6*	—	" McAdie	. . . . .	6
"	7	—	" Ward	. . . . .	5
"	20	—	" "	. . . . .	2
Palaeontology	1	—	" Raymond; Mr. Bradley	. . . . .	21
"	2	—	" "	. . . . .	8
"	3	—	" "	. . . . .	2
"	20	—	" "	. . . . .	4
					504
<i>Radcliffe:</i>					
Geology	4	—	Professor Woodworth	. . . . .	25
"	5	—	" "	. . . . .	12
Geography	1	—	" Atwood	. . . . .	46
"	6	—	" "	. . . . .	11
"	7	—	" "	. . . . .	5
Meteorology	1	—	" Ward	. . . . .	13
"	3	—	" "	. . . . .	6
Palaeontology	1	—	" Raymond	. . . . .	8
					126

Mr. Roderick Peattie received the degree of Doctor of Philosophy, the title of his thesis being "Geographic conditions of the Lower St. Lawrence Valley." The degree of Master of Arts in geology was conferred on Messrs. I. B. Crosby, N. E. A. Hinds, W. M. Rau, E. F. C. Smith, and A. C. Swinnerton.

Professor Atwood conducted an unusually large number of courses, arousing widespread interest in scientific geography. His resignation and the failure of reappointment of a successor mean that for the near future at least both the University and Radcliffe College must suffer prestige so far as the work of this department is concerned. The department has obviously lost the leadership in geographical studies which it had for many years. During the year Professor Atwood published a highly valuable grammar school geography, based on the well-known work by Frye, but completely rewritten.

* Not included in recent Reports.

In addition to his regular courses in geology (5, 12, 15, and 16) Professor Woodworth conducted a course on the elements of seismology (Geology 19) to a few students at their request. In Radcliffe College, he gave two half courses, equivalent to Geology 4 and 5 of the Harvard list.

Professor Woodworth carried on the work of the seismological station. By request the exchange of the monthly bulletin of earthquakes registered at the Station has been extended to the Osaka Meteorological Observatory and to the Central Meteorological Observatory at Tokyo, Japan, beginning January 1, 1920. Mr. Randolph C. Ray, preparator, has given about an hour a day to the routine work of the Station.

As a Geologist of the U. S. G. S., Professor Woodworth gave much time to the revision of a report on the geology of Cape Cod and adjacent islands. The summer of 1920 was spent on Martha's Vineyard. A new locality for the occurrence of the Weyquosque glacial gravels was examined on the land of Mr. Ernest Flanders in Chilmark and a small collection of the water-worn Miocene sharks' teeth characteristic of this horizon was made. A well-preserved coral or bryozoan found in a chert pebble from the Miocene bed in Gay Cliffs was submitted to Mr. E. O. Ulrich, for a determination of its value as a horizon marker. Other chert pebbles from the same bed have been referred to a Helderberg horizon. Professor Lull of Yale University kindly undertook a study of the vertebrate foot print collected in the upper Carboniferous at Attleboro, Mass., in 1916 by Mr. Fred. W. Garnjost.

Professor Ward gave his courses as usual, with the exception of Meteorology 3, which, with the approval of the President, was omitted. Further progress has been made in the preparation of a book on the climatology of the United States, and as President of the American Meteorological Society, a good deal of time has been given to the work of that Society. The summer was spent in the preparation of a presidential address. The Laboratory teaching collections are in good condition.

Professor Raymond gave Palaeontology 1 and 2 in the new form. The former was arranged to illustrate matter of more general interest regarding the progress and evolution of life; the latter takes up the subject of invertebrate Palaeontology from a

technical standpoint. A course in Palaeontology in Radcliffe, offered for the first time in many years, was completed by eight students.

Accessions purchased during the year include two crustaceans from the Middle Cambrian; a model of a trilobite, a skeleton of *Necturus*; and specimens for the stratigraphic collection were donated by Messrs. T. H. Clark, N. E. A. Hinds, and R. F. Webb.

REPORT ON THE MAMMALS.

BY OUTRAM BANGS.

During the year 561 specimens were received.

The more important accessions include: a series of nearly 300 skins, mostly with skulls, chiefly from western North America, the gift of Dr. L. C. Sanford; thirty-seven specimens collected in New Mexico, presented by Mr. John E. Thayer; forty-seven specimens from Arizona, twenty-five from Florida, and a number of bats from Haiti, all the gift of Dr. Thomas Barbour.

A young Lion from Franklin Park, the gift of the City of Boston, has been mounted for exhibition.

Single specimens or small series have been presented by Mr. and Mrs. S. K. Lothrop, Messrs. G. M. Allen, Outram Bangs, L. C. Dunn, G. H. Edwards, A. V. Kidder, C. R. Lamb, J. L. Peters, A. S. Pope, W. L. Smith, and Oliver Trafford. A few specimens were received as the bequest of William Brewster.

Exchanges have been made with Amherst College, the American Museum of Natural History, the Naturhistoriska Riksmuseum, Stockholm, and the South African Museum.

REPORT ON THE BIRDS.

BY OUTRAM BANGS.

In addition to the William Brewster bequest of skins, mounted birds, nests and eggs, the largest single accession ever received by the Ornithological Department, 608 bird skins have been added to the collection.

We are indebted to the U. S. National Museum for 192 bird skins from Celebes, twenty-two of the fifty-nine species, hitherto not in the collection; to Dr. Thomas Barbour for twenty skins from Anticosti collected by Mr. W. S. Brooks and for 109 collected by himself and Mr. Brooks in Cuba, Florida, and among the Florida Keys. Single skins or small series have been presented by Miss M. J. Sitgreaves and by Messrs. Thomas Barbour, W. Cameron Forbes, G. E. Hodsdon, F. H. Kennard, T. E. Penard, J. L. Peters, J. C. Phillips, O. W. Ricketson, L. C. Sanford, C. H. Taylor, Roland Thaxter, and J. E. Thayer.

Specimens have been received in exchange from the U. S. Biological Survey, the Carnegie Museum, and from Messrs. H. R. Coale, J. H. Fleming, Nagamichi Kuroda, L. C. Sanford, and A. T. Wayne; Dr. Sanford's series consisted of 101 skins, seventy-three species, of which twenty-eight were new to the collection. Skins have been sent in exchange to Messrs. Fleming, Kuroda, Sanford, and Wayne, and to the American Museum of Natural History.

For purposes of study, skins have been loaned to the American Museum of Natural History, the Carnegie Museum, the Field Museum of Natural History, the Museum of Vertebrate Zoölogy, University of California, the U. S. Biological Survey, and to Dr. C. H. Townsend. We are indebted to the American Museum of Natural History, the Carnegie Museum, the Field Museum of Natural History, and the U. S. National Museum, for the loan of many bird skins.

Messrs. T. E. Penard and F. H. Kennard continued their studies during the year, and Mr. J. L. Peters was employed for five months, assisting in the general work of the Department.

REPORT ON THE REPTILES AND AMPHIBIANS.

BY THOMAS BARBOUR.

The year has been an unusually fortunate one as more than the customary amount of interesting material has been received.

Dr. G. M. Allen spent August and September, 1919, in Haiti, visiting also Gonaive Island where several new species were secured, and since that time, thanks to his diligence, most of the new material has been entered on the register and card catalogue and intercalated in the collection.

Mr. E. R. Dunn collected during the summer of 1919 in the high mountains of the Southern States and secured very many beautifully preserved urodeles, as well as other amphibians and some reptiles, in all 855 specimens of 55 species. Early in the summer of 1920 he went to Costa Rica, and the shipments already received indicate that he is reaping a rich harvest both in the tropical lowlands and in the higher altitude.

From December to the end of April, I was in Florida and Cuba, where, with the welcome help from Mr. W. S. Brooks, many desirable mammals, reptiles, amphibians, and fishes were obtained.

The series of *Ranae* was revised by Mr. Dunn, and the new cards show that the collection has ninety-eight of the 165 species recently recognized by Boulenger. The collection of *Urodeles* contains thirty-five genera and 119 species.

Dr. Mook of the American Museum of Natural History studied the skeletal material of the crocodilians and has borrowed seven skulls and six skeletons. Mr. G. K. Noble of the same Museum has also studied our Peruvian material and 420 specimens have been loaned him for study.

Gifts have been received from the United Fruit Company, Dr. Malcolm Smith, Mr. C. A. Mosier, Mr. Arthur Loveridge, and Mr. E. R. Dunn.

Excellent material has been obtained by exchange from the

Transvaal Museum, the Rhodesian Museum, the British Museum, the Zoological Museum of the University of Michigan, the U. S. National Museum, the American Museum of Natural History, and the Florida State Museum.

Specimens to complete an old exchange have been sent to the Carnegie Museum, Pittsburg.

Useful suites containing species new to the collection have been purchased from Messrs. R. D. Camp, A. G. Reynolds, C. S. Brimley, M. V. Campbell.

Most of the Lampropeltes loaned to Mr. Blanchard have been returned.

REPORT ON THE FISHES.

BY SAMUEL GARMAN.

Shrinkages in additions to the collections during the years of the war have permitted more attention to previous donations and purchases, to examinations and comparisons of accumulations of duplicates and other specimens gathered during long periods by many students in the furtherance of their investigations, material laid aside for consideration in times of expected leisure that never came, or had been overlooked in changes of interest. The manipulation of these accretions led to surprises in discovery of unsuspected values, and at the same time induced numerous reductions in bulk on the shelves or in greater increase in economies of alcohol and glass ware.

Among the results in searches in the older material has been the discovery or recovery of numerous specimens of historical interest, the importance of which does not diminish in the length of time since their original notices. All this is included in the care of the collections; it was accompanied by skeletal and other anatomical preparations for later publication, by revision of work formerly done, and by continuation of uncompleted researches.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

BY NATHAN BANKS.

During the past year gifts of specimens have been received from Messrs. C. F. Baker, W. S. Brooks, A. N. Caudell, T. D. A. Cockerell, C. W. Johnson, C. H. Kennedy, C. S. Ludlow, James McDunnough, J. D. Sornborger, W. M. Wheeler, and E. B. Williamson.

Several lots of Brazilian Neuroptera, mostly small species, were purchased from Mr. H. S. Parish.

Much of the time was spent in identifying Neuroptera and Fossorial Hymenoptera, and collections were named for the Boston Society of Natural History, the State Entomologist of Pennsylvania, the North Carolina Department of Entomology, Messrs. George Barber, A. P. Morse, and E. M. Walker.

Material from the Rhodesian Museum and the California Academy of Sciences was partly named.

Several hundred types have been located, verified, and numbered. Species-labels have been written and attached to many thousand specimens. About 8,000 insects have been pinned.

The collection has been inspected twice, and very little infestation seen at either time.

Visitors to study the collection, outside of many visits from local entomologists, were Messrs. M. W. Blackman, R. W. Dawson, W. T. Davis, A. Emerson, H. C. Fall, M. D. Leonard, E. H. Strickland, R. Webber, and F. X. Williams.

REPORT UPON THE MYRIOPODS, ARACHNIDS, AND WORMS.

BY RALPH V. CHAMBERLIN.

Aside from several smaller lots, the collection of Pacific Coast Polychaeta of the California Academy of Sciences, and a collection of Pacific polychaetes and sipunculids from the Geological Survey of Canada, were received for study during the year. Some time was spent in working up material for reports on the Polychaeta and Gephyrea of the Canadian Arctic Expedition.

The most important additions of Arachnida included several shipments of material from Prof. C. F. Baker of Los Baños, Philippines. A collection of arachnids from the Guano Islands of Peru was received for study from Mr. R. C. Murphy and a report was prepared upon the same. The types in this collection have been given to the Museum. Several smaller collections of arachnids were also identified for individuals and institutions.

Most of the year was devoted to work upon the Myriopoda. The material available from the Bermuda Islands was reviewed and a report upon the fauna of the region was completed. The material from the East Indian Region in the collections of the Museum, excepting important lots from the Philippines recently received from Prof. C. F. Baker, was identified, and a paper descriptive of the new forms prepared. A paper was also prepared upon myriopods collected in India by Prof. C. A. Kofoid, to whom the Museum is indebted for the first set of specimens. A revisional study was made of the Mecistocephalidae. The remaining portion of the year was given up principally to the study of the Chilopoda and the Diplopoda of the Bryant Walker Expedition to Colombia and British Guiana. A report upon these collections was prepared.

For arachnids and myriopods not otherwise acknowledged the Museum is indebted to Messrs. J. H. Emerton, J. M. Aldrich, H. A. Allard, S. C. Chamberlin, E. R. Sasser, H. L. Sanford, W. A. Hilton, L. O. Howard, H. E. Hubert, and Frits Johansen.

REPORT ON THE ECHINODERMS.

BY HUBERT LYMAN CLARK.

Much of the time during the past year has been given to a continuation of the work on the collection of holothurians. The critical study of more than 200 specimens of *Stichopus* led to the preparation of a report involving the revision of the genus. A similar study has been made of the Synaptinae, resulting in the discovery of seven undescribed species in the Museum collection. During the spring, the Echini taken by the University of Iowa Barbados-Antigua Expedition were studied and a report prepared. Some time has also been given to further study of the brittle-stars of the Amphiuridae.

The accessions for the year were about 200 specimens, chiefly from the University of Iowa, through Prof. C. C. Nutting, and from Mr. D. Thaanum of Hilo, Hawaii. Other donors, to whom thanks are due, were Miss Mildred Bush, Prof. G. H. Parker, Dr. A. G. Mayor, the Bermuda Biological Station, Prof. E. L. Mark, Director, and Mr. W. M. L. Wilson.

REPORT ON THE COELENTERATES.

BY HENRY B. BIGELOW.

For accessions during the past year, the Museum is indebted to Prof. G. H. Parker, series of Renilla from San Diego; the Canadian Geological Survey, Medusae from British Columbia; Dr. Thomas Barbour, Florida Medusae and Siphonophorae; Dr. H. J. Van Cleave, Medusae from Puget Sound.

The Autumn was spent in completing the reports on the Canadian Arctic Medusae, and on the "Grampus" Cruises of 1916.

From the middle of February till the end of May, I was in charge of explorations of the U. S. Fisheries Steamer ALBATROSS, commander L. H. Wallace, U. S. N., commanding, in the Gulf of Maine and adjacent waters. Sailing from Norfolk, February 19, the ALBATROSS proceeded to Boston, where I joined her, making, *en route*, a series of trawl hauls along the outer edge of the continental shelf, and a section across the western end of Georges Bank. A general hydrographic survey of the Gulf of Maine, Georges Bank, and the Continental Shelf south of Cape Sable, Nova Scotia, was carried out during March, and repeated in April to follow the seasonal changes. During the first half of May, the ALBATROSS worked a third set of stations in the western side of the Gulf of Maine, besides conducting a series of experiments on the flotation of the eggs of the haddock; ran a second section across the west end of Georges Bank, and finally returned to Norfolk.

Thanks to the efforts of Commander Wallace, his officers and men, our cruises proved very successful. Notwithstanding the stormy weather to be expected in early spring, we worked 89 stations, took 436 temperatures at serial depths, collected 418 water samples, the salt content of which has since been determined, and made 360 hauls with the various nets. One full tidal record with the Ekman Current Meter was obtained.

As in past years, I have had general supervision of the scientific

observations made by the U. S. Coast Guard Steamer *SENECA* on the international ice patrol off the Grand Banks, April-June, by the observer, Mr. A. L. Thuras. Special mention should be made of Mr. Thuras's perfection of an accurate and convenient apparatus for determining the salinity of the sea water on ship board by its electric conductivity.

Since May my time has been occupied with the examination of the Plankton collections of the *ALBATROSS*.

REPORT ON INVERTEBRATE PALAEONTOLOGY.

BY P. E. RAYMOND.

The Curator spent six weeks of the summer of 1919 in collecting from the Chazy and adjacent formations on the borders of Lake Champlain in Vermont and New York; as a result forty-two drawers of specimens chiefly trilobites, gastropods, and brachiopods were added to the collection. All have been cleaned, identified, and labeled. Many of the species were described by the Curator in earlier reports on the same region, and are to be found in but few museums. A few undescribed species were obtained. Unique specimens, the largest known Palaeozoic sponge, the largest known hypostoma of a trilobite, and corals from the oldest known coral reef, were discovered on Isle La Motte, Vt.

In the spring and summer of 1920 a number of short trips were made to the fossil-bearing localities in the vicinity of Boston, and a number of specimens collected. What appears to be a new locality for Silurian or Devonian fossils was found in the southwestern part of Topsfield by Dr. A. F. Foerste and myself. Dr. Foerste obtained fossils from this neighborhood many years ago, but after a careful search we were not able to rediscover the old collecting place, although the new one is probably in its immediate vicinity.

In addition to the material collected in 1919, a number of smaller collections, mostly in the stratigraphic collection, have been identified, and the Asterozoa have been reidentified and labeled. A study was made of the Archaeocyathinae, about whose structure new facts were discovered, and papers written descriptive of some novel forms of Beatricidae, a starfish, and a crinoid, as well as the results of an investigation into the nature of *Phytopsis tubulosa* Hall. A report on the Shaler Memorial investigations of 1917 and 1918 was also prepared.

During the year large collections of Silurian Cephalopods and of Cretaceous Bryozoa were loaned to Drs. A. F. Foerste and R. S.

Bassler respectively for study, and Dr. E. O. Ulrich is using the larger part of our Lichadidae. Two advanced students, Messrs. R. F. Webb and J. H. Bradley, Jr., prepared for publication articles descriptive of fossils belonging to the Museum.

The accessions, in addition to those mentioned, have been as follows: — *donations* — Messrs. S. W. Chase and Leverett Bradley, Cretaceous fossils from France; Prof. G. H. Parker and Mr. John H. Bradley, Jr., trilobites from British Columbia; Dr. A. F. Foerste, Leperditiae from Topsfield, Mass.; the British Museum (Natural History), through Dr. F. A. Bather, the cast of a specimen of *Isotelus*; M. Changanui, Dijon, France, through Prof. A. C. Lane, six species, univalves from Pleistocene near Dijon, R. V. Chamberlin, five drawers of fossils from Utah; by *purchase* — four crustaceans from British Columbia; seven thin sections of Ordovician fossils; by *exchange* — E. R. Cumings, University of Indiana, two bags of young shells from Harrodsburg, Ind., University of Colorado, through N. E. A. Hinds, fifty-eight species of Pennsylvanian fossils; Prof. W. H. Shidler, Miami University, Oxford, Ohio, twelve species Ordovician fossils.

REPORT ON THE GEOLOGICAL COLLECTIONS.

BY R. W. SAYLES.

The installation of the unique collection of cave deposits from Bisbee, Arizona, in the new hall case, was successfully accomplished. The dark hall and artificial lighting give a realistic effect not attainable by sunlight.

In January, the Curator studied the collection of microscopic slides of slate and shale at the National Museum in Washington, with the object of finding evidences of seasonal deposition. This search resulted in the discovery of probable seasonal banding in lowest Cambrian or latest Proterozoic times. In June, Mr. Allyn C. Swinnerton, a graduate student, was sent to collect specimens and make a field study of some of the slates examined in Washington. His findings corroborated the microscopic evidence noted in the slides. Mr. Swinnerton visited several localities in south-east Tennessee, in New York near Albany, and in western Vermont, and the Cobalt, Ontario, region. The Curator takes this opportunity to express his gratitude to the geologists at Washington for the willing help given him.

The months of February, March, and April, were spent in studying the literature bearing on geologic climates.

Mr. Preston E. James gave a splendid slab of glaciated granite from Rockport, Mass. The labels in the Museum have been renewed.

REPORT ON THE LIBRARY.

During the Museum year from August 1, 1919, to July 31, 1920, inclusive, 1,610 volumes, 1,807 parts of volumes, and 2,278 pamphlets have been added to the Library.

The total number of volumes in the Library is 57,414, the total number of pamphlets is 59,986.

One hundred and sixty-four volumes have been bound; one thousand two hundred pamphlets have been separately bound.

PUBLICATIONS

FOR THE YEAR 1919-1920

(1 AUGUST, 1919 — 31 JULY, 1920).

MUSEUM OF COMPARATIVE ZOÖLOGY.

BULLETIN:—

Vol. LXIII.

- No. 4. 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. XXI. The birds. By Charles Haskins Townsend and Alexander Wetmore. 78 pp. August, 1919.
- No. 5. The Psammocharidae of western North America. By Nathan Banks. 22 pp. September, 1919.
- No. 6. Pacific coast Polychaeta collected by Alexander Agassiz. By Ralph V. Chamberlin. 22 pp. 2 plates. November, 1919.
- No. 7. The ants of the British Solomon Islands. By William M. Mann. 122 pp. 2 plates. December, 1919.
- No. 8. Some amphibians from northwestern Peru, with a revision of the genera *Phyllobates* and *Telmatobius*. By Thomas Barbour and G. K. Noble. 36 pp. 3 plates. January, 1920.
- No. 9. Dogs of the American aborigines. By Glover M. Allen. 89 pp. 12 plates. March, 1920.

Vol. LXIV.

- No. 1. The Myriopoda of the Australian region. By Ralph V. Chamberlin. 270 pp. July, 1920.
- No. 2. Some new Ordovician trilobites. By Percy E. Raymond. 26 pp. July, 1920.

MEMOIRS:—

Vol. XXXIX.

- No. 3. 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. XXXII. Asteroidea. By Hubert Lyman Clark. 46 pp. 6 plates. February, 1920.

REPORT:—

- 1918-1919. 38 pp. December, 1919.
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ZOÖLOGICAL LABORATORY.

CONTRIBUTIONS:—

320. MINNICH, D. E.—The photic reactions of the honey-bee, *Apis mellifera* L. *Journ. exp. zoöl.*, November, 1919, **29**, p. 343–425.
321. MINNICH, D. E.—The relation of phototropism to swarming in the honey-bee, *Apis mellifera* L. *Journ. psychobiol.*, April, 1920, **2**, p. 177–180.
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BERMUDA BIOLOGICAL STATION FOR RESEARCH.

CONTRIBUTIONS:—

107. CROZIER, W. J., AND AREY, L. B.—Onchidium and the question of adaptive coloration. *Amer. nat.*, September–October, 1919, **53**, p. 415–430.
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INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE.

Gray Fund	50,000.00
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Humboldt Fund	8,963.81
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The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Director. The accounts are annually examined by a committee of the Overseers. The only funds the incomes of which are restricted, the Gray, the Humboldt, the Whitney, the Louis Cabot, and the Alexander Agassiz Expedition Funds, are annually charged in an analysis of the accounts, with vouchers, to the payment of which the incomes are applicable.

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

The income of the Humboldt Fund (about \$400.) 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, the Stations at Bermuda, or the Tortugas.

The income of the Whitney Funds can be applied for the care (binding) and increase of the Whitney Library.

The income of the Louis Cabot Fund can be applied to the purchase of books on travel, sport, and natural history.

The Alexander Agassiz Expedition Fund was bequeathed by Alexander Agassiz for the publication of reports on collections brought together by the expeditions with which he was connected.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value

of \$325., 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."

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.

APPENDIX A.

FROM THE WILL OF WILLIAM BREWSTER.

Fourth. My collection of mounted birds and of bird skins, nests and eggs with the cases and cabinets that contain them and all my manuscripts, catalogues of the birds, bird skins, nests and eggs, and my guns, collecting pistols and various things appertaining to them, together with my oil painted copy of Healey's painting of Audubon, and my manuscript note books and journals I give to the President and Fellows of Harvard College for the Museum of Comparative Zoölogy at Cambridge, imposing no conditions affecting this bequest, but hereby expressing my desire that the collection be kept essentially intact and the hope that both specimens and manuscripts may be so dealt with as to render useful service to ornithologists, instead of lying unconsulted and half forgotten as has sometimes happened to similar material deposited in large museums. It is further my wish that free access, under such precautionary rules as the institution may see fit to impose, be at all times afforded to ornithologists who may wish to examine or study the specimens.

Fifth. Such of the printed books in my library as relate to natural history I give as follows:—To the President and Fellows of Harvard College to be added to the library of said Museum of Comparative Zoölogy such as are not duplicates of those in said Museum library at the time of my death * * *

Sixth (a) To the President and Fellows of Harvard College for the Museum of Comparative Zoölogy at Cambridge, the sum of sixty thousand (60,000) dollars, three quarters of the income thereof to be used exclusively for the payment, or part payment, of the salary of a competent ornithologist, who shall take charge of my collection hereinabove given to said Museum and the remaining one-quarter to be used at the discretion of the Director of the Museum for the increase of the collection by purchase, or for the renewal or repair of the cases, or for the publication of matter contained in my manuscripts.

APPENDIX B.

LOUIS AGASSIZ TO RICHARD BLISS, JR.

Cambridge, May 7th, 1867.

Dear Sir,

I have duly received your note and take pleasure in answering it in a manner which I trust may be satisfactory. Mr. Thayer's liberality towards the Museum and the students connected with it has hardly any limit. You may be assured that if you answer my expectations you will want nothing that may contribute to your progress. But in proportion as the facilities thus afforded are complete, it becomes my duty to be careful how and on whom they are

bestowed, as he allows me the most absolute control over their application. My first care is therefore to make sure that the persons selected, under these circumstances, are truly interested in the study of natural history and intend to make it their life business. It is hardly worth my while to give my time to young men who may after a few months turn their attention to other studies. And the pursuit of natural history requires a most absolute devotion. Moreover it is no light affair and before a satisfactory result can be reached it takes years of hard and uninterrupted studies. I expect therefore that you will seriously examine yourself before you decide to come and satisfy yourself that you are prepared to go through the ordeal of a severe training during which all preconceived notions and selfish aspirations must be set aside to make room for such impressions as are resulting from a careful & faithful examination of nature's facts. It is very rarely the case that a student in my department, even if he brings to the task a thorough college education, is fit to pass an examination before he has been three years in the laboratory. For all this time and more if necessary, Mr. Thayer will provide for all your wants, provided no extravagances are indulged in. You would have a room in the building adjoining the Museum, known as Zoological Hall.

Should you feel any misgiving upon reading the above, you may come for a few weeks & see how the work suits you and give it up if you find it too hard. I expect the students to be daily seven hours at their work in the laboratory and otherwise to spend their time as becomes a student in reading and making themselves generally conversant with such collateral branches as may advance their standing in their special pursuits.

Should you now decide to come, you may enter the laboratory at once and the sooner you come the better, since the vacation approaches during which I only spend part of my time in the Museum. Speaking of vacation I would add, that special students who would make the study of Nat. Hist. their life business are expected to employ the ordinary vacations, allowed the students in the University, in the same manner as term time and only to absent themselves for such short periods as the care of health requires.

Respectfully yours,

L. Agassiz.

Richard Bliss, Jr., Esq.

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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*.

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:—

K. BRANDT. The Sagittae.

K. BRANDT. The Thalassicolae.

O. CARLGREN. The Actinarians.

W. R. COE. The Nemerteans.

REINHARD DOHRN. The Eyes of Deep-Sea Crustacea.

H. J. HANSEN. The Cirripeds.

H. J. HANSEN. The Schizopods.

W. A. HERDMAN. The Ascidians.

S. J. HICKSON. The Antipathids.

E. L. MARK. Branchiocerianthus.

JOHN MURRAY. The Bottom Specimens.

P. SCHIEMENZ. The Pteropods and Heteropods.

THEO. STUDER. The Alcyonarians.

H. B. WARD. The Sipunculids.

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:—

— The Volcanic Rocks.

— The Coralliferous Limestones.

G. W. MÜLLER. The Ostracods.

MARY J. RATHBUN. The Crustacea Decapoda.

G. O. SARS. The Copepods.

L. STEJNEGER. The Reptiles.

T. W. VAUGHAN. The Corals, Recent and Fossil.

PUBLICATIONS
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
AT HARVARD COLLEGE.

There have been published of the BULLETIN Vols. I. to LIV., LVI., and Vols. LVIII. to LXIII.; of the MEMOIRS, Vols. I. to XLII., and also Vols. XLIV. to XLVI., and Vol. XLVIII.

Vols. LV., LVII. and LXIV. of the BULLETIN, and Vols. XLIII., XLVII. and XLIX. of the MEMOIRS, are now in course of publication.

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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.

Contributions from the Zoölogical Laboratory, Professor E. L. Mark, Director.
Contributions from the Geological Laboratory, Professor R. A. Daly, in charge.

These publications are issued in numbers at irregular intervals. 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 Director of the Museum of Comparative Zoölogy, Cambridge, Mass.

