REPORT OF THE SECRETARY OF THE SMITHSONIAN INSTITUTION

FOR THE YEAR ENDING JUNE 30

1916

(Publication 2431)

WASHINGTON
GOVERNMENT PRINTING OFFICE
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CONTENTS.

REPORT

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SECRETARY OF THE SMITHSONIAN INSTITUTION

CHARLES D. WALCOTT

FOR THE YEAR ENDING JUNE 30, 1916.

To the Board of Regents of the Smithsonian Institution:

GENTLEMEN: I have the honor to submit herewith the customary annual report on the operations of the Smithsonian Institution and its branches during the fiscal year ending June 30, 1916, including work placed by Congress under the direction of the Board of Regents in the United States National Museum, the Bureau of American Ethnology, the International Exchanges, the National Zoological Park, the Astrophysical Observatory, and the United States Bureau of the International Catalogue of Scientific Literature.

The general report reviews the affairs of the Institution proper and briefly summarizes the operations of its several branches, while the appendices contain detailed reports by the assistant secretary and others directly in charge of various activities. The reports on operations of the National Museum and the Bureau of American Ethnology will also be published as independent volumes.

THE SMITHSONIAN INSTITUTION.

THE ESTABLISHMENT.

The Smithsonian Institution was created an establishment by act of Congress approved August 10, 1846. Its statutory members are the President of the United States, the Vice President, the Chief Justice, and the heads of the executive departments.

THE BOARD OF REGENTS.

The Board of Regents, which is charged with the administration of the Institution, consists of the Vice President and the Chief Justice of the United States as ex officio members, three Members of the Senate, three Members of the House of Representatives, and six citizens, "two of whom shall be residents in the city of Washington and the other four shall be inhabitants of some State, but no two of them from the same State."

In regard to the personnel of the board the only change during the fiscal year was the appointment of James T. Lloyd, Representative from Missouri. The roll of Regents on June 30, 1916, was as follows: Edward D. White, Chief Justice of the United States, Chancellor; Thomas R. Marshall, Vice President of the United States; Henry Cabot Lodge, Member of the Senate; William J. Stone, Member of the Senate; Henry French Hollis, Member of the Senate; Scott Ferris, Member of the House of Representatives; Ernest W. Roberts, Member of the House of Representatives; James T. Lloyd, Member of the House of Representatives; Andrew D. White, citizen of New York; Alexander Graham Bell, citizen of Washington, D. C.; George Gray, citizen of Delaware; Charles F. Choate, jr., citizen of Massachusetts; John B. Henderson, jr., citizen of Washington, D. C.; and Charles W. Fairbanks, citizen of Indiana.

The board held its annual meeting on December 9, 1915. The proceedings of that meeting, as also the annual financial report of the executive committee, have been printed, as usual, for the use of the Regents, while such important matters acted upon as are of public interest are reviewed under appropriate heads in the present report of the Secretary. A detailed statement of disbursements from Government appropriations, under the direction of the Institution for the maintenance of the National Museum, the National Zoological Park, and other branches, will be submitted to Congress by the Secretary in the usual manner in compliance with the law.

FINANCES.

The permanent fund of the Institution and the sources from which it was derived are as follows:

Deposited in the Treasury of the United States.

Bequest of James Smithson, 1846		$515,169.00
Residuary legacy of James Smithson, 1867		26,210.63
Deposit of savings of income, 1867		108,620.37
Bequest of James Hamilton, 1875	$1,000	
Accumulated interest on Hamilton fund, 1895	1,000	
		2,000.00
Bequest of Simeon Habel, 1880		500.00
Deposits from proceeds of sale of bonds, 1881		51,500.00
Gift of Thomas G. Hodgkins, 1891		200,000.00
Part of residuary legacy of Thomas G. Hodgkins, 1894		8,000.00
Deposit from savings of income, 1903		25,000.00
Residuary legacy of Thomas G. Hodgkins, 1907		7,918.69
Deposit from savings of income, 1913		636.94
Part of bequest of William Jones Rhees, 1913		251.95
Deposit of proceeds from sale of real estate (gift of Robert Stanton Avery), 1913		9,692.42
Bequest of Addison T. Reid, 1914		4,795.91
Deposit of savings from income, Avery bequest, 1914		204.09

Deposit of savings from income, Avery fund, 1915	$1,862.60
Deposit of savings from income, Reid fund, 1915	426.04
Deposit of balance of principal, $248.05, and income, $28.39, Rhees fund, 1915	276.44
Deposit of first payment of Lucy T. and George W. Poore fund, 1915	24,534.92
Deposit of part of principal of Addison T. Reid fund, 1916	4,698.59
Deposit of principal of George H. Sanford fund, 1916	1,020.00
Deposit of savings from income, 1916	2,681.41
Total of fund deposited in the United States Treasury	996,000.00

Other resources.

Registered and guaranteed 4 per cent bonds of the West Shore Railroad Co., part of legacy of Thomas G. Hodgkins (par value)	42,000.00
Coupon 5 per cent bonds of the Brooklyn Rapid Transit Co., due July 1, 1918 (cost)	5,040.63
Coupon 6 per cent bonds of the Argentine Nation, due Dec. 15, 1917 (cost)	5,093.75
Total permanent fund	1,048,134.38

The second installment to the Addison T. Reid fund, amounting to $4,698.59, and a bequest to be known as the George H. Sanford fund, amounting to $1,020, were added during the year to the permanent fund deposited in the Treasury of the United States, which, together with incomes of several specific funds amounting to $2,681.41, now aggregates the total sum of $996,000, which bears interest at the rate of 6 per cent per annum.

The sum of $10,000, being a part of the bequest designated as the Frances Lea Chamberlain fund, the income of which is to be applied to the maintenance of the Isaac Lea collection of gems and mollusks in the National collections, was received by the Institution in October, 1915, and on the advice of the executive committee was invested in gold notes maturing on December 15, 1917, and July 1, 1918. These investments form a nucelus of what will hereafter be known as the consolidated fund. The income account of each specific fund will be credited with the proportion of income which each invested fund bears to the whole fund.

The income of the Institution during the year, amounting to $107,670.26, was derived as follows: Interest on the permanent foundation, $60,751.23; contributions from various sources for specific purposes, $22,954.99; first payment of the Frances Lea Chamberlain fund, $10,000; second payment on account of the Addison T. Reid fund, $4,698.59; and from other miscellaneous sources, $9,265.45.

Adding the cash balance of $42,165.86 on July 1, 1915, the total resources for the fiscal year amounted to $149,836.12. The disbursements, which are given in detail in the annual report of the executive

committee, amounted to $105,125.10, leaving a balance of $44,711.02 on deposit June 30, 1916, in the United States Treasury and in cash.

The Institution was charged by Congress with the disbursement of the following appropriations for the year ending June 30, 1916:

International exchanges	$32,000
American ethnology	42,000
Astrophysical Observatory	13,000
National Museum:	
Furniture and fixtures	25,000
Heating and lighting	46,000
Preservation of collections	300,000
Books	2,000
Postage	500
Building repairs	15,000
Bookstacks for Government bureau libraries	6,500
National Zoological Park	100,000
International Catalogue of Scientific Literature	7,500
Total	589,500

In addition to the above specific amounts to be disbursed by the Institution there was included under the general appropriation for printing and binding an allotment of $76,200 to cover the cost of printing and binding the Smithsonian annual report, and reports and miscellaneous printing for the Government branches of the Institution.

THE FREER ART GALLERY.

One of the most important events since the foundation of the Institution was consummated in December last. In my last report it was mentioned that Mr. Charles L. Freer was considering the question of erecting a suitable building for the permanent preservation of the splendid collection of objects of art which he presented to the Institution in 1906 and has since augmented by many further gifts. It is exceedingly gratifying here to record the gift by Mr. Freer of $1,000,000 in cash for the immediate erection of a building and that the site and preliminary plans have been agreed upon, so that the actual construction work will soon begin. The building will be of granite and located at the southwest corner of the Smithsonian reservation at Twelfth and B Streets.

The munificent donation by Mr. Freer of his collection and provision for its preservation is unsurpassed in this country, and is one of the most notable gifts of its character in the world's history.

Mr. Freer describes his collection as follows:

> These several collections include specimens of very widely separated periods of artistic development, beginning before the birth of Christ and ending to-day. No attempt has been made to secure specimens from unsympathetic sources, my collecting having been confined to American and Asiatic schools. My great

desire has been to unite modern work with masterpieces of certain periods of high civilization harmonious in spiritual and physical suggestion, having the power to broaden esthetic culture and the grace to elevate the human mind.

The original collection consisted of about 2,300 paintings and other objects of art, and has since been increased to 5,346 items, including American paintings and sculptures, the Whistler collection, and oriental paintings, pottery, bronzes, and jades from China, Korea, Japan, and other Asiatic countries.

A full catalogue of items is given by Mr. Rathbun in his Museum Bulletin on the National Gallery of Art.

EXPLORATIONS AND RESEARCHES.

The usual activities were continued during the past year in advancing one of the fundamental objects of the Smithsonian Institution, the *increase of knowledge*. In this work various explorations and researches were inaugurated or participated in by the Institution and its branches, covering practically all divisions of astronomical, anthropological, biological, and geological science. The extent of these explorations and researches during the history of the Institution covers a wide range, although a great deal more of most important work could have been accomplished had adequate funds been available. Friends of the Institution have generously aided this work, particularly during the last few years, through the contribution of funds for specific purposes, but much yet remains undone, and opportunities for undertaking important lines of investigation are constantly being lost through lack of means to carry them into execution.

Several proposed expeditions to various parts of the world have been temporarily delayed by the war in Europe.

I will here mention only briefly some of the recent activities of the Institution in these directions and for details of other investigations may refer to the appendices containing the reports of those directly in charge of the several branches of the Institution.

GEOLOGICAL EXPLORATIONS IN THE ROCKY MOUNTAINS.

In continuation of my previous work in the Rocky Mountain region, I was engaged during the season of 1915 in field investigation in the Yellowstone Park area and from there north into the Belt Mountains east of Helena, Mont. The work in the Yellowstone Park was carried on with two objects in view:

First. To determine, if possible, the extent to which the lower forms of algæ and possibly bacteria contributed, through their activities, to the deposition from the geyser and hot spring waters of the contained carbonate of lime and silica.

Second. The securing for the National Museum of a series of geyser and hot spring deposits, also silicified wood from the petrified forests and certain types of volcanic rocks.

During the investigation and collecting, numerous photographs were taken of geysers and hot springs and of deposits made from the waters through evaporation and organic agencies.

The collections were brought to the camps by pack horses and buckboard and subsequently packed for shipment at Fort Yellowstone and Yellowstone. Material assistance was afforded by the cooperation of the acting superintendent of the park, Col. L. M. Brett, United States Army, and officers of the United States Engineer Corps in charge of the maintenance and development of the park roads and trails.

Upward of 5 tons of specimens were collected and shipped to the National Museum. This collection permits of the preparation of a special Yellowstone Park exhibit of great beauty and interest.

It was found that algal growth was everywhere present when the temperature of the waters was from 70° to not much above 180° F., and that this growth had a marked effect upon the amount and character of both calcareous and siliceous deposits.

After completing the investigation of the geyser and hot spring deposits, a trip was made to the Fossil Forest in the northeastern section of the park, in the Lamar River Valley. Large collections were made here of silicified wood and various minerals, one of the latter being a remarkable and beautiful form of calcite rosettes, which were illustrated and technically described in the pamphlet on Smithsonian explorations in 1915.[1]

The camp site in the Lamar Valley was one of unusual interest and beauty. The high hills to the south showed the rock cliffs containing silicified woods, calcite rosettes, and beautiful specimens of chalcedony. A little way from the camp the party met with a large herd of bison grazing freely in the broad open valley; also herds of elk, bands of antelope, a few black bear, and an occasional wolf.

On leaving the park, after 675 miles of travel with the camp outfit, the party proceeded down the West Gallatin River Canyon, stopping to examine the section of Cambrian rocks at the mouth of Squaw Creek. The next permanent camp was made in Deep Creek Canyon, 17 miles east of Townsend, Mont., where the extensive pre-Cambrian sections of the Big Belt Mountains are beautifully shown. About 2 tons of pre-Cambrian specimens were collected in this vicinity before the storms of late September (1915) closed the season's field work.

[1] Smithsonian Miscellaneous Collections, Vol. 66, No. 3, 1916.

MASTODON FROM INDIANA.

Many finds of mastodon and mammoth remains, especially from different localities in States bordering on the Great Lakes, are constantly being reported to the Institution. These "finds," chiefly in swamp deposits of the Pleistocene, generally consist of a few isolated bones or teeth, but afford evidence of an abundance of these great creatures during the geological age just preceding the present. Compared, however, with the great number of remains found, complete skeletons are rare, principally because the finds are generally brought to light by workmen who have little or no knowledge of the scientific value of the remains. The National Museum was therefore fortunate during the past year in the acquisition of a fine, nearly complete adult male mastodon skeleton from a swamp deposit in northwestern Indiana.

A part of the skull, four limb bones, a few ribs and vertebræ were unearthed by a dredge crew while excavating a drainage canal and shipped to the Institution. Mr. J. W. Gidley, of the National Museum, later succeeded in finding the lower jaws, most of the remaining vertebræ and ribs, parts of the pelvis, and a few more limb and foot bones, and on a second visit found the missing sections of the vertebral column, several more foot bones, and other important fragments. On assembling all the bones recovered it has been found that, with comparatively little artificial restoration, an unusually fine and complete specimen of the American mastodon can be prepared for exhibition.

PALEONTOLOGICAL AND STRATIGRAPHIC STUDIES IN THE PALEOZOIC ROCKS.

Dr. E. O. Ulrich of the National Museum, was occupied for several months during the field season of 1915, under the auspices of the United States Geological Survey, in a study of the lower Paleozoic deposits of the Mississippi Valley. He was engaged chiefly in seeking evidence respecting the boundary line between the Cambrian and Ozarkian systems. For this purpose many of the outcrops of these rocks were visited, but the most important evidence was found in the upper Mississippi Valley and in the Missouri where the Upper Cambrian rocks are particularly well displayed, and the succeeding deposits of the Ozarkian system are more commonly fossiliferous than elsewhere. The relative abundance of fossils in these areas permitted the actual boundary between the two systems to be accurately determined after considerable study. This boundary was found to coincide with the uneven plane formed at the junction of the deposits laid down by the retreating Cambrian sea with those formed by the return of the waters in the succeeding Ozarkian time. During the progress of these stratigraphic studies

numerous collections of fossils were secured for the museum series, and incidentally the investigations resulted in the proper placement of many fossils whose stratigraphic position had hitherto been uncertain.

In the latter part of the season Dr. Ulrich worked out the field relations of some insufficiently located collections of Paleozoic fossils made in southwest Virginia at various times in the past. The most important result of these investigations is the proof that a large coral fauna, exceedingly like that which marks the horizon of the Onondaga limestone throughout the extent of this well known and widely distributed Middle Devonian formation, had already invaded the continental basins as far as southwest Virginia during the closing stages of the preceding Lower Devonian. This instance of recurring fossil faunas is regarded as one of the most important of the many similar instances that have been established through the field studies of Dr. Ulrich during the past 25 years. All have served in correcting erroneous correlations of formations that had arisen through the confusion of earlier or later appearances of faunas with the one recognized in the standardized sequence of stratigraphic units.

Mr. R. D. Mesler, under the supervision of Dr. Ulrich, spent the summer of 1915 in making collections of Ordovician and Silurian fossils from formations and localities in the Appalachian and Mississippi Valleys which had hitherto been little represented in the museum collections. A large number of fossils resulted from his trip, particularly from the Middle Ordovician rocks of east Tennessee, which will form the basis of a future monograph on the paleontology of that region.

EXPLORATIONS IN SIBERIA.

Through the liberality of the Telluride Association the Institution was enabled to send Mr. B. Alexander with the Koren Expedition to the Kolyma River region of northern Siberia. The expedition left Seattle, Wash., in June, 1914, and returned in September, 1915. The immediate purpose of the trip was to obtain remains of large extinct animals, particularly of the mammoth for which the region is noted. The results were not all that were hoped for, but a considerable quantity of material was obtained, though no complete skeleton. A report, with photographs taken by the party, was published in the pamphlet on Smithsonian explorations and field work in 1915. The collection of bones sent in by the expedition contains a few fine specimens, together with a considerable number of isolated bones, which are valuable for study and comparison. They all indicate a late Pleistocene age, as the bones of many of the forms represented can with difficulty be distinguished from those of species still living in

that region. The animals represented include the mammoth, bison, carabou, horse (two or more species), rhinoceros, musk-ox, wolverine, and wolf. The prize specimen is a finely preserved, almost complete skull of *Elephas primigenius*. It is of especial interest as being the only skull of the Siberian mammoth in any of our American museums.

COLLECTING FOSSIL ECHINODERMS IN THE OHIO VALLEY.

Explorations for fossil echinoderms were conducted during the summer of 1915, under the supervision of Mr. Frank Springer, associate in paleontology in the United States National Museum. The work was limited to two areas of Silurian rocks in the Ohio Valley from each of which much valuable material was procured for the study of certain definite problems. In southern Indiana Mr. Herrick E. Wilson, under Mr. Springer's direction, spent a number of weeks quarrying for Niagaran echinoderms, particularly crinoids, in the vicinity of St. Paul where numerous outcrops of the Laurel limestone occur. The object of this work was to secure as many specimens as possible for comparisons of this peculiar fauna with those from European Silurian rocks. Not only was much material obtained by the quarrying operations, but all of the local collections of fossils were purchased for Mr. Springer, so that the Museum, which hitherto had practically no fossils from the Laurel limestone, is now in possession of a splendid general collection of fossils from this particular formation.

The second area of exploration was in west Tennessee along the Tennessee River, where Mr. W. F. Pate spent some weeks in searching for the peculiar crinoidal bulb, Camarocrinus, and the associated crinoid, Scyphocrinus, both of which Mr. Springer has proved to belong to the same organism. Mr. Pate was successful in finding several localities where excellent specimens of the Camarocrinus and Scyphocrinus were associated. Much material was secured and the specimens will be used in the preparation of Mr. Springer's monograph upon this group of crinoids.

GEOLOGICAL WORK IN PENNSYLVANIA AND VIRGINIA.

By arrangement with the United States Geological Survey, Dr. Edgar T. Wherry, of the National Museum, continued his studies of the geology of the Reading quadrangle in eastern Pennsylvania for a month during the summer of 1915. He completed the areal mapping of the Cambrian and Ordovician rocks of the region, and has transmitted to the Survey the manuscript of a report upon his work. He also mapped Cambrian and Triassic formations on

the Quakertown and Doylestown quadrangles, which lie to the east of the Reading.

A brief visit was made to a newly discovered cave near Lurich, Va., where the cave marble was reported to be of economic importance. This view proved to be unjustified, but some unusual stalactitic formations were found, two specimens of which were obtained for the Museum collections.

EXPEDITION TO BORNEO AND CELEBES.

As the result of zoological explorations carried on by Mr. H. C. Raven in Celebes, through the generosity of Dr. W. L. Abbott, the Museum has received 464 mammals, 870 birds, 50 reptiles, and some miscellaneous specimens. The mammals and birds are of great value as the first adequate representation of a fauna that has particular interest in connection with previous work in other parts of the Malay Archipelago. Early in the summer of 1915 Mr. Raven returned to America and spent several months on vacation and in preparing for further explorations in Celebes and other parts of the East Indies. Dr. Abbott has offered his continued support to this work. Mr. Raven left Washington for the East by way of Japan and Singapore, about the middle of October. Two months later he reported from Buitenzorg, Java, that he was making good progress toward the collecting ground.

EXPLORATIONS IN CHINA AND MANCHURIA.

Zoological explorations, mentioned in previous reports, have been continued in China and Manchuria by Mr. Sowerby through the generosity of a friend of the Institution who desires to remain unknown. During July, August, and September, he made an expedition to the lower reaches of the Sungari River and the I-mien-po district in north Manchuria, where he succeeded in collecting some interesting specimens of mammals, birds, and fishes to be forwarded to the Institution.

EXPLORATIONS IN EASTERN SIBERIA.

In the summer of 1915 Mr. Copley Amory, jr., returned from the northeast coast of Siberia, where for about a year he had been gathering zoological material in connection with a party under Capt. John Koren. As his part of the results of the expedition Mr. Amory turned over to the National Museum 365 mammals, 264 birds, and various miscellaneous specimens principally of plants, fish, and birds' eggs. Most of this material was prepared by Mr. Amory himself, though various members of the expedition contributed to the collections of both mammals and birds. Among the mammals, about

25 wild species are represented and are of interest for comparing the Alaskan species with their nearest Asiatic relatives.

EXPEDITION TO ST. THOMAS, DANISH WEST INDIES.

Mr. C. R. Shoemaker, of the division of marine invertebrates in the National Museum, spent the two months from the middle of June to the middle of August, 1915, in the Danish West Indies, under the auspices of the Carnegie Institution of Washington, D. C., securing collections of corals and other marine invertebrates. This expedition has enriched the collections of the National Museum by about 5,000 specimens, which it is hoped will throw considerable light on the correlation of these islands in the West Indian complex.

The collecting was done in the open water, bays, and channels at St. Thomas, St. John, and St. James. The deeper waters were explored by means of dredging from a motor boat, while native divers, working from the heavy West Indian row boats, were used for collecting in the shallow waters. In addition to this, much shore collecting was done. Owing to the very strong and constant trade wind, work on exposed reefs was in many cases made impossible by the heavy surf. Collecting in the protected bays, however, was most successful, as a great variety of bottom was to be found in many of them.

While the chief aim of the expedition was to secure as complete a representation of the coral fauna as possible—and this aim met with considerable success—fine collections of other marine invertebrates were also obtained, including protozoa, sponges, hydroids, medusæ, alcyonarians, anemones, bryozoans, starfish, sea urchins, holothurians, annelids, crustaceans, mollusks, and ascidians. Collections were also made on land whenever opportunities offered, including insects, mollusks, reptiles, and batrachians.

CACTUS INVESTIGATIONS IN BRAZIL AND ARGENTINA.

Dr. J. N. Rose, associate in Botany, United States National Museum (at present connected with the Carnegie Institution of Washington in the preparation of a monograph of the Cactaceæ of America), accompanied by Mr. Paul G. Russell, of the United States National Museum, continued the botanical exploration of South America during the summer of 1915, spending over five months in travel and field work in Brazil and Argentina.

In addition to the good-sized collections of cactuses, consisting of living, herbarium, and formalin specimens, moderately large collections of insects, shells, diatoms, and other natural-history specimens were obtained. In all about 8,000 herbarium specimens were obtained and over 90 cases, large and small, of living plants were sent

back to the United States. The living collection is now on exhibition at the New York Botanical Garden.

Bahia, Brazil, was the first place visited, which city served as a base for collecting trips into the interior of the State of Bahia. One of these was to the town of Joazeiro, located about 300 miles north-northwest of Bahia, and lying in a typical cactus desert, although this region is traversed by the large Rio Sao Francisco. Notwithstanding the fact that this stream is full the entire year, little or no attempt is being made to use the water for irrigation purposes. The country is of that type known as "catinga," and resembles in a remarkable way the deserts of the West Indies; indeed, the genera of plants are in many cases the same, though the species are distinct. Here was seen the "carnuba," or wax palm, from which is obtained the wax utilized in making records for phonographs. Near Joazeiro is the Horto Florestal, or "forest garden," a Government experiment station in charge of Dr. Leo Zehntner, who rendered great assistance in the study and collection of the cactuses of the region.

After making short stops at various stations in returning to Bahia, a trip was made to Machado Portella, a small town about 175 miles west and a little south of Bahia, the terminus of a little narrow-gauge railway. This is also a semiarid region and proved exceedingly interesting botanically. The next side trip was to Toca da Onca, still farther south, on the edge of a thick tropical forest and in a region much more humid than the northern part of the State.

About six weeks were then spent in beautiful Rio de Janeiro and vicinity. Here, even in the city itself, a botanist finds a great deal to interest him, for the trees are covered with epiphytic cactuses, mostly of the genus Rhipsalis, and within the city itself rises the picturesque Corcovado, a thickly wooded mountain on whose slopes are found many rare ferns and tree-inhabiting cactuses. The Jardin Botanico in this city is one of the finest in the world. Over 200 species of palms from all parts of the tropics are here grown in the open, besides many other rare tropical plants. In another section of the city, in a fine large park called the Quinta Boa Vista, is the Museo Nacional, where a number of rare cactuses were found in the herbarium.

From Rio de Janeiro an ascent of Itatiaya, the highest mountain in Brazil, was made, and on the very top, 10,000 feet above the sea, was found a small cactus with beautiful rose-colored flowers. Excursions were also made to Cabo Frio, to Ilha Grande, and to the islands in the Bay of Rio de Janeiro. A few days were spent in the Organ Mountains, near Petropolis, the summer home of the wealthiest classes of Rio de Janeiro. This range of mountains merits a more thorough biological exploration than has been hitherto undertaken.

Proceeding southward, a day was spent at Santos, Brazil, the world's greatest coffee center. Buenos Aires was visited next, although but little time was spent in the city. Several visits were made to the fine suburb of La Plata, where resides Dr. Carlos Spegazzini, the leading authority on Argentine cactuses.

From Buenos Aires a trip was taken across Argentina to Mendoza, a city situated near the foot of the Andes, in a region favorable to the growth of succulent plants. From there a short excursion was made to Portrerillos, Argentina, on the railway which leads to Valparaiso, Chile. Many very interesting plants were found in both these places.

In the city of Cordova, Argentina, northwest of Buenos Aires, the cactus collection of Dr. Frederick Kurtz was found to contain some rare types, which were very kindly submitted for examination and study. In this vicinity, as well as in the neighboring town of Cosquin, many cactuses were collected on the semiarid peneplain.

FOG-CLEARING INVESTIGATIONS.

Aided by a grant of $2,000 from the Smithsonian Institution and a grant from the Research Corporation, a committee of electrical engineering experts, under the general direction of Mr. F. G. Cottrell, continued during 1915 the investigations begun at San Francisco by the University of California, in cooperation with the United States Lighthouse Service, relative to the clearing of fog by means of electrical precipitation. In a preliminary report read at the first meeting of the committee, Prof. Ryan, of Stanford University, says:

> Science has established the fact that all dust and fog particles in the open atmosphere are electrified and subject to dispersion or precipitation. It is apparent, therefore, that a source of very high direct voltage, with facilities for control and application, may be of inestimable value in certain quarters and seasons for clearing fog away from a street, from along a passenger railway, from around the landing stages of a ferry, or, possibly, about or in advance of a ship under headway at sea.

The clearing of fog differs from the treatment of smoke and fumes in several respects, principally in that the smoke particles must be actually deposited on the electrodes to bring about the desired effect, whereas in treating fog it is only necessary to cause coalescence of the minute particles into larger ones to give much greater transparency, even disregarding the more rapid settling of the larger drops. However, other difficulties are to be expected in the problem of clearing fog, such as the conditions arising from the continual immersion in the wet atmosphere. What is chiefly needed for an intelligent conception of the problem is actual first-hand experience in handling these and other unusual conditions.

The most striking features of the apparatus used in these experiments are the Thordarson 350,000 to 1,000,000 volt transformers, which I saw while visiting the San Francisco Exposition.

A great deal was learned during the year about the electrical technique of the problem, and although days of suitable fog conditions were extremely scarce, on the rare occasions of actual trial very perceptible clearing for a short distance around the high-tension wires was obtained as the fog swept past.

EXPLORATIONS OF ANCIENT MAYA CITIES IN GUATEMALA AND HONDURAS.

Through the courtesy of the Carnegie Institution of Washington, the Smithsonian Institution has been enabled to participate in some very interesting explorations in Central America. Prof. W. H. Holmes, head curator of anthropology in the National Museum, gives the following general account of his work in that country:

> In February, 1916, owing to a generous grant of funds by the Smithsonian Institution, the writer had the good fortune to become a member of the Car-

negie Institution's archeological expedition to Central America under the able direction of Sylvanus G. Morley. The work of exploring and studying in detail the remarkable remains of the ancient Mayan culture was vigorously carried forward. An especial object of the expedition was the discovery of additional inscriptions embodying glyphic dates, for it is the dates, now read with facility, which furnish the skeleton of Maya history.

Among the ancient cities visited while the writer was associated with the expedition were Antigua, the ancient Spanish capital of the kingdom of Guatemala, built on the site of a prehistoric city; the extensive ruins of the ancient city of Iximache, near the site occupied to-day by the capital of Guatemala, Guatemala City; the ruined city of Quirigua in eastern Guatemala, the subject of much scientific interest during recent years; and the ruins of Copan, in Honduras, perhaps the most remarkable of all the American monuments of antiquity.

Especial attention was given by the writer to the collection of data and drawings to be utilized in preparing panoramic views of the several cities visited, and every effort was made to obtain information regarding the technical methods employed by the ancient builders. The quarries from which the stone was obtained were too deeply buried in tropical vegetation to yield up their story without extensive excavation and the methods employed in dressing and carving the stone remain in large part undetermined. Certain chipped and ground stone implements that could have served in dressing the stones used in building were found in numbers, but the story of the carving, especially of the very deep carving of the monuments of Copan, remains unrevealed. Although it is thought that stone tools may have been equal to the great task, it is believed by some that without bronze the work could not have been done. There are, however, no traces of the use of bronze by the Central Americans.

The monuments are on a grand scale and great skill and excellent taste are manifest in their embellishment, the whole giving evidence of a state of culture advancement unsurpassed in any other part of aboriginal America.

STUDY OF NOCTURNAL RADIATION.

Several grants from the Hodgkins fund have been made to Prof. Anders Ångström during the past few years to enable him to carry on researches on the radiation of the atmosphere, particularly nocturnal radiation. The results of observations made by him in Algeria in 1912 and in California in 1913 were embodied in a pamphlet published by the Institution in 1915. In this pamphlet he summarizes his work as follows:

The main results and conclusions that will be found in this paper are the following. They relate to the radiation emitted by the atmosphere to a radiating surface at a lower altitude, and to the loss of heat of a surface by radiation toward space and toward the atmosphere at higher altitudes.

I. The variations of the total temperature radiation of the atmosphere are at low altitudes (less than 4,500 m.) principally caused by variations in temperature and humidity.

II. The total radiation received from the atmosphere is very nearly proportional to the fourth power of the temperature at the place of observation.

III. The radiation is dependent on the humidity in such a way that an increase in the water-vapor content of the atmosphere will increase its radiation. The dependence of the radiation on the water content has been expressed by an exponential law.

IV. An increase in the water-vapor pressure will cause a decrease in the effective radiation from the earth to every point of the sky. The fractional decrease is much larger for large zenith angles than for small ones.

V. The total radiation which would be received from a perfectly dry atmosphere would be about $0.28\frac{\text{cal.}}{\text{cm.}^2\text{min.}}$ with a temperature of 20° C. at the place of observation.

VI. The radiation of the upper, dry atmosphere would be about 50 per cent of that of a black body at the temperature of the place of observation.

VII. There is no evidence of maxima or minima of atmospheric radiation during the night that can not be explained by the influence of temperature and humidity conditions.

VIII. There are indications that the radiation during the daytime is subject to the same laws that hold for the radiation during the nighttime.

IX. An increase in altitude causes a decrease or an increase in the value of the effective radiation of a blackened body toward the sky, dependent upon the value of the temperature gradient and of the humidity gradient of the atmosphere. At about 3,000 meters altitude of the radiating body the effective radiation generally has a maximum. An increase of the humidity or a decrease of the temperature gradient of the atmosphere tends to shift this maximum to higher altitudes.

X. The effect of clouds is very variable. Low and dense cloud banks cut down the outgoing effective radiation of a blackened surface to about 0.015 calorie per cm.^{2} per minute; in the case of high and thin clouds the radiation is reduced by only 10 to 20 per cent.

XI. The effect of haze upon the effective radiation to the sky is almost inappreciable when no clouds or real fog are formed. Observations in Algeria in 1912 and in California in 1913 show that the great atmospheric disturbance caused by the eruption of Mount Katmai in Alaska, in the former year, can only have reduced the nocturnal radiation by less than 3.0 per cent.

XII. Conclusions are drawn in regard to the radiation from large water surfaces, and the probability is indicated that this radiation is almost constant at different temperatures, and consequently in different latitudes also.

Another grant was made to Prof. Ångström in October, 1915, for a study of nocturnal radiation in the far north during the long Arctic night. Concerning this study he wrote to the Institution on February 16, 1916, as follows:

Through this grant I have been able to make observations on nocturnal radiation during the Arctic night in the north of Sweden, at a place named Abisko, at about 68° 30′ latitude. The observations were extended during about a month (Jan. 1–26) and were obtained under various atmospheric conditions. One night observations were taken at a temperature of —30° C. (—20° F.), when consequently the absolute humidity must have been very low. In general, these observations confirm the views expressed in my paper [1] in regard to the influence of temperature and humidity upon the nocturnal radiation and the radiation of the atmosphere.

In connection with the named measurements observations were also made on the cooling of snow surfaces under the temperature of the surrounding air as a consequence of nocturnal radiation. As was to be expected, a linear relation was found to exist between the radiation and the named temperature difference.

[1] Smithsonian Misc. Coll., Vol. 65, No. 3, 1915.

I hope in the near future to get an opportunity to extend these important observations on the connection existing between radiation and the cooling of various materials existing on the earth's surface. The question is one of scientific as well as of practical agricultural interest.

HARRIMAN TRUST FUND.

Dr. C. Hart Merriam, research associate of the Institution, aided by the income of a trust fund established for the purpose by Mrs. E. H. Harriman, has continued his zoological investigations, particularly the study of the big bears of North America.

RESEARCH CORPORATION.

The Research Corporation was established in 1912 under the New York State laws with the Secretary of the Smithsonian Institution as one of the directors and a member of the executive committee. The primary object of the organization was to develop certain patents described in previous reports which had been offered to the Institution by Dr. F. G. Cottrell but which could not be administered directly by the Institution. Other inventions and patents have since been acquired by the corporation, and through royalties from the installation and utilization of these patents a considerable fund has been created and the income therefrom will be devoted to the advancement of technical and scientific investigation and experimentation through the agency of the Smithsonian Institution and such other scientific and educational institutions and societies as may be selected by the directors.

The Cottrell patents relate to the precipitation of dust, smoke, and chemical fumes by the use of electrical currents. Successful commercial installations have already been made on the following fumes:

(*a*) Silver fumes from electrolytic slimes of copper refinery; (*b*) tin fumes from detinning process residues; (*c*) hydrochloric acid fumes from cleaning vats in electrogalvanizing plant; (*d*) tin and zinc fumes from waste metal recovery plant; (*e*) "low bleach" from electrolytic plant; (*f*) sulphuric acid mist from contact acid plant; (*g*) lead fumes from copper converters; (*h*) fumes from roasting of zinc ores; and (*i*) dust from buffing wheels and from machines for powdering slate.

NATIONAL RESEARCH COUNCIL.

At its annual meeting in Washington in April, 1916, the National Academy of Sciences voted unanimously to offer its services to the President of the United States in the interest of national preparedness, and it was suggested that the academy "might advantageously

organize the scientific resources of educational and research institutions in the interest of national security and welfare." The President accepted the offer and requested the academy to proceed with the organization. An organizing committee was accordingly appointed, and on June 19 the council of the academy, acting upon recommendations of that committee, voted—

That there be formed a National Research Council whose purpose shall be to bring into cooperation existing governmental, educational, industrial, and other research organizations with the object of encouraging the investigation of natural phenomena, the increased use of scientific research in the development of American industries, the employment of scientific methods in strengthening the national defense, and such other applications of science as will promote the national security and welfare.

That the council be composed of leading American investigators and engineers, representing the Army, Navy, Smithsonian Institution, and various scientific bureaus of the Government; educational institutions and research endowments; and the research divisions of industrial and manufacturing establishments.

After the close of the fiscal year the National Research Council was fully organized, the President of the United States appointing the representatives of the Government and authorizing the appointment of other members by the president of the National Academy of Sciences.

OFFICERS AND EXECUTIVE COMMITTEE.

Chairman, George E. Hale; vice chairmen, Charles D. Walcott and Gano Dunn; secretary, Cary T. Hutchinson; executive committee, John J. Carty (chairman), William H. Welch (ex officio), George E. Hale (ex officio), Edwin G. Conklin, Gano Dunn, Arthur A. Noyes, Raymond Pearl, Michael I. Pupin, S. W. Stratton, V. C. Vaughan (others to be appointed).

MEMBERS OF NATIONAL RESEARCH COUNCIL.

Dr. L. H. Baekeland, Yonkers, N. Y.
Dr. Marston T. Bogert, professor of organic chemistry, Columbia University.
Dr. John A. Brashear, Allegheny, Pa.
Dr. John J. Carty, chief engineer, American Telephone & Telegraph Co.
Dr. Russell H. Chittenden, director, Sheffield Scientific School, Yale University.
Dr. Edwin G. Conklin, professor of zoology, Princeton University.
Dr. John M. Coulter, professor of botany, University of Chicago.
Brigadier General William Crozier, Chief of Ordnance, U. S. Army.
Mr. Gano Dunn, president The J. G. White Engineering Corporation.
Dr. Simon Flexner, director, Rockefeller Medical Institute.
Major General William Crawford Gorgas, Surgeon General, U. S. Army.
Dr. W. F. M. Goss, dean of engineering, University of Illinois.
Dr. George E. Hale, director, Mount Wilson Solar Observatory.
Mr. Clemens Herschel, president American Society of Civil Engineers.
Prof. William H. Holmes, head curator of anthropology, United States National Museum.
Dr. W. W. Keen, president American Philosophical Society.
Mr. Van H. Manning, Director U. S. Bureau of Mines.
Prof. Charles F. Marvin, Chief United States Weather Bureau.

Prof. A. A. Michelson, director, Ryerson Physical Laboratory, University of Chicago.

Dr. Robert A. Millikan, professor of physics, University of Chicago.

Dr. Arthur A. Noyes, director, research laboratory of physical chemistry, Massachusetts Institute of Technology.

Dr. Raymond Pearl, director, Maine Agricultural Experiment Station.

Prof. E. C. Pickering, director, Harvard College Observatory.

Dr. Michael I. Pupin, professor of electro-mechanics, Columbia University.

Mr. Charles F. Rand, president United Engineering Society.

Prof. Theodore W. Richards, director of the Wolcott Gibbs Memorial Laboratory, Harvard University.

Mr. C. E. Skinner, director, research laboratory, Westinghouse Electric & Manufacturing Co.

Lieutenant Colonel George O. Squier, Chief of Aviation, U. S. Army.

Dr. S. W. Stratton, Director U. S. Bureau of Standards.

Mr. Ambrose Swasey, Cleveland, Ohio.

Rear Admiral David W. Taylor, Chief Constructor U. S. Navy.

Dr. Elihu Thomson, Swampscott, Mass.

Dr. C. R. Van Hise, president of the American Association for the Advancement of Science.

Dr. Victor Clarence Vaughan, director, medical research laboratory, University of Michigan.

Dr. Charles D. Walcott, Secretary of the Smithsonian Institution.

Dr. William H. Welch, president of the National Academy of Sciences.

Dr. W. R. Whitney, director of the research laboratory, General Electric Co.

The council will be gradually enlarged by the addition of new members who are to serve as chairmen of important committees or who are otherwise to engage in some special work.

To carry out the work of the council committees are being appointed, including (*a*) committee on rules and procedure; (*b*) committee on publication; (*c*) committee on research in educational institutions to consider general plans for the promotion of research in educational institutions and to arrange for local committees in each institution; (*d*) committee on promotion of industrial research with functions in the field somewhat similar to those of the preceding committee; (*e*) committee on a national census of research to prepare a national census of equipment for research, of the men engaged in it, and of lines of investigation pursued in cooperating Government bureaus, educational institutions, research foundations, and industrial research laboratories. It has also been decided to form joint committees in various branches of science in cooperation with the corresponding national scientific societies.

THE LANGLEY AERODYNAMICAL LABORATORY.

In view of the organization of the National Advisory Committee for Aeronautics, provided for by act of Congress approved March 3, 1915, it has appeared unnecessary at present to proceed further toward the permanent establishment of the proposed Langley labora-

tory. As secretary of the Smithsonian Institution, I was appointed a member of the National Advisory Committee and elected chairman of its executive committee, and in this connection I have been able to cooperate toward the solution of many important problems pertaining to the science and art of aviation. One of the chief advantages already being realized by the establishment of the advisory committee is a closer cooperation between the Army and Navy and other Federal departments and coordination of work in the general advancement of aviation. The Institution published during the year two pamphlets on aeronautics, one, a series of reports on wind tunnel experiments, and the other on "Dynamical stability of aeroplanes," both of them by J. C. Hunsaker and associates.

PUBLICATIONS.

The publications of the Institution proper include three series: Smithsonian Contributions to Knowledge; Smithsonian Miscellaneous Collections; and Smithsonian Annual Reports. Under the direction of the Institution there are also issued the Annual Reports, Proceedings, and Bulletins of the United States National Museum, including the Contributions from the National Herbarium; Annual Reports and Bulletins of the Bureau of American Ethnology; and the Annals of the Astrophysical Observatory. All of these series except the "Contributions" and "Collections" are printed through annual Congressional allotments. In all of these series there was published during the year a total of 8,498 pages and 623 plates of illustrations.

Smithsonian Contributions to Knowledge.—This series is intended to show results of original research constituting important contributions to knowledge. One memoir of the series was in press at the close of the year giving the results of an extended study on the comparative histology of the femur.

Smithsonian Miscellaneous Collections.—Twenty-two papers, forming parts of five volumes of this series, were issued, among them three papers on Cambrian geology by your secretary. In this series the annual exploration pamphlet was issued, giving brief accounts of the explorations and field work of the Institution in geology, biology, and anthropology, covering every continent on the globe, and illustrated by 141 photographs taken in the field by the scientists themselves. The Smithsonian Physical Tables, which together with the Mathematical and Geographical Tables have become standard works of reference in educational and research institutions, are published in this series. The sixth revised edition of the Physical Tables, issued during the preceding year, was quickly exhausted, making it necessary to print additional copies. Still another edition is now in press, indicating the constant demand for this work.

Smithsonian report.—The complete volume of the 1914 report was received from the printer and distributed at the beginning of the year. Material for the 1915 report was sent to press in December, and was completed just before the fiscal year closed. In the general appendix are 22 papers showing recent progress in various branches of science, including "The utilization of solar energy," "Evidences of primitive life," by your secretary, "Heredity," "Linguistic areas in Europe," and "Recent developments in telephony and telegraphy." The custom of printing special editions in pamphlet form of papers in the general appendix has proved of great advantage; in several cases there has been a demand for a very large number of copies, which was especially noticeable in connection with an article on "The value of birds to man" in the 1913 report.

Special publications.—Opinion 67 of the Opinions of the International Commission on Zoological Nomenclature was issued as a special publication. A special paper by Chester G. Gilbert of the National Museum, on "Sources of nitrogen compounds in the United States" attracted considerable attention. Among other conclusions, he states:

> The evolution of a practicable process for the oxidation of by-product ammonia to render present resources available, with the development of an atmospheric nitrogen fixation output by the Cyanamide process carefully timed to meet growing demands following a reduction in the retail price of nitrogenous fertilizer, would appear to be the desirable governmental procedure as being the one least liable to disastrous consequences.

National Museum publications.—The National Museum issued an annual report, 2 volumes of the proceedings, 52 separate papers forming parts of these and other volumes, and 4 bulletins.

Bureau of Ethnology publications.—The Bureau of American Ethnology published 2 annual reports, separates of 4 accompanying papers in these reports, and 2 bulletins.

Reports of historical and patriotic societies.—The annual reports of the American Historical Association and the National Society of the Daughters of the American Revolution were submitted to the Institution and communicated to Congress in accordance with the charters of these organizations.

Allotments for printing.—Most of the allotment to the Institution and its branches for printing was used during the year, though it was impracticable to complete a large amount of material in press at the close of the year in the National Museum and Bureau of American Ethnology series.

The allotments for the year ending June 30, 1917, are as follows:

For the Smithsonian Institution: For printing and binding the annual reports of the Board of Regents, with general appendices, the editions of which shall not exceed 10,000 copies $10,000

For the annual reports of the National Museum, with general appendices, and for printing labels and blanks, and for the Bulletins and Proceedings of the National Museum, the editions of which shall not exceed 4,000 copies, and binding, in half morocco or material not more expensive, scientific books, and pamphlets presented to or acquired by the National Museum library	$37,500
For the annual reports and Bulletins of the Bureau of American Ethnology and for miscellaneous printing and binding for the bureau	21,000
For miscellaneous printing and binding:	
International Exchanges	200
International Catalogue of Scientific Literature	100
National Zoological Park	200
Astrophysical Observatory	200
For the annual report of the American Historical Association	7,000
Total	76,200

Committee on printing and publication.—All manuscripts submitted for publication by the Institution or its branches have, as usual, been referred to the Smithsonian advisory committee on printing and publication. During the year 18 meetings were held and 96 manuscripts examined and passed upon. The personnel of the committee was as follows: Dr. Leonhard Stejneger, head curator of biology, National Museum, acting chairman; Dr. C. G. Abbot, director of the Astrophysical Observatory; Dr. Frank Baker, superintendent of the National Zoological Park; Mr. A. Howard Clark, editor of the Smithsonian Institution, secretary of the committee; Mr. F. W. Hodge, ethnologist in charge of the Bureau of American ethnology; and Dr. George P. Merrill, head curator of geology, United States National Museum.

LIBRARY.

The accumulation of a scientific library has always been an important phase of the Institution's work in the "increase and diffusion of knowledge," and the collection has increased in size from year to year until at present it numbers well over half a million titles. The accessions of the year aggregated about 13,000 books and pamphlets.

The main Smithsonian library is assembled in the Library of Congress and is known as the Smithsonian deposit. In addition the Institution maintains the Smithsonian office library, the National Museum library, the library of the Bureau of American Ethnology, the Astrophysical Observatory library, and the National Zoological Park library, besides some 35 specialized sectional libraries maintained in various offices for the use of the scientific staff of the Institution and its branches. The Smithsonian office library contains a collection of books relating to art, the employees' library, and an extensive aeronautical library. This collection of aeronautical works has been notably increased by additional gifts from Dr. Alexander

Graham Bell, consisting of 33 books and 37 portfolios of periodicals, and by a number of reference works from the library of Major Baden-Powell.

The National Museum library received 4,840 accessions, among them 207 titles contributed by Dr. William Healey Dall to his collection of works relating to mollusks; and the scientific library of Dr. Theodore Nicholas Gill, numbering about 3,000 volumes, presented to the Institution by his brother, Mr. Herbert A. Gill, which is a valuable addition to the natural history series, especially in ichthyology.

INTERNATIONAL CONGRESSES AND EXPOSITIONS.

SECOND PAN AMERICAN SCIENTIFIC CONGRESS.

The Second Pan American Scientific Congress, which held its sessions in Washington from December 27, 1915, to January 8, 1916, was the fifth of a series of scientific congresses, the first three of which included only the Latin American countries. At the first strictly Pan American Congress, held in Peru in 1908, in which the United States was invited to participate, it was unanimously voted to hold the next meeting in Washington. The congress held its inaugural session at 10 a. m., December 27, at Memorial Continental Hall, and business sessions and social affairs were arranged for every day thereafter until January 8. The following are the sections into which the congress was divided:

I. Anthropology.
II. Astronomy, Meteorology, and Seismology.
III. Conservation of Natural Resources, Agriculture, Irrigation, and Forestry.
IV. Education.
V. Engineering.
VI. International Law, Public Law, and Jurisprudence.
VII. Mining and Metallurgy, Economic Geology, and Applied Chemistry.
VIII. Public Health and Medical Science.
IX. Transportation, Commerce, Finance, and Taxation.

At the meetings of these sections a great number of papers of scientific and economic importance were read.

The Institution proper was represented in the congress by your secretary and Prof. W. H. Holmes, head curator of anthropology, United States National Museum, as delegates. Of the branches of the Institution, the Bureau of American Ethnology was represented by the ethnologist in charge, Mr. F. W. Hodge, and Dr. J. W. Fewkes, delegates; and the Astrophysical Observatory by Dr. C. G. Abbot, delegate, and Mr. F. E. Fowle, alternate. A reception was held for the Latin American delegates by the Board of Regents and the Secretary of the Institution in the new building of the National Museum on the evening of December 29.

This highly successful and important congress was attended by approximately 100 official delegates from the 21 American Republics, and 60 by special invitation, or representing societies or universities. The United States was represented by approximately 1,000 unofficial delegates or members.

NINETEENTH INTERNATIONAL CONGRESS OF AMERICANISTS.

The Nineteenth International Congress of Americanists, which was to have been held at Washington on the invitation of the Smithsonian Institution in October, 1914, was postponed on account of the war in Europe until a more favorable time for an international gathering. When it became evident that a fully attended meeting would be out of the question in the near future, it was decided to hold the congress in affiliation with the section of anthropology of the Second Pan American Scientific Congress and jointly with the American Anthropological Association, the American Folk-Lore Society, the American Historical Association, and the Archaeological Institute of America. In consequence the date of the meeting was definitely fixed for December 27–31, 1915.

Mr. John W. Foster, ex-Secretary of State, former minister to Mexico and Russia, ex-president of the Washington Society of the Archaeological Institute, etc., served as president of the congress. The honorary presidents were the Secretary of the Smithsonian Institution; Mr. Clarence B. Moore, of Philadelphia; and Prof. William H. Holmes, of the National Museum. Mr. Clarence F. Norment, of Washington, served as treasurer, and Dr. Aleš Hrdlička, of the National Museum, as secretary of the Congress. There was a long list of honorary vice presidents, a general (honorary) committee, associate foreign secretaries, and an organizing committee (with the Secretary of the Smithsonian Institution as chairman).

Official representatives of foreign Governments were in attendance from Austria, Chile, Cuba, Germany, Great Britain, Greece, Guatemala, Nicaragua, Peru, Russia, Sweden, and Uruguay, and about 100 official delegates from various learned societies and universities in the United States and foreign countries.

The headquarters of the congress were at the National Museum, and most of the sessions were held there.

Nearly 100 papers relating to the study of somatology, archeology, ethnology, folklore, history, and linguistics were read at the sessions of the congress, among them papers by several members of the staff of the Bureau of American Ethnology and of the National Museum.

PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

Only a very small allotment was allowed the Smithsonian Institution and its branches from the congressional appropriation for Government exhibits at San Francisco in 1915. It was possible, however, to make a small display showing in a general way the scope and activities of the Institution, and an ethnological exhibit illustrating the characteristics and culture status of typical primitive peoples. The exhibits were located in the Liberal Arts Palace, covering a floor space of about 6,000 square feet.

The exhibit of the Institution proper consisted of a series of photographs of its founder, James Smithson, the four secretaries, pictures of the building and departments, and a complete set of its publications. There was also displayed an exact reproduction of the Langley experimental steam flying machine which performed the epoch-making flights over the Potomac River, May 6, 1896, together with photographs taken at the time. Langley's success as a pioneer in aviation was commemorated on the Column of Progress at the exposition (pl. 1) by a tablet with the following inscription:

> To commemorate science's gift of aviation to the world through Samuel Pierpont Langley, an American.

The principal exhibit by the National Museum dealt with ethnology, or the scientific study of the races of men, their origin, distribution, relations, and culture. It included four family lay-figure groups, the Eskimo of Alaska, the Dyak of the East Indies, the Zulu-Kaffir of South Africa, and the Carib of South America; also village groups in miniature illustrating the houses and house life of various peoples, together with cases of specimens relating to the primitive arts and industries.

The remaining departments or branches of the Institution, including the International Exchange Service, the Bureau of American Ethnology, the Astrophysical Observatory, the Zoological Park, the Hodgkins fund, the Aerodynamical Laboratory, and the Regional Bureau of the International Catalogue of Scientific Literature, were represented by charts, photographs, maps, instruments, and publications illustrative of their various functions.

Mr. W. de C. Ravenel, administrative assistant of the United States National Museum and secretary to the exposition board, acted as the representative of the Smithsonian Institution and its branches, with the assistance of Dr. Walter Hough, curator of ethnology, United States National Museum.

The exhibits were enumerated in detail in a descriptive catalogue of 120 pages.

LANGLEY TABLET ON COLUMN OF PROGRESS AT PANAMA-PACIFIC INTERNATIONAL EXPOSITION, SAN FRANCISCO, CAL., 1915.

The family groups illustrated the most effective museum method of presenting ethnological material. The catalogue describes the groups as follows:

The Eskimo family group comprises seven life-size figures clad in the native costumes and colored according to life, engaged in the usual summer vocations and amusements. At the left a woman is cooking meat in a primitive pottery vessel, and another woman is putting dried fish in the storehouse. In the background a man with a sinew-backed bow is watching a youth practicing with his sling. On the right another man is seated on the ground carving a wooden dish with a curved knife, and two little girls are playing with their native toys. The structure in the back of the case is a representation of the storehouse commonly used by the western Eskimo. The dwelling groups show the houses to be dome-shaped, made of earth piled over a cobwork of timbers erected in an excavation in the ground. In the summer a passageway gives entrance, but in the winter a tunnel is built. A bench on which the people sleep runs around the wall on the inside of the house. The cooking within the dwelling is done in a pottery vessel suspended over a lamp.

The group representing the Zulu-Kaffir and Bantu tribes, which live in the semiarid southern extremity of the African continent, depicts the natives as physically strong and energetic and not so dark as the true negro. This race is superior in military and social organizations and compares favorably in the arts and industries with other African families. The group shows a section of a house with a doorway, a fireplace on which a woman is cooking mush, a woman dipping beer from a large pottery jar, a woman from the field with a hoe, a water carrier with a jar on her head, a man playing a marimba or xylophone, and a boy driving a goat. The natives are represented as they existed some years ago, before they were affected by contact with the white man. Other cases include models of the native African dwellings and examples of the handiwork of these people, an interesting feature of which is the primitive ironwork in which many African tribes were highly skilled.

The next group takes the exposition visitor from Africa across the Atlantic to northern South America, where dwells the Carib in the forested tropical interior of British Guiana. Some of the tribes of this great race have only recently been visited by white men. Here is to be seen a Carib warrior with his blowgun, a woman and a child squeezing cassava in a primitive lever press, another woman decorating a tree gourd with characteristic interlocking designs, and a child playing with a pet parrot. A hammock swung between two house posts represents the form of bed in general use in ancient as well as modern Latin America. Among the articles manufactured by these natives examples of ceremonial objects and articles of personal adornment are exhibited, including headdresses, earrings, belts, arm bands, necklaces, and capes.

A fourth family group represents the Dyaks of the island of Borneo. They are expert house and boat builders and skilled in the use of the blowgun. Rice, sago, tropical fruits, monkeys, wild pigs, and other game, yield them subsistence. The men are warlike, and are still, to some extent, head-hunters, their weapons being spears, short swords, and blowguns with poison-tipped darts. The Dyak family group is represented on the porch of a communal house, carrying on various occupations. A woman is pounding rice in a wooden mortar, while another is represented as bringing in a basket of rice on her back, a third is making a basket, a man armed with a bayoneted blowgun is approaching with a freshly killed monkey, and two children are shown playing cat's cradle, a popular native game.

The museum exhibits also included a series of objects illustrating the development of six kinds of implements and appliances of the arts—apparatus for fire making, the jackknife, the saw, the spindle, the shuttle, and the ax. Pictures of other exhibits in biology, geology, and anthropology in the National Museum were shown by a "stereomotorgraph" machine.

The Smithsonian Institution was awarded a grand prize, under the head of scientific investigation, for the collective exhibit by the Institution proper, the Bureau of American Ethnology, the Museum, the Astrophysical Observatory, and the Bureau of International Catalogue of Scientific Literature; a grand prize for the balloon pyrheliometer designed and exhibited by the Astrophysical Observatory; a gold medal for the "Group of elk" shown by the Museum; and a silver medal for investigations for the betterment of social and economic conditions. The balloon pyrheliometer, as its name implies, is an instrument for measuring the heat of the sun. It is carried aloft by a pair of rubber balloons until one of them bursts, when it gradually descends to the earth, supported by the other. Records have thus been obtained at heights of over 9 miles.

PANAMA-CALIFORNIA EXPOSITION AT SAN DIEGO.

Although no appropriation was made by Congress for exhibits at San Diego in 1915, it was possible for the Institution, through cooperation with the exposition authorities, to arrange an interesting exhibit of physical anthropology and one illustrating American aboriginal industries. These exhibits were described in my report of last year.

At the close of the San Francisco Exposition a number of the Smithsonian exhibits were transferred to San Diego, this fair having been extended over another year. These exhibits were located in the Science of Man Building, and included four large cases containing the family groups of natives from different quarters of the globe, as described above, and some cases containing specimens of their arts and industries, together with several small family dwelling groups.

NATIONAL MUSEUM.

The report of Assistant Secretary Rathbun, appended hereto, reviews in detail the operations of the National Museum. The total number of new specimens acquired was 243,733; about one-half pertained to the department of zoology, about one-third were botanical and paleontological, and the rest were additions to the anthropological and other collections. Among the ethnological additions of special interest may be noted a series of costumes, weapons, and utensils from British Guiana; many objects from Celebes,

Borneo, and the Philippines; and a large collection from aboriginal mounds and ruin sites in Utah. To the division of American history the additions included china and glassware and other objects once the property of General and Martha Washington. The memorials of Gen. Sherman, which had long been in the custody of the Museum, have now been presented by his son, Hon. P. Tecumseh Sherman, and the Cromwell collection of 20,000 domestic and foreign postage stamps, deposited some years ago, became the absolute property of the Museum on the death of Mr. Cromwell in September, 1915.

To the interesting collection of historical costumes there have been added costumed figures representing four hostesses of the White House, Mrs. James Monroe, Mrs. John Quincy Adams, Mrs. Abraham Lincoln, and Mrs. James R. McKee.

By the will of Dr. Shepard there was bequeathed an important collection of meteorites which had been in the possession of the Museum for a number of years.

In the department of biology the additions were representative of many parts of the world, including mammals, birds, and reptiles from Celebes and Borneo, collected through the long-continued generosity of Dr. W. L. Abbott; and like collections from Siam, Kashmir, northern China, and Manchuria. Part of the results of the Smithsonian biological survey of the Panama Canal Zone was a collection of about 18,000 fishes. The Carnegie Institution of Washington deposited some 8,000 botanical specimens gathered by Dr. J. N. Rose in Brazil and Argentina.

Mr. Rathbun enumerates many other interesting objects recently received, particularly those pertaining to the industrial arts, a department which has been very greatly developed since the removal of the natural history exhibits to the new building, yet the proper installation of series illustrating the many branches of the arts and industries is already seriously hindered through lack of space. It is in this department in particular that the Museum manifests one of its principal functions. The exhibits are so selected and so installed as to teach visitors how things are made and what they are made of, and not so much who makes the best articles or how they should be packed to meet the demands of trade. And yet while these collections first of all educate the public they also teach the manufacturer and therefore are of decided economic importance. One of the leading New England manufacturers not long since, while examining the exhibits in his own industrial line, remarked, "this helps business."

I can not too strongly urge the need of still greater advancement in this department of Smithsonian activities. The time is fast ap-

proaching when there should be constructed in the Smithsonian reservation another new building, a Museum of Industrial Arts. The collections are here and in many respects they surpass similar collections in Europe or elsewhere. The splendid new building in which the natural history collections are now so adequately housed has offered opportunity for the development of that department beyond the highest expectations. Like progress could be made with a Museum of Industrial Arts. European countries have such structures, one is needed here in Washington. It is an economic question. Commercial museums have their place for developing trade and commerce, and are of much value for such purpose, but the development of the artistic taste of the public through an educational Museum of Industrial Arts is of even greater importance. It would stimulate inventive skill and advance every art and every industry. The exhibits illustrating textile industry and mineral technology in particular are very complete, consisting of specimens of raw materials, machinery used in manufacture, and the finished products.

To the National Gallery of Art there has been added a collection of 82 drawings in pencil, pen, etc., by contemporary French artists, a gift from citizens of France to the people of the United States; also an oil painting of Abraham Lincoln, by Story, the gift of Mrs. E. H. Harriman. The paintings in the National Gallery collection are of much popular interest and of great artistic and intrinsic value, but they are crowded in temporary quarters in a building designed for purposes other than a gallery of art.

During the last year Mr. Freer made 535 additions to his collection, including 23 paintings and sculptures by American artists, and over 500 oriental objects consisting of paintings, pottery, bronzes, and jades. The entire collection now aggregates about 5,346 items.

The auditorium in the new building has been the meeting place of a number of scientific bodies and of international congresses; and in the foyer opportunity was offered for several special exhibitions.

In cooperating with schools and colleges there were distributed some 7,000 duplicate specimens of minerals, fossils, mollusks, and other objects, classified and labeled for teaching purposes.

The number of visitors to the new building averaged 1,012 on week days and 1,240 on Sundays.

BUREAU OF AMERICAN ETHNOLOGY.

The Bureau of American Ethnology is under the direct charge of Mr. F. W. Hodge, whose detailed report is appended hereto. The operations of the bureau include field work and special researches pertaining to the American Indians and the natives of Hawaii.

With the cooperation of the Museum of the American Indian, Heye Foundation, the Nacoochee mound in Georgia was excavated and

proved to have been used both for domicile and for burial purposes. In the mound were found a large number of smoking pipes and a great amount of broken pottery. In New Mexico, also in cooperation with the Museum of the American Indian, plans were made for excavating the historic pueblo of Hawikuh in the Zuñi Valley southwest of Zuñi pueblo. Among the most interesting field operations during the year were those by Dr. Fewkes in the Mesa Verde National Park, Colo., where he unearthed a type of structure architecturally different from any hitherto found in the Southwest. The excavation was carried on under the joint auspices of the bureau and the Department of the Interior, and the building, which Dr. Fewkes has named the Sun Temple, is described in a pamphlet published by that department. The Sun Temple is a large D-shaped structure, the longest wall of which measures 131 feet 7 inches. The walls are 2 to 5 feet in thickness and show structural qualities that compare favorably with any building of this type north of Mexico. Dr. Fewkes is of the opinion that though the building was used primarily as a place of worship, it was intended also for a place of refuge in case of attack.

In the Northwest, investigations were continued by Dr. Frachtenberg on the languages, history, and traditions of the various Indian tribes of Oregon and Washington. In connection with this work it is interesting to note that in revising some manuscript material Dr. Frachtenberg secured the assistance of the last surviving member of the Atfalati tribe of the Kalapuya Indians.

A number of special researches have been in progress during the year, among them research work by Dr. Franz Boas in connection with the completion of part 2 of the Handbook of American Indian Languages. Through the liberality of Mr. Homer E. Sargent, of Chicago, work has been well advanced on an extended study of the Salish dialects, as well as on a study of Salish basketry, which it is intended to describe in an illustrated memoir. Part 1 of the Handbook of American Antiquities by Prof. W. H. Holmes was in type at the close of the year, and the preparation of part 2 was well under way.

The study of Indian music by Miss Frances Densmore, which has attracted considerable attention among musicians, has been continued during the year, chiefly among the Mandan and Hidatsa Indians in North Dakota. A number of ceremonial and war songs were recorded phonographically and a new phase of the work was undertaken, consisting of testing the pitch discrimination of the Indians by means of tuning forks. There was in press at the close of the year a bulletin by Miss Densmore entitled "Teton Sioux music."

The publications of the bureau issued during the year comprise two annual reports with their accompanying papers, and two bulletins. In press or in preparation at the close of the year were three annual reports and five bulletins. The bureau library was enriched by the addition of 1,078 volumes, among them 20 volumes of Bibles and portions of the Bible in American Indian languages.

INTERNATIONAL EXCHANGES.

The total number of packages of governmental and other documents handled by the International Exchange Service during the year was 301,625, an increase of 25,869 over the previous year. This figure, however, still shows a decrease as compared with the total handled in 1914, owing to the suspension of shipments to 10 countries involved in the European war. Efforts have been made to resume shipments to certain of these countries, which have met with some degree of success in the case of Germany and Russia.

The Exchange Service has continued its policy of international helpfulness by assisting governmental and scientific establishments to procure publications especially desired both in this country and abroad. One instance showing the value of this policy may be cited. The Pan American division of the American Association for International Conciliation, of New York, wished to assemble a collection of several thousand volumes of North American origin for presentation to the Museo Social Argentino at Buenos Aires. Through the Exchange Service the matter was brought to the attention of the proper establishments and several hundred governmental and other publications were received for the proposed collection.

The number of sets of United States governmental documents sent through the Exchange Service to foreign countries has been reduced from 92 to 91, owing to the discontinuance of shipments to the government of Bombay at the request of that government.

NATIONAL ZOOLOGICAL PARK.

The National Zoological Park is becoming each year a greater and greater attraction to the public, and as its collections increase so does its value become of more importance as a source of information to the zoologist in his study of animal life.

There is now in the park a total of 1,383 individual animals, representing 360 species, as shown by the detailed census in the report of the superintendent.

Among the recent accessions may be mentioned a pair of young lions, a pair of Siberian tigers, a great red kangaroo, several monkeys, and a number of interesting birds, but the newly acquired ani-

mal that seems most popular is a male chimpanzee, about 4½ years old, from the forests of French Congo.

The number of visitors during the past year was 1,157,110, as compared with 794,530 in the year preceding. This included 161 schools, classes, etc., numbering 8,679 individuals.

Recent improvements include the construction of a hospital and laboratory building and the grading of some ridges and gullies to secure additional building sites and paddocks for the deer and other large animals.

As mentioned in previous reports an appropriation was made in 1913 for the purchase of several acres as an extension to the western boundary of the park, but legal proceedings and complications incident to adjustment of values and benefit assessments caused such delay that the appropriation, not being a continuing one, lapsed on June 30, 1915, and Congress has failed to renew the allotment for this much desired improvement.

Many important needs are urged by the superintendent, some of which I have mentioned year after year. One of these is an aviary building for the birds now being housed in temporary quarters greatly deleterious to their health. Other needs are a building for the elephants, hippopotami, and similar animals; an ape house; a reptile house; a pheasantry; an ostrich house; an aquarium; and an insectary; also a gatehouse and a permanent boundary fence.

THE ASTROPHYSICAL OBSERVATORY.

Observations of the solar constant were continued at Mount Wilson, Cal., from July to October, 1915, and were begun again in 1916.

During the year there was published the results of solar-constant observations made under Prof. Pickering's direction at Arequipa, Peru, since August, 1912, with a silver-disk pyrheliometer lent by the Smithsonian Institution. These observations confirm the variations of the sun observed at Mount Wilson. An interesting feature of the Arequipa observations was the fact that the volcanic eruption of Mount Katmai in 1912, which produced a great deal of dust over the northern hemisphere, apparently had no effect on the atmosphere south of the equator.

The results of observations at Mount Wilson in 1913 and 1914 on the distribution of radiation along the diameter of the sun's disk were published during the year. It is thus shown that the average distribution over the disk varies from year to year as well as from day to day.

Observations have been continued on the transmission of rays of great wave length through long columns of air, which it is expected will be of much interest in studying the earth's temperature as dependent on radiation toward space.

After several years of experimenting the Astrophysical Observatory has constructed an instrument called the pyranometer, designed for measuring the intensity of sky light by day and of radiation outward toward the sky by night. A full account of this instrument has been published in pamphlet form. The pyranometer may prove of advantage in botanical investigations in forests and greenhouses, since it can measure radiation in deep shade as well as in the full sun.

The Institution has made an allotment from the Hodgkins fund for carrying on solar-constant work at some suitable place in South America. Throughout the year, for several years, it is intended to continue observations at Mount Wilson in California and at the South American station with a view to determine the dependence of the earth's climatic conditions on the sun's variation of radiation. In addition to his solar-constant work the director of the observatory has given considerable attention to experiments at Mount Wilson with solar cooking apparatus "comprising ovens heated by oil under gravity circulation maintained by heat collected by a concave cylindric mirror of about 100 square feet surface." These experiments were not concluded at the close of the year.

INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

The International Catalogue of Scientific Literature, the United States bureau of which is administered by the Smithsonian Institution, was organized in 1901, and since that date 17 volumes of references to scientific literature, one for each of 17 branches of science, have been published each year. During the past year 24,160 classified references to American scientific literature were prepared by the United States bureau, bringing the total number of references to the literature of this country since the inception of the catalogue up to 369,509.

As stated in last year's report, the war in Europe caused considerable financial embarrassment to the publication of the catalogue owing to the impossibility of collecting subscriptions from several of the countries involved. The generosity of the Royal Society of London in making up this loss of income made possible the publication of the thirteenth annual issue, and this year a request was made for assistance from the United States. Your secretary succeeded in interesting the Carnegie Corporation, of New York, in the project and through the generous assistance of that establishment it was made possible to publish the fourteenth annual issue.

The value to science of this catalogue is universally recognized, and it is the opinion of scientists everywhere that any lapse in its publication would be a real calamity, as shown by the action of the Inter-

national Council of the Catalogue in voting to extend the work to at least 1920.

NECROLOGY.

James Burrill Angell, doctor of laws, died April 1, 1916. He had been a regent of the Institution for a quarter of a century, from January 19, 1887, to January 15, 1912, when he resigned on account of age and inability longer to attend meetings of the board. He was born at Scituate, R. I., January 7, 1829, and through his long life as a journalist, an educator, and a diplomat he served his country faithfully in many positions of honor and trust.

He began his career as a professor of modern languages at Brown University, was a journalist during the period of the Civil War, president of the University of Vermont 1866–1871, president of the University of Michigan 1871–1909, United States minister to China 1880–1882, and minister to Turkey 1897–98, and served on several important treaty commissions. In accepting his resignation as a regent in 1912 the board recorded its appreciation of his long and faithful service to the Smithsonian Institution.

Respectfully submitted.

CHARLES D. WALCOTT, *Secretary.*

Appendix 1.

REPORT ON THE UNITED STATES NATIONAL MUSEUM.

Sir: I have the honor to submit the following report on the operations of the United States National Museum for the fiscal year ending June 30, 1916:

INTRODUCTORY.

Seventy years ago Congress first definitely recognized the national collections and directed their segregation and preservation under the custody and supervision of the Smithsonian Institution in the building to be erected for that establishment. By 1850 arrangements had been sufficiently perfected to justify the appointment of an assistant in charge of museum matters and to begin the acquisition of natural-history specimens, but it was not until 1858 that the extensive collections which had previously accumulated at the Patent Office could be accepted. With an influx of material relatively as phenomenal as in more recent years, the Museum rapidly spread beyond the boundaries originally assigned to it and by 1875 was practically in possession of all parts of the Smithsonian building not required for the offices of the parent institution. But even so, there was a condition of great congestion from which relief was only obtained in 1881, the year of the completion of the second building. Though specially designed for displaying the many important donations in numerous branches of the industrial arts from the Centennial Exhibition of 1876, the latter had also to serve for the overflow in natural history, a combination which fully taxed its capacity in less than three years. Then followed nearly three decades during which about as much material was assembled in outside storage as found lodgement within the two structures.

The problem as regards the departments of natural history was solved when the new large granite building was made ready for occupancy in 1911, except that it lacked accommodations for the division of plants, or National Herbarium. As the depository for the Department of Agriculture and other establishments conducting extensive botanical explorations, this branch of the Museum has about outgrown its provisional quarters in the Smithsonian building, and its future requirements should not long go unheeded.

The most serious phase of the situation now confronting the Museum, however, results from the wholly inadequate facilities for systematically developing the collections illustrative of the industrial arts. Comprehended under the fundamental act, partly organized in 1880, greatly enriched from the Philadelphia exhibition of 1876, and with a steady growth through all subsequent years, this important department, whose principal aim is popular education on technical lines by means of exhibits visualizing conditions and processes as well as products, is filling to such an extent every foot of available space that the halls present rather the appearance of gross storage than of orderly and classified arrangement. Public sentiment, expressed through many channels, demands better progress than heretofore in carrying out the purposes of this department, but the difficulties in the way are by no means confined to limitations of space, since the more immediate embarrassments arise from an insufficiency of funds for employing the necessary skilled assistants required for working up and preparing the exhibits, which includes the construction of many models.

The department of the fine arts is even more poorly provided for than any of the other Museum branches, as it is occupying borrowed space which is already so crowded as seemingly to forbid further contributions, and while this condition lasts there can be little hope for advancement. There is, however, one bright feature to mention in this connection—the decision to immediately begin the erection of the building for the Charles L. Freer collections of American and oriental art, the plans showing a beautiful granite structure, the completion of which will bring to the Institution much the largest donation it has ever had, one of the most notable gifts of its character in the world's history. Put to no expense for either building or collections, it is hoped that the example set by Mr. Freer will lead to more liberal consideration on the part of the Government of the needs of the National Gallery of Art, for which no appropriations of any kind have ever yet been made.

During the past year many valuable additions were made to the collections generally, new and instructive features were incorporated in the exhibition halls, and a wider public interest was stimulated through an exceptional number of meetings and of special expositions of scientific and art objects held at frequent intervals in the convenient quarters provided for such purposes.

COLLECTIONS.

The total number of specimens acquired during the year was approximately 243,733. Received in 1,525 separate accessions, they were classified and assigned as follows: Department of anthropology, 29,493; zoology, 120,303; botany, 40,631; geology and mineralogy,

1,700; paleontology, 48,403; textiles, woods, and other animal and vegetable products, 2,304; mineral technology, 280; and the National Gallery of Art, 619. As loans for exhibition, 1,960 articles were also obtained, mainly for the Gallery of Art and the divisions of history and ethnology. Material for examination and report, consisting chiefly of rocks, ores, fossils, and recent animals and plants, was received to the extent of 1,036 lots.

Anthropology.—One of the most desirable ethnological additions was a series of costumes, weapons, and utensils—excellent illustrations of the arts and industries of recently discovered tribes in the interior of British Guiana, collected by Mr. John Ogilvie. The aborigines of Celebes and Borneo were represented by many important objects assembled by Mr. H. C. Raven and presented by Dr. W. L. Abbott; and those of the Philippine Islands by extensive and varied contributions, including weapons, musical instruments, baskets, costumes, etc., received from Mrs. Caroline E. Bates, Mr. E. H. Hammond, and the following officers of the United States Army, namely, Maj. Edgar Russel, Maj. W. T. Johnston, and Capt. J. R. Harris. Baskets, ornaments, and other articles of various Indian tribes of North America, were also given by Mrs. Bates; a number of rare and valuable objects from the Osage Indians were deposited by the Bureau of American Ethnology; interesting examples of art and ethnologica from various parts of the world were presented by Miss Louise Salter Codwise; and costumes and implements from the Blackfeet Indians and the Greenland Eskimo were likewise obtained.

An extensive collection of archeological material from mounds and ruin sites in Utah, resulting from explorations by Mr. Neil M. Judd for the Bureau of Ethnology, is of particular value in aiding to determine the distribution of Pueblo culture toward the north. Other accessions from America consisted mainly of artifacts, including many rare specimens, from several of the States, and of woven fabrics and pottery from Peru. A gift of Old World antiquities from Miss Codwise was composed principally of Egyptian scarabs, necklaces, and figurines, and Palestinian amulets, while a collection of prehistoric stone implements from Great Britain contained some choice specimens.

The division of physical anthropology received many skeletons and skulls, in very complete condition, from Mr. Clarence B. Moore, who obtained them at "The Indian Knoll," on the Green River, Ky.; and a similar collection from Mr. George G. Heye, secured during an exploration of old burial sites in Georgia and Tennessee. Especially noteworthy was an excellent series of skulls and numerous other bones belonging to the period before the advent of the whites, procured in old burial caves in Hawaii by Mr. August Busck.

The more notable accessions in mechanical technology bore upon the subjects of the telephone and firearms. The American Telephone & Telegraph Co. contributed a set of instruments and of loading coils, with examples of line wire and glass insulators, used at the opening of the first telephone line between New York and San Francisco on January 25, 1915, and also a duplicate of the first instrument through which speech was transmitted electrically in Boston in 1875; while Dr. Alexander Graham Bell deposited his diplomas, certificates of award, and announcements of election to scientific societies, an interesting series of documents indicative of the many honors which have been conferred upon him. A gift from Mrs. Bates of much historical value included old military guns of European and American manufacture, pistols and revolvers, a gun made in the Philippine Islands, two very fine bronze swivel cannon, and several Toledo blades and other swords.

Mr. Hugo Worch added three old American pianos to his munificent donation of the previous year, and made a provisional deposit of four other instruments, three American and one of London make. The permanent acquisitions in ceramics consisted mainly of examples from some of the prominent potteries of the United States, but among the loans were specimens of porcelains from abroad and also of glassware, bronze, and brass, which are now exhibited in the ceramic gallery.

Among the accessions in graphic arts were experimental apparatus and pictures illustrating progress and the several steps in the electrical transmission of photographs from one place to another, as also the development of the engraving machine called the akrograph; a Wells printing press; examples of the art of overlay in printing; samples of poster stamps and lithographs; and a number of fourteenth and fifteenth century manuscripts. The additions in photography included daguerreotypes, ambrotypes, and tintypes; a sepia print of a painting on carved wood by Rosselimo; and a series of prints of astronomical subjects from the Yerkes Observatory.

American history.—The historical collections were increased to an exceptional extent by both gifts and deposits. Most prominent was a loan by Mr. Walter G. Peter, a descendant of Martha Washington, of many objects of artistic and domestic interest once the property of General and Mrs. Washington at Mount Vernon, which richly supplement the Lewis collection long in the possession of the Museum. Mention can here be made of only a few of the articles, among which were a china portrait plaque of Washington designed by Richard Champion; a water-color portrait of him by William Thornton; two gold lockets containing locks of his hair; a gold watch of Mrs. Washington, the cover engraved with the Washington coat of arms; a child's French dressing table of exquisite workman-

ship presented by Lafayette to the granddaughter of Mrs. Washington, Martha Custis, who became Mrs. Thomas Peter; letters written to Mrs. Washington on the death of her husband; documents relating to the settlement of her estate; and a number of fine examples of eighteenth century china and glassware.

It is pleasing to note that the valuable loan collection of memorials of Gen. William Tecumseh Sherman, United States Army, with some additions, was given into the permanent keeping of the Museum during the year by his son, Hon. P. Tecumseh Sherman. From the widow and children of Maj. Gen. Henry W. Lawton, United States Volunteers, there was acquired as a gift an extensive series of objects, including a medal of honor from Congress, forming a significant reminder of the distinguished career of this officer in the Civil War, several Indian wars, and the Philippines. Important relics of Capt. Edward Trenchard, United States Navy (1784–1824), and of his son, Rear Admiral Stephen Decatur Trenchard, United States Navy, including two presents awarded to the former by acts of Congress, were received on deposit. There were also many other gifts and loans of notable personal and period relics, and the national societies of the Colonial Dames of America and the Daughters of the American Revolution made interesting additions to their already extensive loan collections.

By the death of Mr. David W. Cromwell, of New York, on September 11, 1915, the splendid collection of nearly 20,000 domestic and foreign postage stamps, which he placed on permanent deposit in 1908, became the absolute property of the Museum. Among other additions in philately, including stamps, stamped envelopes, and post cards, were 1,565 new foreign and 269 new domestic issues, received from the Post Office Department.

The collection of historical costumes was enriched to the extent of 562 articles, nearly all of which were loans. To the series of costumed figures representing hostesses of the White House four were added, namely, Mrs. James Monroe, Mrs. John Quincy Adams, Mrs. Abraham Lincoln, and Mrs. James R. McKee.

Biology.—In the accessions of vertebrate animals the Asiatic region was especially well represented, and many genera and species new to the collection were obtained. The name of Dr. W. L. Abbott remains conspicuous in this connection through three contributions. The first, composed of material gathered under his direction and at his expense in Celebes and Borneo by Mr. H. C. Raven, consisted of 465 mammals, 869 birds, and a number of reptiles and batrachians. The second, presented jointly with Mr. C. B. Kloss, contained 197 mammals and 133 birds. besides reptiles and batrachians from Siam; while the third was a series of 183 mammals from Kashmir, British India. The Celebes and Siam specimens are especially important,

both as coming from localities not hitherto represented in the Museum and as supplementing the existing large collections from the related faunal regions of the Malay Peninsula, the Philippine Islands, and Borneo. From northern China and Manchuria was received a valuable series of mammals, birds, and reptiles, the results of further field work by Mr. Arthur de C. Sowerby. Obtained by Mr. Copley Amory, jr., during a collecting trip to the little-known Kolyma River region of northeastern Siberia and presented by him, were 365 mammals and 243 birds, besides a number of nests and eggs of the latter.

Additional mammals were received from Baluchistan through exchange with the McMahon Museum at Quetta and from East Africa as a gift from Mr. Elton Clark. The most important accessions of reptiles, batrachians, and fishes consisted of the specimens obtained in connection with the Smithsonian biological survey of the Canal Zone by Mr. S. F. Hildebrand, Prof. S. E. Meek, and Mr. E. A. Goldman, the number of fishes amounting to about 18,000. An extensive collection of Peruvian fishes made by Dr. R. E. Coker in 1907 and 1908 was presented by the Government of Peru, and another from South American localities was received from Indiana University in exchange. The Bureau of Fisheries deposited 1,242 specimens from *Albatross* explorations in the Pacific Ocean.

The receipts by the division of marine invertebrates were exceptionally extensive. Twenty-seven separate collections were transferred by the Bureau of Fisheries, a part of which had been worked up and described. They represented investigations by the steamer *Albatross* in the Pacific Ocean, by the steamers *Fish Hawk* and *Bache* and the schooner *Grampus* in the Atlantic Ocean and contiguous waters, and certain other inquiries. Of crustaceans there were about 15,000 specimens, of annelids about 1,000 specimens, of pteropod mollusks about 3,200 specimens, of starfishes nearly 150 types, and of fresh-water mollusks about 1,000 specimens from the Mississippi River, besides very many unassorted lots of crustaceans, salpa, pyrosoma, and other groups.

A very large number of miscellaneous invertebrates from the Danish West Indies and about 5,000 specimens of land and marine mollusks from the Florida Keys were deposited by the Carnegie Institution of Washington, while over 3,000 miscellaneous specimens from dredgings off the coast of Florida and about 7,000 land and fresh-water shells from Cuba were presented by Mr. John B. Henderson. An accumulation of samples of ocean bottom, filling nearly 11,000 bottles, obtained by vessels of the Coast and Geodetic Survey during hydrographic investigations in the Atlantic and Pacific Oceans and the Gulf of Mexico, were transferred to the custody of the Museum.

The principal accessions of insects consisted of Lepidoptera and Diptera deposited by the Bureau of Entomology, of named species of beetles and Hymenoptera from Australia, and of types of new species presented by Prof. T. D. A. Cockerell.

The division of plants received several large and important collections. The Department of Agriculture transferred over 6,600 specimens, of which a considerable proportion were grasses. Some 8,000 specimens, representing the field work of Dr. J. N. Rose in connection with his cactus investigations in Brazil and Argentina during the summer of 1915, were deposited by the Carnegie Institution of Washington; and about 2,000 specimens secured by the Peruvian expedition of 1914–15 were presented by the National Geographic Society and Yale University. Among other important accessions were specimens from the Philippines, Amboina, China, and Panama.

Geology.—During explorations in the Rocky Mountain region in the summer of 1915, Dr. Charles D. Walcott procured for the Museum in the Yellowstone National Park a large and well-selected series of the siliceous and calcareous sinters, including some masses of exceptional size, native sulphur, silicified wood, sundry mineral specimens, and an extensive representation of volcanic rocks, intended in part for an exhibition of the geological features of that park. Among other important acquisitions were illustrations of the geology and mineral associations of the pegmatite deposits of southern California, and of the emerald mines at Muzo, Colombia; a number of scheelite specimens of more than ordinary interest from Utah; and an unusually fine large specimen of secondary copper sulphate from the Silver Bow Mine, Mont. The Geological Survey transferred examples of the nitrate deposits in Idaho and Oregon, and of potash-bearing salts and associated rocks from the vicinity of Tonopah, Nev.; and Dr. Joseph P. Iddings presented some fine specimens of the peculiar problematic bodies known as obsidianites and Darwin glass from Borneo and Tasmania, and an important series of phosphate rocks from Ocean and Makatea Islands.

By the will of Dr. Charles Upham Shepard, who died early in July, 1915, the very important collection of meteorites belonging to him, which has been on deposit for a number of years, was bequeathed to the Museum; while from several other sources material representing 32 distinct falls of meteorites in many different parts of the world was also acquired.

The mineral collection received many additions, including exceptionally fine specimens, examples of recent finds and several rare species, the largest accession, a deposit from the Geological Survey, consisting of about 300 specimens mostly illustrative of a report by Dr. W. T. Schaller on the gem minerals of the pegmatites of California. From the same Survey was also transferred a large amount

of petrological material, mainly rocks illustrating the geology and ore deposits of several districts and localities, described in recent papers.

Of fossil invertebrates the Geological Survey made extensive contributions from the Tertiary of the Atlantic and Gulf coastal plain, the Cretaceous of New Mexico, and other formations and localities. Other important accessions were several thousand specimens of bryozoa and ostracoda from various parts of the world, a collection of Upper Cretaceous forms of special interest as containing types described long ago by Prof. T. A. Conrad, insects from the Florissant beds of Colorado, and types of new species of crabs.

Most prominent of the additions in vertebrate paleontology was a nearly complete skeleton of a large mastodon found near Winamac, Ind., which has already been mounted and placed in the exhibition hall. From the Koren expedition to the Kolyma River region of northeastern Siberia were received nearly 200 specimens, of which the most valuable is a fine skull of the Siberian mammoth, the only one of this northern form now in any American museum. Two collections of fossil plants, recently described, including the type and figured specimens, were transferred by the Geological Survey. One was from the San Juan Basin, N. Mex., the other from the Fox Hills formation, Colo.

Textiles.—In the division of textiles excellent progress was made in the acquisition and installation of new exhibits. Probably the most important was an extensive series of specimens, and of models, sections, and photographs of machinery from the American Thread Co., showing the manufacture of cotton thread in all its details. Other noteworthy accessions were two additional Jacquard machines for decorating textiles; further illustrations of the operation and work of the embroidery automats, of the manufacture of silk fabrics, and of the designing, weaving, and printing of silk upholstery and drapery materials; examples of Javanese batik work on cotton and silk, and of various patterns of moiré silks; a demonstration of the successive stages in the production of painted cut velvet, called "Yuzen Birodo" by the Japanese; and samples of silk skein-dyeing and silk piece-dyeing and printing.

The Japanese Commission to the Panama-Pacific International Exposition contributed 100 commercial fabrics, including many kinds not produced in this country. The representation of American upholstery and drapery fabrics and allied textiles of various materials and character of decoration was greatly increased and improved, and manufacturers continued to keep the collection supplied with novelties and new types and designs of dress fabrics as soon as they were brought out. Numerous excellent examples of the handicraft work done in the schools of the Philippine Islands were also obtained.

Wood technology.—In the recently organized section of wood technology there were many accessions of samples of important commercial woods and of illustrations of wood utilization, the public installation of which was about to be taken up at the close of the year. While the wood specimens, mostly in the form of large boards, were intended primarily for practical educational purposes, a large proportion had been determined botanically, insuring for them a proper technical designation.

The principal collection of wood samples, from the Philippine Islands, consisted of 110 pieces, representing 85 species, the duplicates showing different characteristics as to grain and figure. In addition there were 16 pieces and 15 species from Argentina; 32 specimens of various foreign woods highly prized for veneers and for cabinet and furniture work, including the several important varieties which are imported into this country under the trade name of mahogany; 38 specimens of redwood from the Pacific coast, representing a large range of patterns produced by the manufacturers and some of their better grades of plain lumber; and also examples of koa and ohia woods from Hawaii, Honduran mahogany, red gum, yellow poplar, white oak, and black cherry.

Material received as part of an exhibit of the turpentine industry included three butt sections of longleaf pine from a commercial turpentine orchard, illustrating the manner in which gum for the distillation of turpentine is obtained by the box, the cup and gutter, and the Forest Service methods, clearly showing the progressive improvement from the former wasteful to the modern economical processes. These were accompanied by samples of the gum, scrape, turpentine, and resin, and examples of the tools used, and, in addition, there was a model of a turpentine still of a pattern common to the longleaf pine belt, in a setting typical of the region, some of the trees being boxed and others provided with cups and gutters. The utilization of wood was also illustrated by samples of dyewoods in the log, and a series of extracts from them, including logwood, Brazil wood, fustic, and quebracho; and by several series of specimens showing the materials and successive stages in the manufacture of a number of articles of common use, such as matches, tool handles, brushes, and sporting goods.

Of subjects other than textiles and woods, while no special efforts were made in their behalf, much desirable material was received, including agricultural products generally, foods, medicines, resins, models of fishing methods and boats, fishery products, etc.

Mineral technology.—A very realistic model of Trinidad Asphalt Lake and its environs, a series of colored transparencies and photographic enlargements, and a complement of specimens typifying the

different forms of asphalt occurrence as well as the useful products prepared therefrom, constituted the most striking addition to the exhibits in the division of mineral technology. Next may be mentioned a complete ore stope removed bodily, ore faces, timbering, chute, manway, and all accessories, from the Copper Queen Mine at Bisbee, Ariz.

Among other important acquisitions were a model representing the layout of a Portland cement plant and the sequence of operations connected with the manufacture of cement; an industrial series of specimens covering the occurrence and uses of natural graphite, including a remarkable block of pure graphite weighing 250 pounds; a model reproducing the unique method of mining placer gravel for gold in the frozen north by a system of underground drifting or tunneling bedrock, with the ground thawed out in immediate advance of the tunnel by means of steam; and a model of a cyanide leaching plant showing admirably the method commonly employed in the extraction of gold from its ores where the metal does not lend itself to simpler and more direct processes for its segregation.

NATIONAL GALLERY OF ART.

It is very gratifying to note that early in the year Mr. Charles L. Freer waived the condition attending his munificent gift of American and oriental art to the effect that the collection remain in his possession during his life, and expressed a desire that the erection of the building be taken up at the earliest possible moment. The sum required for this purpose, $1,000,000, also a donation from Mr. Freer, was turned over to the Institution in December, and the site and preliminary plans, both satisfactory to the benefactor, received later the approval of the Board of Regents of the Institution, and of the Federal Commission of Fine Arts. The site is the southwestern part of the Smithsonian reservation, at the corner of Twelfth and B Streets, S. W., and approximately two years will be required for the completion of the building, at the end of which time the transfer of the many precious objects to Washington may be expected to take place. The fact that the planning and the execution of the work of construction is in the hands of Mr. Charles A. Platt, of New York, insures their being carried out in an eminently satisfactory manner.

Since the last report Mr. Freer has increased the extent of his collection to about 5,346 items by 535 additions, of which 23 are paintings and sculptures by the American artists Tryon, Thayer, Metcalf, Murphy, and Saint-Gaudens; while the oriental objects, numbering 512, consist mainly of paintings, pottery, bronzes, and jades from China, Korea, and Japan. Mr. Freer announces considerable headway in the preparation of the final catalogues, on which a number of experts of wide repute are at work.

The National Gallery of Art also received during the year from the Department of State a most interesting collection of 82 drawings in pencil, pen, charcoal, chalk, crayon, and water color, executed by eminent contemporary French artists and presented to the people of the United States by the citizens of the French Republic as a token of their appreciation of the sympathetic efforts of American citizens toward relieving the distress occasioned by the European war. There should likewise be mentioned an oil portrait of Abraham Lincoln, by George H. Story, presented by Mrs. E. H. Harriman.

MEETINGS AND CONGRESSES.

The auditorium and committee rooms in the new building were utilized to a much greater extent than in any previous year for scientific and art meetings, lectures, and other functions. Three of the local societies made the Museum their regular meeting place, among these being the Washington Society of the Fine Arts, which presented its customary three courses of lectures. Annual or special meetings were held by the National Academy of Sciences, the Mining and Metallurgical Society of America, the Society of American Foresters, the American Oriental Society, and the American Surgical Association. Lectures, singly or in short series, were given under the auspices of 10 of the science and art societies, and 6 receptions were held in connection with large gatherings of national and international bodies.

Among the special meetings there were several which merit distinctive mention. The most important of these was the Nineteenth International Congress of Americanists which met from December 27 to 31, in affiliation with Section I of the Second Pan American Scientific Congress, then also in session in Washington, the American Anthropological Association, the American Folk-Lore Society, the American Historical Association, and the Archaeological Institute of America. On the afternoon of February 9 a bronze tablet in memory of Prof. S. F. Baird as the instigator of the Federal fishery service, a contribution to the Bureau of Fisheries by 47 subscribers, was dedicated in the auditorium with appropriate ceremonies in the presence of a large assemblage.

During the week of the safety-first exhibition, February 21–28, the auditorium was occupied on five days for lectures and discourses on the subjects comprehended by this notable display, nearly all of them being profusely illustrated, both motion pictures and lantern slides being used. The speakers, besides the Secretary of Labor and several assistant secretaries of departments, were all experts in the several bureaus represented. The exercises attending the centenary celebration of the organization of the Coast and Geodetic Survey,

held in the auditorium on April 5 and 6, consisted of an exposition of the work of this, the first scientific service of the Government, by eminent authorities who had been invited to speak upon those phases of the Survey's activities with which they are best acquainted.

The American Association of Museums held its eleventh annual meeting in Washington from May 15 to 18, and the American Federation of Arts its seventh annual convention from the 17th to the 19th of the same month. While only one session of the former and none of the latter was held in the Museum, a reception was tendered to both on the evening of May 17, when an important loan exhibition of the industrial arts was opened with a special view.

SPECIAL EXHIBITIONS.

The educational efforts of the Museum were most notably served by several large and important special exhibitions. Supplementing the arrangements for the meetings of the Congress of Americanists and affiliated societies during convocation week, an interesting installation was made of material relating to pertinent subjects.

During the week of February 21–27 the foyer, with three of its communicating rooms, was occupied by one of the most remarkable and interesting Government exhibitions that has ever been assembled. Having as its theme the "safety-first" idea, it was participated in by 20 bureaus, the American National Red Cross Society, and the Metropolitan police department, the activities of all of which are primarily for or comprehend in a marked degree the safeguarding of life and property, as well as the prevention and care of disease. Although the available area was restricted the display proved most effective and satisfactory, as it was also comprehensive, probably nothing in the Government service relating to "safety first" having escaped some representation. Attention was widely called to the exhibition in advance. The governors of States were notified of the nation-wide aspect of the exposition, one of the results of which was to bring about a meeting of State mine inspectors in the Museum, and manufacturers and operators from all over the country were invited to be present. The total attendance of visitors during the week was 35,447.

The exercises commemorating the centenary of the Coast and Geodetic Survey, held on April 5 and 6, were supplemented by an exhibition in the foyer, the purpose of which was to illustrate the appliances and methods used and the results obtained in both its marine and geodetic work during the 100 years of its existence. The material was admirably selected and arranged, constituting one of the most complete and instructive special displays ever installed in the Museum.

The models and drawings submitted in competition for the monument at Fort McHenry, Baltimore, in memory of Francis Scott Key, author of the "Star-Spangled Banner," and the soldiers and sailors who participated in the battle of North Point and the attack on Fort McHenry in the War of 1812, were arranged in the rotunda of the new building, where, after having been passed upon by the jury of awards, they were exhibited to the public from May 17 to June 17.

The exhibition of American industrial art, held during the spring and summer of 1915 under the auspices of the American Federation of Arts, was repeated as a feature of the seventh convention of this association, being opened on May 17, 1916, and continuing for one month. The foyer and five of its communicating rooms were occupied. The exposition was designed to bring together examples of art on industrial lines, both hand and machine made, to show what is being produced in this country, and though not exhaustive in any particular, some of the best-known art workers of the country participated, and it was felt that a fairly high standard had been maintained.

Following the close of the Panama-Pacific International Exposition on December 4, and in accordance with an act of Congress, a large part of the Museum's ethnological exhibit was transferred from San Francisco to the Panama-California International Exposition at San Diego, to be shown there until the end of the calendar year 1916. The selection made for this purpose consisted of four large family groups of Eskimo, Zulu-Kaffirs, Caribs, and Dyaks; miniature dwelling groups of aboriginal peoples in many parts of the world; four cases of artifacts; and a set of lithographs from Catlin's North American Indian paintings.

MISCELLANEOUS.

Duplicate material to the extent of over 7,000 specimens, classified and labeled for teaching purposes and arranged in 96 sets, was distributed to schools and colleges, the subjects principally represented being rocks, minerals, ores, fossils, and recent mollusks. For obtaining additions to the collections through the medium of exchange, about 9,400 duplicates, chiefly from the natural-history divisions, were utilized. A large number of specimens were sent for study to collaborators of the Museum and other specialists. They consisted mainly of plants, recent animals, and fossils, and were contained in 114 lots.

The attendance of visitors at the new building aggregated 316,707 for week days and 64,521 for Sundays, being a daily average of 1,012 for the former and of 1,240 for the latter. For the older Museum building, which is only open on week days, the total was 146,956 and

the daily average 469. The halls in the Smithsonian building, which were closed for renovation during about five months, received 48,517 visitors.

The publications of the year comprised 2 volumes of Proceedings and 4 Bulletins, besides the annual report and 52 separate papers belonging to the series of Proceedings and Contributions from the National Herbarium. The total distribution of Museum publications aggregated 73,798 copies.

Through the addition of 1,895 volumes, 72 parts of volumes, and 2,873 pamphlets, the number of volumes in the Museum library was increased to 47,713, and of pamphlets and unbound papers to 79,241.

Respectfully submitted,

RICHARD RATHBUN,
Assistant Secretary in Charge,
United States National Museum.

Dr. CHARLES D. WALCOTT,
Secretary of the Smithsonian Institution.

OCTOBER 30, 1916.

Appendix 2.

REPORT ON THE BUREAU OF AMERICAN ETHNOLOGY.

Sir: I have the honor to submit the following report on the operations of the Bureau of American Ethnology during the fiscal year ended June 30, 1916, conducted in accordance with the provision of the act of Congress approved March 3, 1915, making appropriations for the sundry civil expenses of the Government, and with a plan of operations submitted by the ethnologist in charge and approved by the Secretary of the Smithsonian Institution. The provision of the act authorizing the researches of the bureau is as follows:

American ethnology: For continuing ethnological researches among the American Indians and the natives of Hawaii, including the excavation and preservation of archæologic remains, under the direction of the Smithsonian Institution, including necessary employees and the purchase of necessary books and periodicals, $42,000.

Mr. F. W. Hodge, ethnologist in charge, devoted most of his energies, as usual, to administrative affairs. However, in pursuance of a plan for cooperative archeological research by the Bureau of American Ethnology and the Museum of the American Indian (Heye Foundation) of New York, Mr. Hodge early in July joined Mr. George G. Heye, of the museum mentioned, in the excavation of the Nacoochee mound in White County, northeastern Georgia, permission to investigate which was accorded by the owner, Dr. L. G. Hardman.

The Nacoochee mound is an earthwork occupied by the Cherokee Indians until early in the nineteenth century. The name "Nacoochee," however, is not of Cherokee origin; at least, it is not identifiable by the Cherokee as belonging to their language, and by no means does the word signify "the evening star" in any Indian tongue, as one writer has claimed.

The summit of the mound, which had been leveled for cultivation about 30 years ago, measured 83 feet in maximum and about 67 feet in minimum diameter; the height of the mound above the adjacent field was 17 feet 3 inches, and the circumference of the base 410 feet. These measurements are doubtless less than they were at the time the mound was abandoned by the Cherokee, as all the dimensions

have been more or less reduced by cultivation, the slope at the base particularly having been plowed away for several feet. The mound was reared both for domicile and for cemetery purposes and was composed of rich alluvial soil from the surrounding field. Excavation determined that the mound was not built at one time, but evidently at different periods, as circumstances demanded. This was shown plainly by the stratification of the mound soil, the occurrence of graves at different depths with undisturbed earth above them, the presence of fire pits or of evidences of fires throughout the mound at varying levels, and by the finding of a few objects derived from the white man in the upper part and in the slopes of the mound, but not in the lower levels. From this last observation it is evident that the occupancy of the mound extended well into the historical period, a fact supported by the memory of the grandparents of present residents of the Nacoochee Valley, who recalled the mound when the Cherokee Indians still occupied it and the surrounding area.

The fact that the mound was used for burial purposes is attested by the finding of the remains of 75 individuals during the course of the excavations, the graves occurring from slightly beneath the summit to a depth of about 19 feet, or below the original base of the mound. These graves, with few exceptions, were unmarked, and in most instances were not accompanied with objects of ceremony or utility. The exceptions were those remains with which were buried stone implements, shells or shell ornaments, a smoking pipe, a pottery vessel, or the like. The skeletons were found usually with the head pointed in an eastwardly direction, and were all so greatly decomposed that it was impossible to preserve any of them for measurement and study, the bones in most cases consisting of only a pasty mass.

As mentioned above, most of the burials were unmarked. The exceptions consisted of two graves incased and covered with slabs of stone, both unearthed near the very base of the mound. One of these stone graves contained a skeleton the bones of which were largely of the consistency of corn meal, owing to the ravages of insects, but what was lacking in the remains themselves was more than compensated by the finding near the skull of a beautiful effigy vase of painted pottery, the only piece of painted ware, whole or fragmentary, found in the entire mound. The occurrence of this type of vessel and the presence of the stone graves at the bottom of the mound suggest the possible original occupancy of the site by Indians other than the Cherokee.

Perhaps the most remarkable feature of the mound was the large number of smoking pipes of pottery, mostly broken, but in many forms and of varying degrees of workmanship. Some of the pipes are of excellent texture and are highly ornamented with conven-

tionalized figures of birds, etc., or marked with incised designs. Another feature of the mound was the presence of a great amount of broken pottery, especially in the refuse at the base and covering the slopes. This pottery is chiefly of fine texture, although some of the cooking vessels are of coarse ware. With the exception of the painted vessel above noted, the only ornamentation applied by the makers of the pottery consists of incised and impressed designs, the latter made usually with a paddle of clay or wood, or worked out in the moist ware before firing by means of a pointed tool, a spatula, a piece of cane, or a shell.

In pursuance of another plan of cooperative archeological research, Mr. Hodge, in October, visited Zuñi, N. Mex., with Mr. Heye, for the purpose of examining the ruins of the historic pueblo of Hawikuh, in the Zuñi Valley southwest of Zuñi pueblo, and of making the necessary arrangements with the Indians for its excavation. This site is of great archeological and historical interest, as the pueblo was inhabited when first seen by Fray Marcos de Niza in 1539, and when visited and stormed by Coronado in the following year. It became the site of an important Franciscan mission in 1629, and was finally abandoned in 1670 on account of depredations by hostile Indians. By reason of the fact that Hawikuh was inhabited continuously from prehistoric times until 130 years after the opening of the historical period, it is expected that a thorough study of its ruins will shed important information on the effect of the earliest Spanish contact with the Zuñi people and will supplement archeological work conducted in other village sites of that tribe. Owing to unforeseen circumstances, active work was not commenced before the close of the fiscal year, but it is hoped that its initiation will not be long delayed. A permit therefor has been granted by the Secretary of the Interior.

By provisional agreement with the School of American Archæology at Santa Fe, N. Mex., and the Royal Ontario Museum of Archæology at Toronto, plans were perfected whereby the Smithsonian Institution, in conjunction with those establishments, was to conduct archeological researches of an intensive character in the Chaco Canyon of northern New Mexico, one of the most important culture areas north of Mexico. Although every effort was made to obtain from Congress the necessary appropriation for meeting the Institution's share of the expense (a permit for the excavations having been issued by the Secretary of the Interior), the project was presented too late for action, hence the work, so far as the Smithsonian Institution is concerned, has been necessarily postponed.

As opportunity offered, the preparation of the bibliography of the Pueblo Indians was continued by Mr. Hodge, who also represented the Smithsonian Institution as a member of the United States Geographic Board, and the Bureau of American Ethnology at the meet-

ings of the Smithsonian advisory committee on printing and publication.

Dr. J. Walter Fewkes, ethnologist, having been detailed to continue the excavation and repair of prehistoric ruins in the Mesa Verde National Park, Colo., under the joint auspices of this Bureau and the Department of the Interior, left Washington for that locality in August, 1915, and remained in the park continuously until the close of October. Dr. Fewkes devoted his attention mainly to a large mound of stones and earth situated near the point of a promontory opposite Cliff Palace, across Cliff Canyon, the excavation of which revealed a type of structure hitherto unknown in the Mesa Verde National Park, and architecturally different from any that had been previously excavated in the Southwest. The rooms of this building, which Dr. Fewkes designates as "Sun Temple," were thoroughly cleared out, the débris removed, and the walls were repaired in such manner that they will not be likely to deteriorate for many years. A report on the work of excavation and on the structural features of this interesting building forms the subject of an illustrated pamphlet published by the Department of the Interior in June, 1916, under the title "Excavation and repair of Sun Temple, Mesa Verde National Park."

Structurally the Sun Temple consists of two parts—an original building, to which an annex is so united as to give the two a D-shape ground plan, the southern or straight wall of which extends almost exactly east-west. This wall measures 131 feet 7 inches in length; the highest wall of the structure is 11 feet 7 inches, the lowest 5 feet. The walls are massive, varying in thickness from 2 to 5 feet, and are composed of a core of rubble faced on both sides, the exposed stones having been carefully fashioned by hand and accurately fitted, although, as in the case of pueblo masonry generally, the stones are usually neither "broken" at the joints nor bonded at the corners. Nevertheless the walls of the Sun Temple display excellent structural qualities that will compare favorably with any of its class north of Mexico. Architectually the annex resembles certain tower-like structures in the ancient pueblo region, and in plan the whole ruin bears resemblance also to Pueblo Bonito in Chaco Canyon, N. Mex.

The building contains three circular rooms resembling kivas, or ceremonial chambers, still used by some of the Pueblo Indians, and many other rooms of unusual shape and doubtful significance. There was no indication that the Sun Temple had been roofed; indeed, there is strong evidence that the construction of the buildings was never finished. Dr. Fewkes was not able to determine the age of the Sun Temple, but he is of the opinion that it was built later

than Cliff Palace. One evidence of its antiquity, however, was observed, namely, a cedar tree growing from the top of the highest walls was found to have 360 annual rings of growth, indicating that it sprouted a few years after Coronado led his expedition into the Southwest in 1540.

The builders of the Sun Temple are supposed by Dr. Fewkes to have been the former cliff dwellers of the neighboring canyons. As to its purpose, he is of the opinion that the building was used primarily for worship, but that like other temples among primitive peoples it was intended secondarily as a place of refuge in case of attack, and for the storage of provisions. The impression of a fossil palm leaf on the corner stone at the southwestern angle is believed to mark a shrine where rites to the sky or sun god were performed long before the temple was built. It is this supposed shrine that suggested the name for the edifice.

On the completion of the excavation and repair of the Sun Temple, Dr. Fewkes similarly treated Oak-tree House, a cliff dwelling in the precipice of Fewkes Canyon above which stands the Sun Temple. A collection of artifacts found in this dwelling was gathered in the course of the excavation and later deposited in the National Museum.

En route to Washington, Dr. Fewkes visited the so-called "Buried City of the Panhandle," on Wolf Creek in Ochiltree County, Tex., which had been reported to the bureau by residents of the neighborhood and had become locally celebrated. The remains examined hardly justify the name given to the site, which in former days was used as an encampment by wandering Indians rather than by sedentary people. Dr. Fewkes's attention was drawn also to a supposed artificial wall which gave name to Rockwall, not far from Dallas, Tex., but on examination this was found to be a natural sandstone formation.

Dr. Fewkes returned to Washington in November and immediately prepared a report on his summer's work in the Mesa Verde National Park for the use of the Department of the Interior, an advance summary of which, issued by the department, was widely published in the newspapers. An account of the excavation and repair of Oak-tree House and Painted House, the largest cliff ruins in Fewkes Canyon, was also prepared for publication. On the completion of these tasks Dr. Fewkes devoted the remainder of his limited time to the preparation of the extended memoir on The Aborigines of the West Indies for publication in a report of the bureau. In June he again departed for the field with the view of initiating, before the close of the fiscal year, an inquiry into the archæological evidences bearing on Hopi legends that ancestors of the clans of the ancient pueblo of Sikyatki lived at Tebungki, or Beshbito, an oval ruin 15 miles east of Keams Canyon, Ariz. Dr. Fewkes visited and

surveyed the ruin and made photographs and notes thereof. He likewise investigated certain large ruins east of Tebungki, on the ancient trail of migration from Chaco Canyon, and traced for some distance the prehistoric trail running from San Juan Valley southward past the great ruins, as yet undescribed, near Crownpoint, N. Mex.

During the months of July to December, 1915, Mr. James Mooney, ethnologist, continued to devote most of his attention to the preparation for publication of the Cherokee Sacred Formulas, including transliteration, translation, and explanation of each formula, with complete glossary and botanic index. These formulas, collected by Mr. Mooney on the East Cherokee Reservation in North Carolina, are written in the Cherokee language and alphabet and held for their own secret use by priests of the tribe, most of them long since dead. They consist of prayers, songs, and prescriptions, dealing with medicine, love, hunting, fishing, agriculture, war, the ball play, self-protection, etc. They number in all between 500 and 550, contained in several manuscripts, as follows:

1. *Gadigwanasti* ("Belt," died 1888).—186 in a large blank book of foolscap size, and 94 others on separate sheets of the same size, closely written; 280 in all. Obtained from his son.

2. *A'yuñini* ("Swimmer," died 1899).—Written in an unpaged blank book of 242 pages, 3½ by 12 inches, only partially filled; 137 in all. Obtained from himself and transliterated and translated with full explanation from his distation in 1888.

3. *A'wanita* ("Young Deer," died about 1892).—24 written on separate sheets and obtained from him in 1888. Transcribed later into No 4.

4. *Tsiskwa* ("Bird," died 1889).—22, dictated from deathbed and with other formulas written out in regular fashion, with index, in a blank book of 200 pages, 8 by 10 inches, by his nephew, W. W. Long (Wiliwesti), in 1889.

5. *Dagwatihi* ("Catawba Killer," died about 1890.—Written out from his dictation by W. W. Long, in No. 4, in 1889; 11 in all.

6. *Gahuni* (died 1866).—10 in all, together with a Cherokee-English vocabulary in Cherokee characters and other miscellany, contained in an unpaged blank book, 6 by 14 inches. Obtained in 1889 from his widow, Ayâsta, mother of W. W. Long.

7. *Other formulas* originally written by Inâli ("Black Fox," died about 1880), Yânûgûlegi ("Climbing Bear," died 1904, Dûninâli ("Tracker," still living), Ayâsta ("Spoiler," died 1916), Âganstâta ("Groundhog Meat," still living), and others; mostly transcribed into No. 4.

8. A large number of dance songs, ceremonial addresses, Civil War letters from Cherokee in the Confederate service, council records, etc., all in the Cherokee language and characters, contained in various original blank book manuscripts and letter sheets. Some of these have been transcribed into No. 4, and many of them might properly appear with the Sacred Formulas.

Of all this material, about 150 formulas, including the entire Swimmer book, No. 2, were transliterated, translated, and annotated and glossarized, with Swimmer's assistance, in 1888–89. Of

these, 28 specimen formulas were published in 1891 in "Sacred Formulas of the Cherokees," in the Seventh Annual Report of the bureau. The manuscript glossary for the whole 150 formulas numbers about 2,000 words.

All the other formulas, together with the more important miscellany noted under No. 8, were transliterated and translated with interlinear translation in the summers of 1911–14, together with such additional explanation as might be furnished by surviving experts. Also some 500 or 600 plants noted in the medical prescriptions have been collected in the field, with their Cherokee names and uses, and the botanic identification made by assistance of the botanists of the National Museum. This entire body, exclusive of No. 2 completed, is now in process of final transcription and elaboration, with explanation, botanic appendix, and glossary. Most of the work at present is being devoted to the Gadĭgwanasti manuscript, but the interdependence of the formulas necessitates frequent shifting from one to another. The glossary proceeds incidentally with the final translation, but more slowly as the full import of the words becomes manifest. Many of the words and expressions are technical, symbolic, and in archaic and unusual dialectic forms, with corresponding difficulty of interpretation. The complete glossary will probably comprise at least 4,000 words.

The botanic section will consist of a list of all the plants used in the formulas, as stated, and of some others of special importance, with their Indian names and meanings, botanic identification, and Cherokee uses as deduced from the various formulas and from direct information.

An explanation of the method and significance of the ceremony, the preparation of the medicine and the manner of its application will accompany each formula, but this work is deferred to the end, to insure symmetrical treatment without unnecessary repetition.

It is planned to have one or more introductory chapters explanatory of the Cherokee mythology, beliefs relating to the spiritual and occult world, ceremonial observances, initiation of hunters, and other matters illustrative of the formulas, together with parallels from other tribal systems, and also a chapter explanatory of the peculiar linguistic forms.

More than 200 formulas have received final form. The finished work will fill at least one large report volume and require a year for completion.

In July and August, 1915, Mr. Mooney gave considerable time to furnishing information and suggestions for the proposed Sequoya statue intended to constitute Oklahoma's contribution to the Capitol gallery. The usual number of letter requests for miscellaneous information also received attention.

On May 27 Mr. Mooney proceeded to western North Carolina for the purpose of continuing his Cherokee studies, and at the close of the fiscal year was still in the field.

Dr. John R. Swanton, ethnologist, devoted the greater part of the year to his memoirs pertaining to the Creek and associated tribes, to which reference was made in the last report. The first of these, dealing with the habitat and classification of the former Southeastern Indians, their history and population, is nearly completed; it consists of upward of 750 typewritten pages, exclusive of the bibliography, all of which has been put in order and annotated. Some new manuscript sources of information have recently been discovered which will make further additions necessary, but with this exception the text is now complete. Six maps are to be used in illustration; two of these, which are entirely new, are now being made, and the others are to be reproductions. The second paper, to cover the social organization and social customs of the Creeks and their neighbors, has likewise been arranged and annotated, but it is being held in order to incorporate the results of further field research.

From the end of September until the latter part of November, 1915, Dr. Swanton was in Oklahoma, where he collected 113 pages of Natchez text from one of the three surviving speakers of the language; he also spent about three weeks among the Creek Indians, where about 80 pages of myths in English were procured. Further ethnological material was also obtained from the Creeks and from the Chickasaw, to whom a preliminary visit was made. While with the former people Dr. Swanton perfected arrangements with a young man to furnish texts in the native language, which he is able to write fluently, and in this way 173 pages have been submitted, not including translation. From Judge G. W. Grayson, of Eufaula, Okla., to whom the bureau has been constantly indebted in many ways, was obtained in Creek and English, and also in the form of a dictaphone record, a speech of the kind formerly delivered at the annual *poskita*, or busk, ceremony of the Creeks. From an Alibamu correspondent, referred to in previous reports, some additions to the Alibamu vocabulary and a few pages of Alibamu text were procured.

At the beginning of the fiscal year Mr. J. N. B. Hewitt, ethnologist, transcribed and edited the Seneca text "Dooä'dane'gĕ^{n}'" and Hotkwisdadegĕ'^{n}'a; making 45 pages, to which he added a literal interlinear translation that required more than twice as many English words as Indian, the whole being equivalent to about 130 pages. This text is a part of the Seneca material now in press for the Thirty-second Annual Report of the bureau. Mr. Hewitt also read for correction, emendation, and expansion, the galley proofs of Curtin's Seneca material, and prepared more than 50 pages of notes and additions for the introduction and also for the text; he also has ready

notes and corrections for the proofs still to come. From unedited text Mr. Hewitt completed a free translation of 32 pages of the Onondaga version of the "requickening address" of the Ritual of Condolence of the League of the Iroquois, being a part of the material for his projected memoir on the Iroquois League.

After the material of the Seneca legends had been submitted for printing, Mr. Curtin's field records and notes, made while recording this material, came into possession of the bureau. Mr. Hewitt devoted much time to reading and examining this undigested material, some 4,000 pages, for the purpose of ascertaining whether part of it should be utilized for printing or for illustrative purposes in what was already in type. This examination yielded some good material for notes and interpretations, but only small return as to new material for printing.

In the early autumn Mr. Hewitt made special preparations for the prosecution of field work on his projected memoir on the League of the Iroquois, by tentative editing and copying of a number of Mohawk and Onondaga texts recorded hastily in the field in previous years. The following parts of the Ritual of the Condolence Council were thus typewritten: The fore part of the Ceremony of Condolence, called "Beside-The-Forest," or "Beside-The-Thicket," in Mohawk; the so-called "Requickening Address," in the Onondaga version, and also the explanatory "introduction" and the "reply" in Onondaga to the "Beside-The-Forest" address already noted; and the installation address in Onondaga, made by Dekanawida to the last two Seneca leaders to join the League, was likewise edited and typewritten. Mr. Hewitt also devoted much study to other parts of the League material, for the purpose of being able to discuss it intelligently and critically with native informants. Some of the most striking results of this year's field work are due to this preparatory study of the material already in hand. Mr. Hewitt spent many days in the office in searching out and preparing data for replies to correspondents of the bureau.

On April 17, 1916, Mr. Hewitt left Washington for the Six Nations reserve near Brantford, Ontario, for the purpose of resuming field work, having in view primarily the putting into final form of the Onondaga and Mohawk texts pertaining to the League of the Iroquois, recorded in former years. These texts cover a wide range of subjects and represent the first serious attempt to record in these languages very technical and highly figurative language from persons unaccustomed to dictate connected texts for recording. These text embody laws, decisions, rituals, ceremonies, and constitutional principles; hence it is essential that correct verbal and grammatic forms be given.

One of the most important results of Mr. Hewitt's field studies is the demonstration that, contrary to all available written records and various printed accounts, there were never more than 49 federal civil chiefs of the League of the Iroquois, and that the number 50, due to misconception of the meaning of ordinary terms by Thomas Webster of the New York Onondaga, who died about 30 years ago, is modern and unhistorical. This false teaching has gained credence because it arose only after the dissolution of the integrity of the League of the Iroquois in the years following its wars with the United States, when most of the tribes became divided, some removing to Canada and some remaining in New York State, a condition which naturally fostered new interpretations and newer versions of older legends and traditions.

Mr. Hewitt also recorded a Cayuga version of the so-called Dekanawida tradition, comprising 130 pages of text, dictated by Chief John H. Gibson, which purports to relate the events that led to the founding of the League or Confederation of the Five Iroquois tribes and the part taken therein by the principal actors. In this interesting version Dekanawida is known only by the epithet "The Fatherless," or literally "He Who is Fatherless," which emphasizes the prophecy that he would be born of a virgin. In this version "The Fatherless" is represented as establishing among the Cayuga tribesmen the exact form of government that later he founded among the Five Iroquois tribes. It is said that the Cayuga selfishly limited the scope of that form of government, and therefore its benefits, to the Cayuga people alone, for the Cayuga statesmen did not conceive of its applicability to the affairs and welfare of all men. And so, this tradition affirms, it became needful that "The Fatherless" return to the neighbor tribes of the Cayuga to establish among them the League of the Five Tribes of the Iroquois, which was designed to be shared by all the tribes of men. This event is mentioned in the other Dekanawida versions.

This Cayuga version also purports to explain the origin of the dualism lying at the foundation of all public institutions of Iroquois peoples, by attributing the first such organization among the Cayuga to two persons who were related to each other as "Father and Son," or "Mother and Daughter," and who agreed to conduct public affairs jointly. This statement of course is somewhat wide of the mark, because it does not explain the existence of similar dualisms among other tribes such dualisms resting commonly, in the social organization, on the dramatization of the relation of the male and female principles in nature.

Mr. Hewitt was also able to confirm another radical exegesis of a part of the installation ceremony of the League of the Iroquois as first proposed by himself. This deals with the significance and

the correct translation of the words of the famous "Six Songs" of this ceremony. All other interpreters who have attempted to translate these words have assumed that these songs are "songs of greeting and welcome," but Mr. Hewitt, solely on grammatic grounds and the position of these songs, regards them rather as "songs of parting," or "songs of farewell," which are dramatically sung by an impersonator for the dead chief or chiefs.

Mr. Hewitt also recorded, in the Onondaga dialect, a short legend descriptive of the three Air or Wind Beings or Gods, the so-called Hoñdu'i, the patrons of the Wooden-mask or "False-face" Society, whose chief function is the exorcism of disease out of the community and out of the bodies of ill persons; another on the Medicine Flute; another on the Husk-mask Society; and another on the moccasin game used at the wake for a dead chief: in all more than 100 pages of text not related to the material dealing with the Iroquois League.

While in the field Mr. Hewitt purchased a number of fine specimens illustrating Iroquois culture, exhibiting art of a high order; these consist of a wooden mask, colored black; a husk-mask; two small drums; a "medicine" flute; a moccasin game used at a chief's wake; a pair of deer-hoof rattles; a horn rattle; and a squash rattle. During the time he was in the field, until the close of the fiscal year, Mr. Hewitt read, studied, corrected, and annotated about 8,000 lines of text other than that mentioned above, and also made a number of photographs of Indians.

Mr. Francis La Flesche, ethnologist, was engaged in assembling his notes on the rites of the Osage tribe. Up to the month of February, 280 pages of the ritual of the Fasting degree of the war rites were finished, completing that degree, which comprises 492 pages. The Çathadse, or Rush-mat degree, was next taken up and completed; this degree covers 104 pages. The Child-naming ritual was then commenced, and 21 pages have been finished.

In September, while on leave of absence, Mr. La Flesche was visited on the Omaha reservation by Xuthá Watoⁿiⁿ of the Tsízhu Wanoⁿ gens, who gave a description of the Washábe Athiⁿ, or war ceremony, as he remembered it. With this description he gave 5 wígie and 14 songs. The wígie and the words of the songs have been transcribed from the dictaphone but are not yet typewritten, and the music of the songs has not yet been transcribed. A number of stories also were obtained from Xuthá Watoⁿiⁿ, among them that of the Osage traditional story of the separation of the Omaha and Osage tribes. Xuthá Watoⁿiⁿ died soon after his return home, his death being regarded by many as confirming the old-time belief that anyone who recites informally the rituals associated with these ceremonies will inevitably suffer dire punishment. The death of this old

man shortly after giving the rituals has therefore added to the difficulties attending the task of recording these ancient rites.

Notwithstanding these obstacles, Mr. La Flesche succeeded, during his visit to the Osage Reservation in April and May, in securing from old Shoⁿ′gemoⁿiⁿ the version of the Fasting ritual belonging to the Tsízhu Peace gens, of which he is a member. The wígie and the words of the songs have been transcribed from the dictaphone, but are not yet typewritten, and the music of the songs is also to be transcribed. Shoⁿ′gemoⁿiⁿ likewise gave the Child-naming ritual belonging to his gens, in which there are two wígie, one containing 227 lines and the other 94. In addition to these rituals, Shoⁿ′-gemoⁿiⁿ, after considerable hesitancy, recounted the "Seven and Six" (13) coups he is always called on to recount when any Noⁿ′hoⁿzhiⁿga of the Hoⁿ′ga division performs the ceremonies of some of the war rites. For this service he is paid a horse and goods amounting in value from $125 to $150.

Mr. La Flesche also secured from Waxthízhi information concerning the duties of the two hereditary chiefs of the Osage tribe, the gentes from which they were chosen, and how their orders were enforced. He also obtained from Watśemoⁿiⁿ two wígie, one recited by him at the ceremonies of the war rites, and the other by the Nóⁿhoⁿzhiⁿga of the Hóⁿga Ahiutoⁿ gens.

In these studies Mr. La Flesche was materially assisted by Washóshe and his wife, who have both overcome their aversion to telling of the rites. Washóshe resigned from the Nóⁿhoⁿzhiⁿga order because of the injustice of its members toward a woman whom he selected to weave ceremonially the rush-mat shrine for a waxobe when he was taking the Çathadse degree. This man presented to Mr. La Flesche a mnemonic stick owned by his father and gave the titles of the groups of lines marked on the stick, each of which represents a group of songs. This mnemonic stick will be placed in the National Museum with the Osage collection.

Mr. John P. Harrington, ethnologist, spent the entire fiscal year in making an exhaustive study of the Indians of the Chumashan linguistic stock of southern California. Three different bases have been established for working with informants and elaborating the notes. The period from July to October, inclusive, was spent at San Diego, Cal., where every facility for the work was granted by the courtesy of the Panama-California Exposition; November to March, inclusive, at the Southwest Museum, Los Angeles; and April to June, inclusive, at Santa Ynez. The month of January, 1916, was spent at Berkeley, Cal., where, through the courtesy of the Bancroft Library of the University of California, various linguistic manuscripts and historical archives pertaining to the Chumashan stock were studies and copied. During the period named more than

300,000 words of manuscript material were obtained and elaborated. In addition to the grammatical and ethnological material an exhaustive dictionary of the Ventureño is well under way, which comprises some 8,000 cards. This is to be followed by similar dictionaries for the other dialects. The most satisfactory feature of the work was the collection of material on the supposedly extinct dialects of San Luis Obispo and La Purísima. The Purisimeño material consists mainly of words and corrected vocabularies, while on the Obispeño important grammatical material was also obtained. A large part of the material which still remains to be obtained depends on the life of two very old informants, consequently it is most important that Mr. Harrington continue his work in this immediate field until the opportunities are exhausted.

The beginning of the fiscal year found Dr. Truman Michelson, ethnologist, at Tama, Iowa, engaged in continuing his researches among the Fox Indians, which consisted mainly of recording sociological data and ritualistic origin myths. In August, Dr. Michelson proceeded to Oklahoma for the purpose of investigating the sociology and phonetics of the Sauk Indians, as well as of obtaining translations of Fox texts pertaining especially to ritualistic origin myths. After successfully concluding this work, Dr. Michelson returned to Washington in October, when he commenced the translation of the textual material gathered in the field. Advantage was taken of the presence in Washington of a deputation of Piegan in obtaining a detailed knowledge of Piegan terms of relationship. From these studies Dr. Michelson determined that the lists of relationship terms recorded by Lewis H. Morgan, as well as by other investigators, require revision. He also commenced to arrange the material gathered by the late Dr. William Jones pertaining to the ethnology of the Ojibwa Tribe, with a view of its publication as a bulletin of the bureau. Toward the close of the year Dr. Michelson undertook to restore phonetically the text of the White Buffalo dance of the Fox Indians, which likewise is intended for bulletin publication. It is believed that the results of this task will be ready for the printer before the close of the calendar year.

Dr. Leo J. Frachtenberg, special ethnologist, divided his time, as in previous years, between field research and office work. On July 8 he left his winter headquarters at the United States training school at Chemawa, Oreg., and proceeded to the Yakima Reservation, Wash., where he revised, with the aid of the last Atfalati Indian, the Kalapuya manuscript material collected in 1877 by the late Dr. A. S. Gatschet of the bureau. This material, comprising 421 manuscript pages, consists of vocables, stems, grammatical forms, and ethnological and historical narratives, and its revision marked the comple-

tion of the work on the Kalapuya linguistic family commenced two summers ago. This work lasted until the latter part of July. In conjunction with this particular phase of field work, Dr. Frachtenberg corrected the second revision of the galley proofs of his Siuslaw grammatical sketch to appear in the second part of Bulletin 40.

On returning to Chemawa, Dr. Frachtenberg took up the editing and typewriting of his grammatical sketch of the Alsea language, the compilation of which was completed during the previous winter; this was finished in the early part of October, and the complete sketch, consisting of 158 sections and 421 typewritten pages, was submitted for publication in the second part of the Handbook of American Indian Languages (Bulletin 40). Dr. Frachtenberg interrupted this work on August 22 and took a short trip to the Siletz Reservation, where he collected 52 Athapascan and Shastan songs, which were transmitted to the bureau for future analysis.

On October 7 he proceeded to the Quileute Reservation, where he enlisted the services of a Quileute informant, with whom he returned to Chemawa and brought to a successful completion the study of the grammar and mythology of the Quileute Tribe. This investigation extended from October until the latter part of March. The material collected by Dr. Frachtenberg during this period consists of 30 native myths and traditions fully translated, a large body of notes to these texts, voluminous grammatical forms, and vocables. In January Dr. Frachtenberg left Chemawa for a short trip to the Grand Ronde Reservation, Oreg., where he recorded 19 Kalapuya songs on the dictaphone.

As Dr. Frachtenberg's allotment for field work among the Quileute was then exhausted, he was obliged to remain at Chemawa until the close of the fiscal year. He therefore undertook the correction of the page proofs of his grammatical sketch of the Siuslaw language (pp. 431–629), and on its completion engaged in translating, editing, and typewriting the Alsea texts collected in 1910. The editing of these texts involved much labor, since it was deemed advisable to present in the introduction a complete discussion of Alsea mythology, and a concordance beween the folklore of this tribe and the myths of the other tribes of the Pacific coast. For that purpose all the published works on the folklore of the tribes of the northwestern area were consulted, including that of the Maidu, Shasta, Yana, Klamath, Takelma, Coos, Lower Umpqua, Tillamook, Chinook, Kathlamet, Wishram, Quinault, Chilcotin, Shuswap, Thompson River, Lillooet, Haida, Tlingit, Kwakiutl, Tsimshian, Bellacoola, and the Athapascan Tribes of the north. This work was practically completed by the close of the fiscal year. The collection consists of 8 creation myths, 13 miscellaneous tales, 3 ethnological and historical narratives, 4 statements as to religious beliefs, and 3 tales collected in English (31

traditions in all). It comprises, in addition to the introdution, 392 typewritten pages, and will be submitted for publication as a bulletin of the bureau.

SPECIAL RESEARCHES.

Dr. Franz Boas, honorary philologist, continued his researches connected with the preparation of the remainder of part 2 of the Handbook of American Indian Languages, assisted by Dr. Hermann K. Haeberlin, Miss H. A. Andrews, and Miss Mildred Downs, and also devoted attention to the completion of the report on Tsimshian mythology.

The bulletin on "Kutenai Tales," for which galleys were received in July, 1915, has been revised twice and is nearing completion. The page proof is being extracted preparatory to the accompanying grammatical sketch and vocabulary.

Through the liberality of Mr. Homer E. Sargent, of Chicago, it has been possible to do much work on the preparation of an extended paper on the Salish dialects, now comprising about 500 pages of manuscript. The material has been collected since 1886, partly by Dr. Boas himself and partly by Mr. James Teit, the considerable expense of the field work of Mr. Teit having been generously met by Mr. Sargent. In the course of the last 30 years it has been possible to collect vocabularies of all the Salish dialects, sufficient to afford a clear insight into the fundamental relations of these dialects, a preliminary work necessary to a more thorough study of the language. At the same time Mr. Teit gathered ethnological notes which are to be included in this work. The preparation of the vocabularies and of the detailed comparison that had been begun in previous years by Dr. Boas has been continued by Dr. Haeberlin, the basis of this study being their manuscript material and the published sources. Also through the liberality of Mr. Sargent and in cooperation with Columbia University in the city of New York, Dr. Haeberlin will be able to supplement his material by an investigation of one of the tribes of Puget Sound.

The interest of Mr. Sargent has also made possible a detailed study of the Salish basketry of the interior plateau and the preparation of the illustrations for a memoir on this subject. For the latter purpose there have been utilized the collections of the United States National Museum, the American Museum of Natural History, the University Museum of Philadelphia, the Museum of the American Indian (Heye Foundation), and the private collections of Mr. Sargent and others.

The preparation of a manuscript on the Ethnology of the Kwakiutl Indians has been well advanced. The material for the first volume, which is to contain data collected by Mr. George Hunt, has been completed, excluding a number of translations which remain to be

elaborated. According to the plan, the work is to consist of two parts, the first a collection of data furnished by Mr. Hunt in answer to specific questions asked by Dr. Boas; the second a discussion of them, and other data collected on previous journeys to British Columbia. This volume is to consist of an account of the material culture, social organization, religion, and kindred subjects. Most of the illustrations for this volume have been completed, and about 1,600 pages of manuscript have been prepared. Miss Downs has made detailed extracts from Kwakiutl myths required for a discussion of this subject.

Miss Downs has also compared the proofs of Dr. Frachtenberg's Siuslaw grammar with published texts, and these proofs have been compared and passed on by Dr. Frachtenberg. This work completes the revision of the Siuslaw grammar, the publication of which has been delayed owing to various reasons.

No progress has been made toward the final publication of the Chukchee grammar, as it has been impossible to communicate with the author, Mr. W. Bogoras, who is in Russia.

Some progress has been made with the contributions to Mexican archeology and ethnology, to be edited by Prof. Alfred M. Tozzer, of Harvard University, with a view of their publication by the bureau as a bulletin. Dr. Paul Radin has furnished a manuscript on Huave; Dr. Haeberlin has nearly completed the study of modern Mexican tales, collected by Dr. Boas and by Miss Isabel Ramírez Castañeda; and Dr. Boas has been engaged in the preparation of material on certain types of Mexican pottery and on an account of a journey to Teul, Zacatecas.

Prof. W. H. Holmes, of the National Museum, completed for the bureau the preparation of part 1 of the Handbook of American Antiquities (Bulletin 60), and at the close of the year galley proofs of the entire work had been received and were in process of revision. On account of the pressure of more urgent work in connection with his official duties, only limited progress was made in the preparation of part 2. On April 21 Mr. Holmes made a brief visit to the museums of Philadelphia and New York for the purpose of conducting studies required in the preparation of this handbook.

Miss Frances Densmore's field trip during the summer of 1915 for the purpose of continuing her studies of Indian music, comprised visits to three reservations and occupied two and one-half months. Most of the time was spent among the Mandan and Hidatsa, at Fort Berthold, N. Dak., and during part of her sojourn Miss Densmore camped near what is recognized as the last Mandan settlement, where she was enabled to record many interesting data that could not have been obtained in any other way. The Indians felt more free to sing there than at the agency, and Miss Densmore also had an

opportunity to observe and photograph native customs, notably those of tanning a hide and preparing corn. The study of music on the Fort Berthold Reservation included that pertaining to the ceremony connected with eagle catching. An old eagle trap was visited and photographed, and the songs of the leader in the eagle camp were recorded by the only Mandan who had the hereditary right to sing them. The songs of the Goose Women Society and the Creek Women Society were also sung by those who inherited them and were recorded phonographically. Among these are the ceremonial songs sung by the "corn priest" in the spring to fructify the seed corn. Songs of war and of the various men's societies were also recorded. The total number of songs from this reservation now transcribed exceeds 100.

A new phase of the work was that of ascertaining the pitch discrimination of the Indians by means of tuning forks. This was begun at Fort Berthold and continued for comparative purposes at the Standing Rock and White Earth Reservations. Data from four tribes are now available on this subject of research.

Miss Densmore read all the galley and part of the page proofs of the bulletin on Teton Sioux Music. Important additions were made to this book in the form of graphic representations, original plots of 240 songs and 18 diagrams having been made to exhibit the results obtained through mathematical analyses. Of these graphic representations 63 will appear in the bulletin. One hundred and fifty pages of manuscript were submitted during the year, in addition to the descriptive analyses of the songs.

In the preparation of the Handbook of Aboriginal Remains East of the Mississippi, Mr. D. I. Bushnell, jr., added much new material. Many letters were sent to county officials in New England requesting information regarding the location of ancient village sites, burial places, and other traces of aboriginal occupancy in their respective areas. Many of the replies contained valuable and interesting information. Letters of like nature were addressed to officials in the Southern States, and the replies were equally satisfactory. Numerous photographs have been received from various sources, which will serve as illustrations for the handbook, but it is desired to increase the number if possible. The manuscript of the handbook will probably be completed during the next fiscal year.

Dr. Walter Hough, of the National Museum, was detailed to the bureau in June for the purpose of conducting archeological investigations in western central New Mexico. Proceeding to Luna, Socorro County, Dr. Hough commenced the excavation of a ruin previously located by him, as described in Bulletin 35 of the bureau (p. 59). This site was thought to contain evidence of pit dwellings exclusively, but excavations showed that an area of about 40 acres

contained circular, semisubterranean houses in which no stone was used for construction. Seven of the pits were cleared, and it was ascertained that many more existed beneath the surface, dug in the sandy substratum of the region. Burnt sections of roofing clay showed that these houses were roofed with beams, poles, brush, and mud, as in present pueblo construction. The roof was supported by wooden posts, charred remains of which were found. Nothing was ascertained respecting the construction of the sides of the dwellings or in regard to the height of the roofs. On the floor of each of the pits uncovered were a rude metate, grinding stones, slabs of stone, and the outline of an otherwise undefined fireplace not quite in the center of the chamber. A bench about a foot high and a few feet in length was cut in the wall of some of the pits, and in one of the pits, against the wall, was a fireplace with raised sides of clay.

Another type of structures adjoined the pits; these were rectangular, open-air houses with mud roofs, in which mealing and culinary work was carried on. Here were numerous metates, manos, rubbing stones, pottery, etc.; some of the metates were set up on three round stones. Near the pit was a cemetery in which infants were buried, the burials being associated with clay hearths and much charcoal, and near the bodies were placed small pottery vessels. Scrapers of flint and bones of deer were also found among the burials. So far as ascertained, the people who used the circular semisubterranean houses had a limited range. Traces of their culture have not been found below an elevation of 7,000 feet in the mountain valley, and it appears probable that their culture was associated with an environment of lakes which once existed in these valleys. It is evident in some cases that the pit dwellings were displaced by houses of stone. In most instances artifacts are different from those of the stone-house builders, and the latter have more points of resemblance to, than of difference from, the ancient inhabitants of Blue River. It is probable that the range of the pit-house people would be found to be more extensive by excavation around the sides of stone houses in other localities, the remains of pit structures being easily obliterated by natural filling. At this time the pit-dweller culture can be affiliated only with uncertainty with that of the ancient Pueblos. At the present stage of the investigation the lack of skeletal material is severely felt, but further work may overcome this difficulty.

In continuation of his preliminary examination of archeological remains in western Utah, summarized in the last annual report of the bureau (pp. 51–53), Mr. Neil M. Judd, of the National Museum, returned to Utah in June, 1916, and excavated one of the large mounds near Paragonah, in Iron County. Limited in time and handicapped by unfavorable weather, the results obtained were less than those anticipated; nevertheless they show the similarity existing

between the ancient Paragonah dwellings and those near Beaver City and neighboring settlements, and warrant the belief that the builders of these structures were more closely related to the house-building peoples of Arizona and New Mexico than has been suspected.

In the report following his reconnoissance of last year, Mr. Judd drew attention to the fact that the mounds still existing near Paragonah comprise a mere remnant of the large group formerly at that place and predicted the early razing of those remaining. The hurried investigation of this year was undertaken for the purpose of gaining information regarding these ruins before their destruction.

One of the largest and, at the same time, one of the least disturbed mounds was selected as a type for excavation. Its dimensions were approximately 100 by 300 feet; its average height was 4½ feet. Two great gashes had been made through the opposite ends of the mound by diggings of many years ago, each cut partially exposing the walls of a single long room. Including these two dwellings, which were reexcavated only with considerable difficulty, Mr. Judd successfully revealed and measured the walls of 14 rectangular houses, 11 of which are entirely cleared of fallen débris and earth accumulation. The walls of these ancient habitations, like those previously examined near Beaver City, had been constructed entirely of adobe mud; in their present condition they exhibited no evidence of the use of angular bricks or blocks similar to those employed in Pueblo structures subsequent to the Spanish conquest. On the contrary, close examination showed that the walls were invariably formed by the union of innumerable masses of plastic clay, forced together by the hands of the builders and surfaced inside and out during the process of construction. Careful inspection of the ruins showed that the dwellings were originally roofed in the manner typical of cliff houses and of modern Pueblo structures throughout the Southwest. No certain evidence could be found that doors or other wall openings were utilized by the primitive artisans—each house invariably consisted of a single room that apparently had been entered from the roof. One of the most important discoveries made during the course of the Paragonah excavations was that of a circular, semi-subterranean room which, with similar wall fragments previously discovered in the Beaver City mounds, tends to establish the use of the kiva, or ceremonial chamber, by the ancient house-building peoples of western Utah.

On the conclusion of his studies at Paragonah, Mr. Judd proceeded to Fillmore, Willard County, for the purpose of investigating certain mounds reported in that neighborhood. These and similar elevations near the villages of Meadow, Deseret, and Hinckley, were all superficially identified as of the same type and representing the same

degree of culture as those above described. In all a collection of more than 500 objects was gathered during the course of the season's work.

A pleasing coincidence resulting from Mr. Judd's Fillmore investigation was the fact that the guide he engaged had been employed in the same capacity by Dr. Edward Palmer, one of the National Museum's most indefatigable collectors, during the latter's expedition of 1872.

The archeological data collected by Mr. Judd during his two brief expeditions to western Utah are sufficient to warrant the extension of the northern limits of the area known to have been occupied by the ancient Pueblo peoples. Further work, however, is urgent, since that already accomplished has not only contributed certain valuable facts to Southwestern archeology, but it has shown also the probability of finding, in the unknown desert regions of that section, a solution of some of the vital questions with which American anthropology has labored for many years.

By reason of the fact that Mr. James R. Murie has been engaged by the American Museum of Natural History, New York City, in connection with its ethnologic researches pertaining to the Plains Indians, his work of recording the rites and ceremonies of the Pawnee Tribe came to a close, and tentative arrangements have been made whereby the American Museum will complete the investigation and the results published by the bureau. Dr. Clark Wissler, curator of anthropology of the American Museum, has undertaken this task.

Dr A. L. Kroeber, of the University of California, continued the preparation of the Handbook of the Indians of California for publication by the bureau, and at this writing it is believed that the manuscript, with the accompanying maps and illustrations, will be submitted for publication before the close of the calendar year.

MANUSCRIPTS.

The large collection of manuscripts in possession of the bureau was augmented by the following principal items, which do not include manuscripts in process of preparation by members of the bureau's staff for publication:

Miami-French dictionary; photostat copy of the original in the John Carter Brown Library at Providence, R. I.

A number of notebooks from Dr. A. L. Kroeber, on Gros Ventre and Cheyenne-Arapaho linguistics and texts. These consist of: (*a*) Gros Ventre, 41–47, 49; (*b*) Arapaho and Cheyenne, 1–14, 21–22, 24–28, and also a catalogue of this material recorded on 3,500 cards; (*c*) 110 pages of manuscript on the same subjects.

First draft of Gatschet's Klamath Dictionary, 177 pages.

Copies of the following manuscripts, made by photostat in the bureau by the courtesy of Rev. George Worpenberg, S. J., librarian of St. Mary's College, St. Marys, Kans.:

Catéchism dans la langue Potewatèmi, A. D. 1847.

Petit Catechism en Langue Potewatemi, A. D. 1848.

Evangelia Dom, and Evangelia in Festis, and portions of the Gospels read on Sundays and certain Festivals of the Saints.

PUBLICATIONS.

The task of editing the publications of the bureau has continued in charge of Mr. J. G. Gurley, editor, assisted from time to time by Mrs. Frances S. Nichols. Following is a summary for the year:

PUBLICATIONS ISSUED.

Twenty-ninth Annual Report (1907–08). Accompanying paper: The Ethnogeography of the Tewa Indians, by John Peabody Harrington.

Thirtieth Annual Report (1908–09). Accompanying papers: Ethnobotany of the Zuñi Indians (Stevenson); An Inquiry into the Animism and Folk-lore of the Guiana Indians (Roth).

Bulletin 57. An Introduction to the Study of the Maya Hieroglyphs (Morley).

Bulletin 62. Physical Anthropology of the Lenape or Delawares, and of the Eastern Indians in General (Hrdlička).

PUBLICATIONS IN PRESS OR IN PREPARATION.

Thirty-first Annual Report (1909–10). Accompanying paper: Tsimshian Mythology (Boas).

Thirty-second Annual Report (1910–11). Accompanying paper: Seneca Fiction, Legends, and Myths (collected by Jeremiah Curtin and J. N. B. Hewitt; edited by J. N. B. Hewitt).

Thirty-third Annual Report (1911–12). Accompanying papers: Designs on Prehistoric Hopi Pottery (Fewkes); Preliminary Account of the Antiquities of the Region between the Mancos and La Plata Rivers in Southwestern Colorado (Morris); Uses of Plants by the Indians of the Nebraska Region (Gilmore); Mound Excavation in the Eastern Maya Area, with an Introduction dealing with the General Culture of the Natives (Gann).

Bulletin 40. Handbook of American Indian Languages (Boas). Part 2.

Bulletin 55. Ethnobotany of the Tewa Indians (Robbins, Harrington, Freire-Marreco).

Bulletin 59. Kutenai Tales (Boas).

Bulletin 60. Handbook of Aboriginal American Antiquities, Part 1. Introductory. The Lithic Industries: Mining, Quarrying, Manufacture (Holmes).

Bulletin 61. Teton Sioux Music (Densmore).

The distribution of the publications of the bureau has continued in immediate charge of Miss Helen Munroe, of the Smithsonian Institution, and at times by Mr. E. L. Springer, assisted from the beginning of the fiscal year until his resignation on April 15 by Mr. W. A. Humphrey, and subsequently by Miss Lana V. Schelski. Notwithstanding conditions in Europe and the impossibility of sending publications abroad except to a very limited extent, 2,235 more pub-

lications were distributed than during the previous fiscal year. This distribution may be classified as follows:

Series.	Copies.
Annual reports and separates	2,036
Bulletins and separates	9,990
Contributions to North American Ethnology—volumes and separates	18
Introductions	9
Miscellaneous publications	367
	12,420

ILLUSTRATIONS.

Mr. DeLancey Gill, illustrator, has continued in charge of the preparation of the illustrations for the publications of the bureau and of photographing the members of visiting Indian deputations to Washington, in which work he has been assisted by Mr. Albert E. Sweeney. The results accomplished in this direction are as follows:

	Number.
Photographic prints for distribution and office use	1,137
Negatives of ethnologic and archeologic subjects	126
Negative films developed from field exposures	188
Photostat prints from books and manuscripts	1,125
Mounts used	78
Proofs examined	251
Photographs retouched	43
Drawings made	187
Portrait negatives of visiting delegations (Pawnee, Sauk and Fox, Winnebago, Blackfoot, Cheyenne, Chippewa)	25

The complete editions of three colored plates, aggregating 20,000 prints, were examined at the Government Printing Office. Illustrative material for three bulletins was completed for reproduction, and progress was made on similar work for the Thirty-third Annual Report.

LIBRARY.

The library of the bureau continued in charge of Miss Ella Leary, librarian, assisted by Charles B. Newman, messenger boy. During the year 1,078 volumes were accessioned; of these 214 were purchased, 135 were acquired by gift and exchange, and 729 are volumes of serials which were entered after having been bound for the first time. The library also procured 272 pamphlets, chiefly by gift. The periodicals currently received number about 750, of which 12 are acquired by subscription and 738 by exchange. Among the more noteworthy accessions of books are 20 volumes of Bibles, Testaments, and portions of the Bible in American Indian languages. The library now contains about 21,315 volumes, 13,460 pamphlets, and several thousand unbound periodicals. There were sent to the Government Printing Office for binding, 1,338 books, pamphlets, and

serial publications, and of these all but 20 had been returned to the bureau before the close of the year.

In addition to the cataloguing of current accessions the efforts of the librarian were devoted to making a subject, author, and analytical catalogue of the books represented in the old catalogue by an imperfect author catalogue alone. In this connection special attention was given to linguistic works. From time to time Mrs. F. S. Nichols has assisted in this work, and satisfactory progress has been made.

Although maintained primarily for the use of the staff, the library is consulted more and more by students not members of the bureau, as well as by officials of the Library of Congress and of the Government departments.

COLLECTIONS.

The following collections were acquired by the bureau, by members of its staff, or by those detailed in connection with its researches, and have been transferred to the National Museum:

704 archeological objects gathered in Utah and Wyoming by Mr. Neil M. Judd. (58757.)

Collection of potsherds showing types of ornamentation, from the Nacoochee Mound, White County, Georgia, being a part of the objects gathered by the joint expedition of the Bureau of American Ethnology and Museum of the American Indian (Heye Foundation). (58819.)

170 archeological specimens collected by Mr. Gerard Fowke at the flint quarry shop sites at Crescent, St. Louis County, Missouri. (59015.)

Collection of nonhuman bones from the Nacoochee Mound, Georgia. (59017.)

A small collection of prayer-sticks from a Pueblo shrine on the summit of Langley Peak, west of the Rio Grande and south of the Rio Chama, New Mexico, presented by Mr. Robert H. Chapman. (59112.)

53 Indian potsherds and arrow points presented by Mr. Arthur L. Norman, Troup, Texas. (59252.)

Stone "collar" from Porto Rico, received by purchase from Mr. K. A. Behne, San German, Porto Rico. (59280.)

A point and tackle of a salmon spear; a halibut hook, and five small fishhooks, the gift of Mr. Robert H. Chapman. (59288.)

Set of ear perforators formerly owned by Wâthuxage of the Tsízhu Washtage gens of the Osage, presented through Mr. Francis La Flesche by Mrs. Fred Lookout. (59782.)

Sacred hawk bundle, or waxobe, of the Buffalo-face People of the Osage tribe, collected by Mr. Francis La Flesche. (59792.)

Osage war shield, collected by Mr. Francis La Flesche. (59934.)

PROPERTY.

In regard to the property of the bureau there is nothing to add to the statements presented in recent reports. The cost of necessary furniture, typewriters, and photographic and other apparatus acquired during the fiscal year was $238.54.

MISCELLANEOUS.

Quarters.—One of the rooms in the north tower occupied by the bureau force was repaired and painted, a new electric fixture installed, and the wooden casing under the exposed stairway removed and fireproofing substituted.

Personnel.—The only change in the personnel of the bureau was the resignation of Mr. William A. Humphrey, stenographer and typewriter, on April 15, 1916, and the appointment of Miss Lana V. Schelski on May 15 to fill the vacancy.

The correspondence and other clerical work of the office, in addition to that above mentioned, has been conducted by Miss Florence M. Poast, clerk to the ethnologist in charge; Miss May S. Clark, who particularly aided Mr. Bushnell in correspondence connected with the preparation of the Handbook of Aboriginal Remains; and Mrs. F. S. Nichols, who has aided the editor.

Respectfully submitted.

F. W. Hodge,
Ethnologist in Charge.

Dr. Charles D. Walcott,
Secretary of the Smithsonian Institution,
Washington, D. C.

Appendix 3.

REPORT ON THE INTERNATIONAL EXCHANGES.

Sir: I have the honor to submit the following report on the operations of the International Exchange Service during the fiscal year ending June 30, 1916.

The congressional appropriation for the support of the service during the year, including the allotment for printing and binding, was $32,200 (the same amount as appropriated for the past eight years), and the repayments from departmental and other establishments aggregated $3,678.25, making the total available resources for carrying on the system of exchanges $35,878.25.

During the year 1916 the total number of packages handled was 301,625, an increase of 25,869, as compared with the preceding year. The weight of these packages was 399,695 pounds, an increase of 31,841 pounds.

Although these figures show an increase in the amount of work carried on by the service over that for last year, both the number and weight of the packages handled are lower than for the year 1914. This reduction, however, is accounted for by the suspension of shipments to a number of countries, owing to the European war, as explained in the last report.

The number and weight of the packages of different classes are indicated in the following table:

	Packages.		Weight.	
	Sent.	Received.	Sent.	Received.
			Pounds.	*Pounds.*
United States parliamentary documents sent abroad	161,265	.....	93,458	.....
Publications received in return for parliamentary documents	.....	3,073	.....	16,938
United States departmental documents sent abroad	72,766	.....	142,415	.....
Publications received in return for departmental documents	.....	4,352	.....	8,911
Miscellaneous scientific and literary publications sent abroad	42,862	.....	84,196	.....
Miscellaneous scientific and literary publications received from abroad for distribution in the United States	.....	17,307	.....	53,777
Total	276,893	24,732	320,069	79,626
Grand total	301,625		399,695	

In connection with the above statistics, attention should be called to the fact that many returns for publications sent abroad reach their destinations direct by mail and not through the Exchange Service.

Of the 1,758 boxes used in forwarding exchanges to foreign agencies for distribution, 319 contained full sets of United States official documents for authorized depositories, and 1,439 were filled with departmental and other publications for depositories of partial sets and for miscellaneous correspondents. The total number of boxes sent abroad during 1916 was 105 more than the preceding year.

As referred to last year, the interruption to transportation facilities caused by the European war made it necessary for the International Exchange Service in August, 1914, to suspend the shipment of consignments to Austria, Belgium, Bulgaria, Germany, Hungary, Montenegro, Roumania, Russia, Serbia, and Turkey. With the exception of Germany, exchange relations with these countries are still suspended. It has been possible to arrange for the sending of several consignments to Germany through the American consul general at Rotterdam, but the Institution has not yet undertaken the regular transmission of boxes to that country. One shipment has been received from Germany, and the Institution, through the Department of State, has arranged with the British Government for the sending of consignments from Germany to this country at bimonthly intervals.

In May, 1915, as mentioned in the last report, the Institution endeavored to arrange with the Commission of International Exchanges at Petrograd for the resumption of shipments to Russia by way of Archangel, but the commission then expressed a desire to postpone the renewal of operations until after the close of the war. The commission now writes that it has been found possible to resume the forwarding of consignments either by way of Vladivostok, Russia, or Bergen, Norway. The Institution has signified its preference for the latter route, at the same time asking if shipments can be forwarded to Russia through the same port.

Through the burning at sea of the steamship *Mount Eagle*, box 125, containing publications from various governmental and scientific establishments in this country for distribution in Korea, was destroyed. Owing to a similar accident to the steamship *Athenai*, box 231, for Greece, was lost. In almost every instance the Institution was able to procure from the senders duplicate copies of the lost publications, which were duly forwarded to their destinations. In this connection it should be stated that the destruction of the above-mentioned vessels was not due to the war. Thus far only two exchange packages—each containing 12 publications—have been lost

through the sinking of steamers by war vessels, reference to which was made in the last report.

In continuation of a policy of international helpfulness, the Institution has rendered aid to governmental and scientific establishments, both in this and foreign countries, in procuring especially desired publications. One instance in particular in which the Institution extended aid during the year in procuring publications may be referred to in this connection. The Pan American Division of the American Association for International Conciliation in New York City, which was assembling a library to consist of some seven or eight thousand volumes of works of North American origin for presentation to the Museo Social Argentino at Buenos Aires, applied, through the Department of State, for a selection of publications of the United States Government and of certain scientific institutions in this country. The matter was brought to the attention of the proper establishments, and several hundred publications were received for the proposed library. The Department of State, in bringing this matter to the attention of the Institution, stated that the department attached considerable importance to the request as a potent means of furthering the best ideals of Pan Americanism.

It may be stated in this connection that it is the custom of the Government of India to refer any requests from establishments in this country for Indian official documents to the Exchange Service for indorsement before acting thereon. In such instances statistics and other information relative to the society or establishment making the request is furnished, and a proper recommendation is made in regard to the application.

The number of boxes sent to each foreign country and the dates of transmission are shown in the following table:

Consignments of exchanges for foreign countries.

Country.	Number of boxes.	Date of transmission.
ARGENTINA	51	July 21, Aug. 19, Sept. 30, Oct. 21, Nov. 26, 1915; Jan. 17, Feb. 18, Apr. 25, May 26, 1916.
BOLIVIA	6	July 16, Oct. 2, Nov. 12, Dec. 14, 1915; Feb. 3, Apr. 6, 1916.
BRAZIL	37	July 21, Aug. 19, Sept. 30, Oct. 21, Nov. 26, 1915; Jan. 17, Feb. 18, Mar. 25, May 26, 1916.
BRITISH COLONIES	23	July 3, 10, 17, 24, 31, Aug. 7, 14, 21, 28, Sept. 4, 11, 18, 25, Oct. 9, 16, 23, 30, Nov. 6, 13, 20, 30, Dec. 4, 11, 18, 1915; Jan. 28, Feb. 8, 16, 25, Mar. 8, 20, Apr. 1, 10, 18, May 2, June 5, 16, 1916.
BRITISH GUIANA	7	July 20, Aug. 20, Nov. 19, 1915; Feb. 5, Mar. 24, 1916.
CANADA	24	Aug. 10, Oct. 23, Dec. 10, 1915; Feb. 25, Mar. 28, June 2, 1916.
CHILE	23	July 21, Aug. 20, Oct. 4, Nov. 4, Dec. 3, 1915; Feb. 1, Mar. 2, Apr. 4, May 4, 1916.
CHINA	53	July 14, Aug. 12, Sept. 24, Oct. 19, Nov. 27, Dec. 15, 1915; Jan. 8, 31, Feb. 23, Mar. 8, 24, Apr. 4, 7, 13, May 6, 1916.

Consignments of exchanges for foreign countries—Continued.

Country.	Number of boxes.	Date of transmission.
COLOMBIA	11	July 16, Oct. 1, Nov. 12, Dec. 13, 1915.
COSTA RICA	12	July 16, Oct. 2, Nov. 12, Dec. 13, 1915; Feb. 2, Mar. 3, Apr. 5, 1916.
CUBA	6	Aug. 10, Oct. 23, Dec. 10, 1915; Feb. 25, Mar. 28, June 2, 1916.
DENMARK	33	July 2, Aug. 3, Sept. 9, Oct. 9, 28, Nov. 16, 30, 1915; Jan. 16, Mar. 17, June 10, 1916.
ECUADOR	8	July 16, Aug. 17, Oct. 2, Nov. 12, Dec. 14, 1915; Mar. 4, Apr. 7, 1916.
EGYPT	10	July 28, Aug. 24, Oct. 6, Nov. 9, Dec. 8, 1915; Feb. 5, May 26, 1916.
FRANCE	154	July 14, 29, Aug. 16, 25, Sept. 25, Oct. 14, Nov. 2, 19, Dec. 4, 1915; Jan. 28, Feb. 12, Mar. 14, Apr. 14, May 25, 1916.
GERMANY	137	Aug. 14, 1915; Jan. 19, June 9, 1916.
GREAT BRITAIN AND IRELAND	392	July 3, 10, 17, 24, 31, Aug. 7, 14, 21, 28, Sept. 4, 11, 18, 25, Oct. 9, 16, 23, Nov. 6, 13, 20, 30, Dec. 4, 11, 18, 1915; Jan. 20, 28, Feb. 8, 16, 25, Mar. 8, 20, Apr. 1, 10, 17, May 2, June 5, 1916.
GREECE	9	July 28, Aug. 28, Oct. 6, Nov. 12, Dec. 11, 1915; Jan. 25, 1916.
GUATEMALA	6	July 20, Oct. 6, Nov. 16, Dec. 14, 1915; Mar. 4, Apr. 6, 1916.
HAITI	6	Aug. 10, Oct. 23, Dec. 10, 1915; Feb. 25, Mar. 28, June 2, 1916.
HONDURAS	4	July 20, Oct. 6, 1915; Feb. 3, Apr. 6, 1916.
INDIA	54	July 10, 17, 24, 31, Aug. 7, 14, 21, 28, Sept. 4, 11, 25, Oct. 9, 16, 23, 30, Nov. 6, 13, 20, 30, Dec. 4, 11, 18, 1915; Jan. 28, Feb. 8, 16, 25, Mar. 8, 20, Apr. 1, 10, 17, May 2, June 5, 16, 1916.
ITALY	94	July 13, Aug. 25, Sept. 25, Oct. 13, Nov. 2, 18, Dec. 6, 1915; Jan. 21, Feb. 12, Mar. 14, Apr. 12, May 25, 1916.
JAMAICA	6	July 29, Sept. 28, Nov. 5, Dec. 15, 1915; Feb. 4, Apr. 7, 1916.
JAPAN	50	July 5, Aug. 3, Sept. 11, Oct. 9, Nov. 9, Dec. 9, 1915; Jan. 29, Feb. 29, Mar. 29, Apr. 29, 1916.
KOREA	3	July 28, Sept. 28, Oct. 23, 1915.
LIBERIA	3	July 29, Sept. 28, Dec. 15, 1915.
LOURENÇO MARQUEZ	1	July 28, 1915.
MEXICO	6	Aug. 10, Oct. 23, Dec. 10, 1915; Feb. 25, Mar. 28, June 2, 1916.
NETHERLANDS	46	July 15, 27, Aug. 14, 17, 25, Sept. 28, Oct. 13, Nov. 3, Dec. 2, 1915; Jan. 21, Feb. 21, Apr. 1, May 2, 1916.
NEW SOUTH WALES	34	July 8, Aug. 10, Sept. 23, Oct. 20, Nov. 23, 1915; Jan. 14, Feb. 14, Mar. 15, Apr. 20, 1916.
NEW ZEALAND	28	July 13, Aug. 12, Sept. 24, Oct. 20, Nov. 23, 1915; Jan. 15, Feb. 14, Mar. 15, Apr. 21, 1916.
NICARAGUA	4	July 20, Oct. 6, Nov. 16, 1915; Apr. 6, 1916.
NORWAY	26	July 2, Aug. 3, Sept. 9, Oct. 9, Nov. 9, Dec. 8, 1915; Jan. 25, Mar. 7, Apr. 17, 1916.
PARAGUAY	7	July 29, Oct. 2, Nov. 16, Dec. 14, 1915; Feb. 3, Apr. 7, 1916.
PERU	30	July 21, Aug. 20, Oct. 4, Dec. 3, 1915; Feb. 1, Mar. 2, Apr. 4, May 4, 1916.
PORTUGAL	20	July 2, Aug. 3, Sept. 9, Oct. 9, Nov. 9, Dec. 8, 1915; Jan. 25, Mar. 7, Apr. 11, June 16, 1916.
QUEENSLAND	16	July 2, Aug. 12, Sept. 24, Oct. 20, Nov. 23, 1915; Jan. 15, Feb. 14, Mar. 15, Apr. 21, 1916.
SALVADOR	6	July 20, Oct. 6, Nov. 16, Dec. 14, 1915; Mar. 4, Apr. 6, 1916.
SIAM	5	July 28, Sept. 28, Dec. 7, 1915; Apr. 7, Feb. 4, 1916.
SOUTH AUSTRALIA	24	July 8, Aug. 10, Sept. 23, Oct. 20, Nov. 23, 1915; Jan. 14, Feb. 14, Mar. 15, Apr. 20, 1916.
SPAIN	40	July 7, Aug. 10, Sept. 22, Oct. 19, Dec. 2, 1915; Jan. 21, Feb. 21, Mar. 29, Apr, 28, June 10, 1916.

Consignments of exchanges for foreign countries—Continued.

Country.	Number of boxes.	Date of transmission.
SWEDEN	49	July 27, Aug. 24, Sept. 15, Oct. 18, Nov. 24, 1915; Jan. 15, Feb. 17, Mar. 17, Apr. 22, 1916.
SWITZERLAND	50	Sept. 24, Oct. 13, Nov. 3, Dec. 3, 1915; Jan. 15, Feb. 18, Mar. 24, Apr. 24, June 8, 1916.
TASMANIA	20	July 3, 10, 17, 24, 31, Aug. 7, 14, 21, 28, Sept. 4, 11, 18, 25, Oct. 9, 16, 30, Nov. 6, 13, 20, 30, Dec. 4, 11, 18 1915; Jan. 28, Feb. 8, 16, 25, Mar. 8, 20, Apr. 1, 10, 18, May 2, June 5, 16, 1916.
TRINIDAD	3	July 29, Sept. 28, Dec. 15, 1915.
UNION OF SOUTH AFRICA	34	July 27, Aug. 25, Nov. 5, Dec. 6, 1915; Feb. 5, Mar. 8, Apr. 11, 1916,
URUGUAY	17	July 21, Aug. 20, Oct. 4, Nov. 12, Dec. 13, 1915; Feb. 2, Mar. 3. Apr. 5, 1916.
VENEZUELA	13	July 16, Oct. 2, Nov. 12, Dec. 13, 1915; Feb. 2, Mar. 8, Apr. 5, 1916.
VICTORIA	35	July 8, Aug. 10, 19, Sept. 23, Oct. 20, Nov. 23, 1915; Jan. 14, Feb. 14, Mar. 15, Apr. 20, 1916.
WESTERN AUSTRALIA	20	July 3, 10, 17, 24, 31, Aug. 7, 14, 21, 28, Sept. 4, 11, 18, 25, Oct. 9, 16, 23, 30, Nov. 6, 13, 20, 30, Dec. 4, 11, 18, 1915; Jan. 28, Feb. 8, 16, 25, Mar. 8, 20, Apr. 1, 10, 18, May 2, June 5, 16, 1916.
WINDWARD AVD LEEWARD ISLANDS.	2	July 29, Sept. 28, 1915,

FOREIGN DEPOSITORIES OF UNITED STATES GOVERNMENTAL DOCUMENTS.

The number of sets of the United States official publications regularly forwarded to foreign countries in accordance with treaty stipulations and under the authority of the congressional resolutions of March 2, 1867, and March 2, 1901, has been reduced from 92 to 91—the series sent to the Government of Bombay having been discontinued at the latter's request. In asking that these shipments be discontinued, the secretary to the Government of Bombay stated that it would in no way affect the transmission of the reports of his Government for deposit in the Library of Congress.

The recipients of the 55 full and 36 partial sets are as follows:

DEPOSITORIES OF FULL SETS.

ARGENTINA: Ministerio de Relaciones Exteriores, Buenos Aires.
AUSTRALIA: Library of the Commonwealth Parliament, Melbourne.
AUSTRIA: K. K. Statistische Zentral-Kommission, Vienna.
BADEN: Universitäts-Bibliothek, Freiburg. (Depository of the Grand Duchy of Baden.)
BAVARIA: Königliche Hof- und Staats-Bibliothek, Munich.
BELGIUM: Bibliothèque Royale, Brussels.
BRAZIL: Bibliotheca Nacional, Rio de Janeiro.
BUENOS AIRES: Biblioteca de la Universidad Nacional de La Plata. (Depository of the Province of Buenos Aires.)
CANADA: Library of Parliament, Ottawa.

CHILE: Biblioteca del Congreso Nacional, Santiago.
CHINA: American-Chinese Publication Exchange Department, Shanghai Bureau of Foreign Affairs, Shanghai.
COLOMBIA: Biblioteca Nacional, Bogotá.
COSTA RICA: Oficina de Depósito y Canje Internacional de Publicaciones, San José.
CUBA: Secretaria de Estado (Asuntos Generales y Canje Internacional), Habana.
DENMARK: Kongelige Bibliotheket, Copenhagen.
ENGLAND: British Museum, London.
FRANCE: Bibliothèque Nationale, Paris.
GERMANY: Deutsche Reichstags-Bibliothek, Berlin.
GLASGOW: City Librarian, Mitchell Library, Glasgow.
GREECE: Bibliothèque Nationale, Athens.
HAITI: Secrétaire d'État des Relations Extérieures, Port au Prince.
HUNGARY: Hungarian House of Delegates, Budapest.
INDIA: Department of Education (Books), Government of India, Calcutta.
IRELAND: National Library of Ireland, Dublin.
ITALY: Biblioteca Nazionale Vittorio Emanuele, Rome.
JAPAN: Imperial Library of Japan, Tokyo.
LONDON: London School of Economics and Political Science. (Depository of the London County Council.)
MANITOBA: Provincial Library, Winnipeg.
MEXICO: Instituto Bibliográfico, Biblioteca Nacional, Mexico.
NETHERLANDS: Library of the States General, The Hague.
NEW SOUTH WALES: Public Library of New South Wales, Sydney.
NEW ZEALAND: General Assembly Library, Wellington.
NORWAY: Storthingets Bibliothek, Christiania.
ONTARIO: Legislative Library, Toronto.
PARIS: Préfecture de la Seine.
PERU: Biblioteca Nacional, Lima.
PORTUGAL: Bibliotheca Nacional, Lisbon.
PRUSSIA: Königliche Bibliothek, Berlin.
QUEBEC: Library of the Legislature of the Province of Quebec, Quebec.
QUEENSLAND: Parliamentary Library, Brisbane.
RUSSIA: Imperial Public Library, Petrograd.
SAXONY: Königliche Oeffentliche Bibliothek, Dresden.
SERBIA: Section Administrative du Ministère des Affaires Étrangères, Belgrade.
SOUTH AUSTRALIA: Parliamentary Library, Adelaide.
SPAIN: Servicio del Cambio Internacional de Publicaciones, Cuerpo Facultativo de Archiveros, Bibliotecarios y Arqueólogos, Madrid.
SWEDEN: Kungliga Biblioteket, Stockholm.
SWITZERLAND: Bibliothèque Fédérale, Berne.
TASMANIA: Parliamentary Library, Hobart.
TURKEY: Department of Public Instruction, Constantinople.
UNION OF SOUTH AFRICA: State Library, Pretoria, Transvaal.
URUGUAY: Oficina de Canje Internacional de Publicaciones, Montevideo.
VENEZUELA: Biblioteca Nacional, Caracas.
VICTORIA: Public Library, Melbourne.
WESTERN AUSTRALIA: Public Library of Western Australia, Perth.
WÜRTTEMBERG: Königliche Landesbibliothek, Stuttgart.

DEPOSITORIES OF PARTIAL SETS.

ALBERTA: Provincial Library, Edmonton.
ALSACE-LORRAINE: K. Ministerium für Elsass-Lothringen, Strassburg.
BOLIVIA: Ministerio de Colonización y Agricultura, La Paz.
BREMEN: Senatskommission für Reichs- und Auswärtige Angelegenheiten.
BRITISH COLUMBIA: Legislative Library, Victoria.
BRITISH GUIANA: Government Secretary's Office, Georgetown, Demerara.
BULGARIA: Minister of Foreign Affairs, Sofia.
CEYLON: Colonial Secretary's Office (Record Department of the Library), Colombo.
ECUADOR: Biblioteca Nacional, Quito.
EGYPT: Bibliothèque Khédiviale, Cairo.
FINLAND: Chancery of Governor, Helsingfors.
GUATEMALA: Secretary of the Government, Guatemala.
HAMBURG: Senatskommission für die Reichs- und Auswärtigen Angelegenheiten.
HESSE: Grossherzogliche Hof-Bibliothek, Darmstadt.
HONDURAS: Secretary of the Government, Tegucigalpa.
JAMAICA: Colonial Secretary, Kingston.
LIBERIA: Department of State, Monrovia.
LOURENÇO MARQUEZ: Government Library, Lourenço Marquez.
LÜBECK: President of the Senate.
MADRAS, PROVINCE OF: Chief Secretary to the Government of Madras, Public Department, Madras.
MALTA: Lieutenant Governor, Valetta.
MONTENEGRO: Ministère des Affaires Étrangères, Cetinje.
NEW BRUNSWICK: Legislative Library, Fredericton.
NEWFOUNDLAND: Colonial Secretary, St. Johns.
NICARAGUA: Superintendente de Archivos Nacionales, Managua.
NORTHWEST TERRITORIES: Government Library, Regina.
NOVA SCOTIA: Provincial Secretary of Nova Scotia, Halifax.
PANAMA: Secretaria de Relaciones Exteriores, Panama.
PARAGUAY: Oficina General de Inmigracion, Asuncion.
PRINCE EDWARD ISLAND: Legislative Library, Charlottetown.
ROUMANIA: Academia Romana, Bucharest.
SALVADOR: Ministerio de Relaciones Exteriores, San Salvador.
SIAM: Department of Foreign Affairs, Bangkok.
STRAITS SETTLEMENTS: Colonial Secretary, Singapore.
UNITED PROVINCES OF AGRA AND OUDH: Under Secretary to Government, Allahabad.
VIENNA: Bürgermeister der Haupt- und Residenz-Stadt.

INTERPARLIAMENTRY EXCHANGE OF OFFICIAL JOURNALS.

The Governments of Bolivia, Peru, and Venezuela were added to those countries with which the immediate exchange of official parliamentary journals is carried on. Following is a complete list of the Governments to which the Congressional Record is now sent:

Argentine Republic.
Australia.
Austria.
Baden.
Belgium.
Bolivia.
Brazil.
Buenos Aires, Province of.
Canada.
Costa Rica.

Cuba.
Denmark.
France.
Great Britain.
Greece.
Guatemala.
Honduras.
Hungary.
Italy.
Liberia.
New South Wales.
New Zealand.
Peru.
Portugal.
Prussia.
Queensland.
Roumania.
Russia.
Serbia.
Spain.
Switzerland.
Transvaal.
Union of South Africa.
Uruguay.
Venezuela.
Western Australia.

It will therefore be seen that there are now 36 countries with which this exchange is conducted. To some of these countries two copies of the Congressional Record are sent—one to the Upper and one to the Lower House of Parliament—the total number transmitted being 41.

LIST OF BUREAUS OR AGENCIES THROUGH WHICH EXCHANGES ARE TRANSMITTED.

The following is a list of the bureaus or agencies through which exchanges are transmitted:

ALGERIA, *via* France.
ANGOLA, *via* Portugal.
ARGENTINA: Comisión Protectora de Bibliotecas Populares, Santa Fé 880, Buenos Aires.
AUSTRIA: K. K. Statistische Zentral-Kommission, Vienna.
AZORES, *via* Portugal.
BELGIUM: Service Belge des Échanges Internationaux, Rue des Longs-Chariots 46, Brussels.
BOLIVIA: Oficina Nacional de Estadística, La Paz.
BRAZIL: Serviço de Permutações Internacionaes, Bibliotheca Nacional, Rio de Janeiro.
BRITISH COLONIES: Crown Agents for the Colonies, London.
BRITISH GUIANA: Royal Agricultural and Commercial Society, Georgetown.
BRITISH HONDURAS: Colonial Secretary, Belize.
BULGARIA: Institutions Scientifiques de S. M. le Roi de Bulgarie, Sofia.
CANARY ISLANDS, *via* Spain.
CHILE: Servicio de Canjes Internacionales, Biblioteca Nacional, Santiago.
CHINA: American-Chinese Publication Exchange Department, Shanghai Bureau of Foreign Affairs, Shanghai.
COLOMBIA: Oficina de Canjes Internacionales y Reparto, Biblioteca Nacional, Bogotá.
COSTA RICA: Oficina de Depósito y Canje Internacional de Publicaciones, San José.
DENMARK: Kongelige Danske Videnskabernes Selskab, Copenhagen.
DUTCH GUIANA: Surinaamsche Koloniale Bibliotheek, Paramaribo.
ECUADOR: Ministerio de Relaciones Exteriores, Quito.
EGYPT: Government Publications Office, Printing Department, Cairo.
FRANCE: Service Français des Échanges Internationaux, 110 Rue de Grenelle, Paris.

GERMANY: Amerika-Institut, Berlin, N. W. 7.
GREAT BRITAIN AND IRELAND: Messrs. William Wesley & Son, 28 Essex Street, Strand, London.
GREECE: Bibliothèque Nationale, Athens.
GREENLAND, *via* Denmark.
GUADELOUPE, *via* France.
GUATEMALA: Instituto Nacional de Varones, Guatemala.
GUINEA, *via* Portugal.
HAITI: Secrétaire d'État des Relations Extérieures, Port au Prince.
HONDURAS: Biblioteca Nacional, Tegucigalpa.
HUNGARY: Dr. Julius Pikler, Municipal Office of Statistics, Váci-utca 80, Budapest.
ICELAND, *via* Denmark.
INDIA: India Store Department, India Office, London.
ITALY: Ufficio degli Scambi Internazionali, Biblioteca Nazionale Vittorio Emanuele, Rome.
JAMAICA: Institute of Jamaica, Kingston.
JAPAN: Imperial Library of Japan, Tokyo.
JAVA, *via* Netherlands.
KOREA: Government General, Keijo.
LIBERIA: Bureau of Exchanges, Department of State, Monrovia.
LOURENÇO MARQUEZ: Government Library, Lourenço Marquez.
LUXEMBURG, *via* Germany.
MADAGASCAR, *via* France.
MADEIRA, *via* Portugal.
MONTENEGRO: Ministère des Affaires Étrangères, Cetinje.
MOZAMBIQUE, *via* Portugal.
NETHERLANDS: Bureau Scientifique Central Néerlandais, Bibliothèque de l'Université, Leyden.
NEW GUINEA, *via* Netherlands.
NEW SOUTH WALES: Public Library of New South Wales, Sydney.
NEW ZEALAND: Dominion Museum, Wellington.
NICARAGUA: Ministerio de Relaciones Exteriores, Managua.
NORWAY: Kongelige Norske Frederiks Universitet Bibliotheket, Christiania.
PANAMA: Secretaria de Relaciones Exteriores, Panama.
PARAGUAY: Servicio de Canje Internacional de Publicaciones, Sección Consular y de Comercio, Ministerio de Relaciones Exteriores, Asuncion.
PERSIA: Board of Foreign Missions of the Presbyterian Church, New York City.
PERU: Oficina de Reparto, Depósito y Canje Internacional de Publicaciones, Ministerio de Fomento, Lima.
PORTUGAL: Serviço de Permutações Internacionaes, Inspecção Geral das Bibliothecas e Archivos Publicos, Lisbon.
QUEENSLAND: Bureau of Exchanges of International Publications, Chief Secretary's Office, Brisbane.
ROUMANIA: Academia Romana, Bucharest.
RUSSIA: Commission Russe des Échanges Internationaux, Bibliothèque Imperiale Publique, Petrograd.
SALVADOR: Ministerio de Relaciones Exteriores, San Salvador.
SERBIA: Section Administrative du Ministère des Affaires Étrangères, Belgrade.
SIAM: Department of Foreign Affairs, Bangkok.
SOUTH AUSTRALIA: Public Library of South Australia, Adelaide.
SPAIN: Servicio del Cambio Internacional de Publicaciones, Cuerpo Facultativo de Archiveros, Bibliotecarios y Arqueólogos, Madrid.

SUMATRA, *via* Netherlands.
SWEDEN: Kongliga Svenska Vetenskaps Akademien, Stockholm.
SWITZERLAND: Service des Échanges Internationaux, Bibliothèque Fédérale Centrale, Berne.
SYRIA: Board of Foreign Missions of the Presbyterian Church, New York.
TASMANIA: Secretary to the Premier, Hobart.
TRINIDAD: Royal Victoria Institute of Trinidad and Tobago, Port-of-Spain.
TUNIS, *via* France.
TURKEY: American Board of Commissioners for Foreign Missions, Boston.
UNION OF SOUTH AFRICA: Government Printing Works, Pretoria, Transvaal.
URUGUAY: Oficina de Canje Internacional, Montevideo.
VENEZUELA: Biblioteca Nacional, Caracas.
VICTORIA: Public Library of Victoria, Melbourne.
WESTERN AUSTRALIA: Public Library of Western Australia, Perth.
WINDWARD AND LEEWARD ISLANDS: Imperial Department of Agriculture, Bridgetown, Barbados.

Respectfully submitted.

C. W. SHOEMAKER,
Chief Clerk, International Exchange Service.

Dr. CHARLES D. WALCOTT,
Secretary of the Smithsonian Institution.

AUGUST 23, 1916.

Appendix 4.

REPORT ON THE NATIONAL ZOOLOGICAL PARK.

Sir: I have the honor to present below a report concerning the operations of the National Zoological Park for the fiscal year ending June 30, 1916.

There was allowed by Congress the sum of $100,000 for all purposes, except printing, for which $200 additional was granted.

The European war has had a marked effect upon the cost of living animals. Not only are the prices higher, but transportation is more difficult and therefore more expensive. Many of the regular dealers have been obliged to withdraw from the business. Notwithstanding these difficulties the National Zoological Park has maintained its collection fairly well, and remains at about the same level in numbers as last year. There are, indeed, some 15 species in the park not previously exhibited here. A careful estimate of the value of the animals in the collection shows that it must be at least $90,000, at the prevailing market prices. The value of the buildings is estimated at $210,000.

ACCESSIONS.

Births, 101 in number, included 5 American bison, deer of 11 species, a yak, a South American tapir, a Bactrian camel, 2 monkeys, some other mammals, and a few birds.

Gifts.—The most important of these was four elands and four Kashmir deer received from the Duke of Bedford at Woburn Abbey, England. Three fawns were born from the deer during their transit. The complete list of the donors and gifts is as follows:

Mr. Edward Anderson, jr., Tucson, Ariz., a desert lynx.
Miss Maude Anderson, Washington, D. C., a common canary.
Miss Marian Ashby, Washington, D. C., a barred owl.
Mr. O. E. Baynard, Clearwater, Fla., two barred owls.
The Duke of Bedford, Woburn Abbey, England, four elands and four Kashmir deer.
Bureau of Biological Survey, an American marten.
Mr. Robert Burrows, Washington, D. C., two alligators.
Miss Argine Carusi, Washington, D. C., an alligator.
Mr. Austin M. Cooper, Washington, D. C., a tarantula.
Mr. E. J. Court, Washington, D. C., a great horned owl.
Mr. Blaine Elkins, Washington, D. C., two raccoons.
Mr. W. C. Emery, Washington, D. C., a copperhead snake.

Mr. Victor J. Evans, Washington, D. C., three marmosettes.
Mr. George Field, Washington, D. C., a Texan armadillo.
Mr. Marcus A. Hanna, Washington, D. C., a copperhead snake.
Mr. G. M. Haynes, Washington, D. C., an alligator.
Mr. Ross Hazeltine, United States Consular Service, an ocelot.
Mrs. Mary F. Henderson, Washington, D. C., two grass parrakeets and a canary.
Mrs. Robert Hitt, Washington, D. C., a bare-eyed cockatoo.
Mr. G. C. Hogan, Comorn, Va., a gray fox.
Mr. George Howell, Washington, D. C., two alligators.
Mr. R. C. Huey, Hot Springs, Ark., a dusky wolf.
Miss Juergens, Washington, D. C., an alligator.
Miss Annie Lee Knight, Washington, D. C., a gray fox.
Mr. J. C. Lamon, Knoxville, Tenn., a black snake.
Mr. T. P. Lovering, Washington, D. C., a king snake.
Mr. S. Lyons, Washington, D. C., two alligators.
Mr. Vinson McLean, Washington, D. C., a gray parrot, a macaw, and a great red-crested cockatoo.
Mr. Lee S. Page, Washington, D. C., an alligator.
Hon. Frank Park, M. C., Sylvester, Ga., at request of late Senator Bacon, three fox squirrels.
Mr. Robert Portner, Washington, D. C., an alligator.
Mr. C. S. Rockwood, Washington, D. C., an alligator.
Mr. Baynard Schindel, Washington, D. C., an alligator.
Dr. R. W. Shufeldt, Washington, D. C., a black snake.
Mr. J. H. Steig, Washington, D. C., a black snake.
Dr. J. R. Stewart, Washington, D. C., a woodchuck.
Mrs. F. H. Talkes, Washington, D. C., a parrot.
Mrs. R. B. Tingsley, Washington, D. C., an alligator.
Mr. C. V. R. Townsend, Munising, Mich., a coyote.
Hon. Woodrow Wilson, Washington, D. C., two bald eagles.
Unknown donor, an alligator.
Unknown donor, two cardinals, one common mocking bird, one brown thrasher.

Exchanges.—The possession of a considerable number of surplus animals made it possible for the park to profit by 187 exchanges. Among the important acquisitions were a pair of young lions from the Department of Parks, New York City, a male guanaco from the Philadelphia Zoological Garden, a chimpanzee, a fine pair of Siberian tigers, a nilgai, a pair of mule deer, a pair of Columbian black-tailed deer, a great red kangaroo, several monkeys and other mammals, a secretary vulture, and a considerable number of other birds.

The chimpanzee was new to the collection and is a very intelligent and interesting male about 4½ years old, from the forests of French Congo. He is an object of great interest to the public and attracts much attention every day, especially when at his meals, as he has been taught to sit in a chair at a table, eat with a fork and drink out of a glass. As there was no conveniently available cage for him in the monkey house, special quarters have been provided in the lion house, in a corner where he is shielded from drafts of air. In

order to prevent feeding by visitors a glass screen was erected between this cage and the public space. Pure air is provided by a duct leading from the outside of the building suitably warmed by a heating coil. He has made himself entirely at home there, appears happy, contented, and quite healthy. A larger, more spacious cage will be constructed for occupation during hot weather, where he can be more satisfactorily seen.

From Yellowstone National Park.—Two black timber wolves, interesting from their rarity, were transferred from the Yellowstone Park.

Captured.—A raccoon, possibly a wild one, but more probably one that had escaped, was caught in a trap.

Loaned.—3 mink and 7 martens were temporarily loaned, also 1 monkey and a parrot.

LOSSES.

Among the most important losses was that of the young male African elephant, Jumbo II, a beautiful, active animal that was bought from the Government Zoological Garden at Giza, Egypt, in 1913. He was then about 4 years old. The death of this valuable animal was entirely unexpected, as he had always seemed in excellent health. A post-mortem examination, made by veterinarians from the Bureau of Animal Industry, revealed a rupture of the stomach, a tear 7 inches in length occurring along the great curvature. Escape of the stomach contents had caused an acute peritonitis. The cause of this rupture is quite obscure. The diet of the animal had not been changed either in quantity or quality, and the stomach had not been overdistended by food. Nor did an examination of the discharged material reveal any substances that might have occasioned an active fermentation with considerable evolution of gas. The other viscera showed no gross pathologic changes.

Other losses were a male lion, from softening of the brain, a fur seal, a male California sea lion, a black leopard, from old age, a male American bison, from pneumonia, a male and female nilgai, from generalized tuberculosis; 38 animals were lost from attacks by cage mates, by dogs (directly or indirectly), or through other accidents. Amebic dysentery attacked some spider monkeys, recently received, and caused the death of six of these animals. Post-mortem examinations were made, as usual, by the Pathological Division of the Bureau of Animal Industry, Department of Agriculture.[1]

[1] The causes of death were reported to be as follows: Enteritis, 24; gastroenteritis, 4; amebic dysentery, 6; fermentation colic, 1; intestinal coccidiosis, 1; cercomoniasis, 1; pneumonia, 15; tuberculosis, 14; congestion of lungs, 3; pulmonary edema, 1; asthma, 1; aspergillosis, 4; pyemia, 3; septicemia, 1; toxemia, 1; pericarditis, 1; hepatitis, 3; fatty degeneration of kidneys, 1; gangrene of cecum, 1; necrosis of rectum, 1; softening of brain, 1; hematoma of liver, 1; tumor, 1; anemia, 2; rupture of stomach, 1; no sufficient cause found, 17; not fit for examination, 3.

ANIMALS IN THE COLLECTION JUNE 30, 1916.

MAMMALS.

Chimpanzee (*Pan troglodytes*) 1
Mona monkey (*Cercopithecus mona*) 3
Patas monkey (*Cercopithecus patas*) 2
Diana monkey (*Cercopithecus diana*) 1
Bonnet monkey (*Macacus sinicus*) 1
Macaque monkey (*Macacus cynomolgus*) 2
Pig-tailed monkey (*Macacus nemestrinus*) 3
Rhesus monkey (*Macacus rhesus*) 29
Brown macaque (*Macacus arctoides*) 2
Japanese monkey (*Macacus fuscatus*) 3
Moor macaque (*Macacus maurus*) 1
Chacma (*Papio porcarius*) 1
Guinea baboon (*Papio papio*) 4
Yellow baboon (*Papio cynocephalus*) 1
Hamadryas baboon (*Papio hamadryas*) 2
Mandrill (*Papio sphinx*) 1
White-throated capuchin (*Cebus hypoleucus*) 2
Brown capuchin (*Cebus fatuellus*) 1
Gray spider-monkey (*Ateles geoffroyi*) 5
Marmosette (*Hapale jacchus*) 3
Mongoose lemur (*Lemur mongoz*) 1
Black lemur (*Lemur macaco*) 1
Polar bear (*Thalarctos maritimus*) 2
European brown bear (*Ursus arctos*) 2
Kadiak bear (*Ursus middendorffi*) 1
Yakutat bear (*Ursus dalli*) 1
Alaskan brown bear (*Ursus gyas*) 2
Kidder's bear (*Ursus kidderi*) 2
Hybrid bear (*Ursus kidderi-arctos*) 2
Himalayan bear (*Ursus thibetanus*) 1
Japanese bear (*Ursus japonicus*) 1
Grizzly bear (*Ursus horribilis*) 3
Black bear (*Ursus americanus*) 6
Cinnamon bear (*Ursus americanus*) 2
Sloth bear (*Melursus ursinus*) 1
Kinkajou (*Cercoleptes caudivolvulus*) 1
Cacomistle (*Bassariscus astuta*) 1
Gray coatimundi (*Nasua narica*) 4
Raccoon (*Procyon lotor*) 13
American badger (*Taxidea taxus*) 2
European badger (*Meles taxus*) 2
Common skunk (*Mephitis putida*) 2
Tayra (*Galictis barbara*) 1
American marten (*Mustela americana*) 9
Fisher (*Mustela pennantii*) 1
Mink (*Putorius vison*) 8
Common ferret (*Putorius putorius*) 1
North American otter (*Lutra canadensis*) 5
Eskimo dog (*Canis familiaris*) 4
Dingo (*Canis dingo*) 1
Gray wolf (*Canis occidentalis*) 6
Dusky wolf (*Canis nubilus*) 1
Coyote (*Canis latrans*) 3
Woodhouse's coyote (*Canis frustror*) 2
Red fox (*Vulpes pennsylvanicus*) 4
Swift fox (*Vulpes velox*) 1
Arctic fox (*Vulpes lagopus*) 1
Gray fox (*Urocyon cinereo-argenteus*) 5
Spotted hyena (*Hyæna crocuta*) 1
African civet (*Viverra civetta*) 1
Common genet (*Genetta genetta*) 1
Cheetah (*Cynailurus jubatus*) 2
Sudan lion (*Felis leo*) 5
Bengal tiger (*Felis tigris*) 2
Siberian tiger (*Felis tigris longipilis*) 2
Puma (*Felis oregonensis hippolestes*) 4
Jaguar (*Felis onca*) 1
Leopard (*Felis pardus*) 3
Ocelot (*Felis pardalis*) 1
Canada lynx (*Lynx canadensis*) 3
Bay lynx (*Lynx rufus*) 7
Spotted lynx (*Lynx rufus texensis*) 2
California lynx (*Lynx rufus californicus*) 1
Florida lynx (*Lynx rufus floridanus*) 1
Steller's sea lion (*Eumetopias stelleri*) 1
California sea lion (*Zalophus californianus*) 1
Harbor seal (*Phoca vitulina*) 1
Fox squirrel (*Sciurus niger*) 9
Western fox squirrel (*Sciurus ludovicianus*) 11
Gray squirrel (*Sciurus carolinensis*) 40
Black squirrel (*Sciurus carolinensis*) 20
Albino squirrel (*Sciurus carolinensis*) 1
Thirteen-lined spermophile (*Spermophilus tridecimlineatus*) 2
Prairie dog (*Cynomys ludovicianus*) 9
Woodchuck (*Marmota monax*) 1
American beaver (*Castor canadensis*) 2
Coypu (*Myocastor coypus*) 2
European porcupine (*Hystrix cristata*) 3
Indian porcupine (*Hystrix leucura*) 1
Viscacha (*Lagostomus trichodactylus*) 1
Mexican agouti (*Dasyprocta mexicana*) 1
Azara's agouti (*Dasyprocta azaræ*) 1
Crested agouti (*Dasyprocta cristata*) 2
Hairy-rumped agouti (*Dasyprocta prymnolopha*) 4
Paca (*Cœlogenys paca*) 2
Guinea pig (*Cavia cutleri*) 13
Patagonian cavy (*Dolichotis patagonica*) 2
Cottontail rabbit (*Lepus sylvaticus*) 2
Domestic rabbit (*Lepus cuniculus*) 15
African elephant (*Elephas oxyotis*) 1
Indian elephant (*Elephas maximus*) 1
Brazilian tapir (*Tapirus americanus*) 4
Mongolian horse (*Equus przewalskii*) 1
Grevy's zebra (*Equus grevyi*) 2
Zebra-horse hybrid (*Equus grevyi-caballus*) 1
Zebra-donkey hybrid (*Equus grevyi-asinus*) 1
Grant's zebra (*Equus burchelli granti*) 1
Collared peccary (*Dicotyles angulatus*) 2
Wild boar (*Sus scrofa*) 1
Northern wart-hog (*Phacochœrus africanus*) 2
Hippopotamus (*Hippopotamus amphibius*) 2
Guanaco (*Lama huanachus*) 3
Llama (*Lama glama*) 8
Alpaca (*Lama pacos*) 2
Vicugna (*Lama vicugna*) 1
Bactrian camel (*Camelus bactrianus*) 3
Arabian camel (*Camelus dromedarius*) 4
Sambar deer (*Cervus unicolor*) 2
Philippine deer (*Cervus philippinus*) 1
Hog deer (*Cervus porcinus*) 9
Barasingha deer (*Cervus duvaucelii*) 13
Axis deer (*Cervus axis*) 8
Japanese deer (*Cervus sika*) 6
Kashmir deer (*Cervus cashmirianus*) 7
Red deer (*Cervus elaphus*) 10
American elk (*Cervus canadensis*) 8
Fallow deer (*Cervus dama*) 7
Virginia deer (*Odocoilcus virginianus*) 13
Mule deer (*Odocoilcus hemionus*) 4
Columbian black-tailed deer (*Odocoileus columbianus*) 5
Cuban deer (*Odocoilcus sp.*) 1
Blessbok (*Damaliscus albifrons*) 1
White-tailed gnu (*Connochætes gnu*) 1
Defassa water buck (*Cobus defassa*) 1
Indian antelope (*Antilope cervicapra*) 4
Arabian gazelle (*Gazella arabica*) 2
Sable antelope (*Hippotragus niger*) 1
Nilgai (*Boselaphus tragocamelus*) 2
Congo harnessed antelope (*Tragelaphus gratus*) 2
Eland (*Taurotragus oryx livingstonii*) 4

Tahr (*Hemitragus jemlaicus*)	3
Circassian goat (*Capra hircus*)	4
Barbary sheep (*Ovis tragelaphus*)	12
Barbados sheep (*Ovis aries-tragelaphus*)	8
Anoa (*Anoa depressicornis*)	1
Zebu (*Bibos indicus*)	2
Yak (*Poephagus grunniens*)	4
American bison (*Bison americanus*)	17
Hairy armadillo (*Dasypus villosus*)	3
Great gray kangaroo (*Macropus giganteus*)	1
Wallaroo (*Macropus robustus*)	2
Red kangaroo (*Macropus rufus*)	3
Bennett's wallaby (*Macropus ruficollis bennetti*)	1
Phalanger (*Trichosurus vulpecula*)	2
Virginia opossum (*Didelphys marsupialis*)	1

BIRDS.

Mocking bird (*Mimus polyglottos*)	1
Catbird (*Dumetella carolinensis*)	1
Brown thrasher (*Toxostoma rufum*)	1
Japanese robin (*Liothrix luteus*)	5
Laughing thrush (*Garrulax leucolophus*)	2
Australian gray jumper (*Struthidea cinerea*)	2
Bishop finch (*Tanagra episcopus*)	4
Cut-throat finch (*Amadina fasciata*)	2
Zebra finch (*Amadina castanotis*)	4
Black-headed finch (*Munia atricapilla*)	4
Three-colored finch (*Munia malacca*)	6
White-headed finch (*Munia maja*)	9
Nutmeg finch (*Munia punctularia*)	6
Java sparrow (*Munia oryzivora*)	12
White Java sparrow (*Munia oryzivora*)	14
Black-faced Gouldian finch (*Poëphila gouldiæ*)	2
Red-faced Gouldian finch (*Poëphila mirabilis*)	2
Sharp-tailed grass finch (*Poëphila acuticauda*)	1
Chestnut-breasted finch (*Donacola castancothorax*)	6
Napolean weaver (*Pyromelana afra*)	4
Madagascar weaver (*Foudia madagascariensis*)	4
Red-billed weaver (*Quelea quelea*)	8
Paradise weaver (*Vidua paradisea*)	8
Red-crested cardinal (*Paroaria cucullata*)	2
Common cardinal (*Cardinalis cardinalis*)	4
Saffron finch (*Sycalis flaveola*)	15
Yellow hammer (*Emberiza citrinella*)	1
Common canary (*Serinus canarius*)	7
Cowbird (*Molothrus ater*)	1
Glossy starling (*Lamprotornis caudatus*)	1
European raven (*Corvus corax*)	1
Australian crow (*Corvus coronoides*)	1
White-throated jay (*Garrulus leucotis*)	1
Blue jay (*Cyanocitta cristata*)	1
American magpie (*Pica pica hudsonica*)	3
Red-billed magpie (*Urocissa occipitalis*)	1
Yellow tyrant (*Pitangus sulphuratus rufipennis*)	1
Giant kingfisher (*Dacelo gigas*)	2
Concave-casqued hornbill (*Dichoceros bicornis*)	1
Reddish motmot (*Momotus subrufescens*)	1
Yellow-breasted lory	1
Blue Mountain lory (*Trichoglossus novæ-hollandiæ*)	8
Scaly-breasted lorikeet (*Psittculeles chlorolepidotus*)	7
Sulphur-crested cockatoo (*Cacatua galerita*)	3
White cockatoo (*Cacatua alba*)	3
Great red-crested cockatoo (*Cacatua moluccensis*)	1
Leadbeater's cockatoo (*Cacatua leadbeateri*)	1
Bare-eyed cockatoo (*Cacatua gymnopis*)	3
Roseate cockatoo (*Cacatua roseicapilla*)	12
Yellow and blue macaw (*Ara ararauna*)	2
Red and yellow and blue macaw (*Ara macao*)	7
Red and blue macaw (*Ara chloroptera*)	2
Gray-breasted parrakeet (*Myopsittacus monachus*)	1
Cuban parrot (*Amazona leucocephala*)	1
Festive amazon (*Amazona festiva*)	1
Porto Rican amazon (*Amazona vittata*)	1
Yellow-shouldered amazon (*Amazona ochroptera*)	2
Yellow-fronted amazon (*Amazona ochrocephala*)	2
Yellow-naped amazon (*Amazona auripalliata*)	2
Yellow-headed amazon (*Amazona levaillanti*)	2
Blue-fronted amazon (*Amazona æstiva*)	1
Gray parrot (*Psittacus erythacus*)	1
Lesser vasa parrot (*Coracopsis nigra*)	1
Banded parrakeet (*Palæornis fasciata*)	1
Love bird (*Agapornis pullaria*)	1
Shell parrakeet (*Melopsittacus undulatus*)	6
Great horned owl (*Bubo virginianus*)	14
Arctic horned owl (*Bubo virginianus subarcticus*)	1
Barred owl (*Strix varia*)	4
Sparrow hawk (*Falco sparverius*)	2
Bald eagle (*Haliætus leucocephalus*)	15
Alaskan bald eagle (*Haliætus leucocephalus alascanus*)	1
Golden eagle (*Aquila chrysaëtos*)	2
Australian eagle	2
Harpy eagle (*Thrasaëtus harpyia*)	1
Crowned hawk-eagle (*Spizaëtus coronatus*)	1
Cooper's hawk (*Accipiter cooperi*)	1
Venezuelan hawk	1
Caracara (*Polyborus cheriway*)	3
Lammergeyer (*Gypaëtus barbatus*)	1
Secretary vulture (*Gypogeranus secretarius*)	1
South American condor (*Sarcorhamphus gryphus*)	1
California condor (*Gymnogyps californianus*)	3
Griffon vulture (*Gyps fulvus*)	2
Cinereous vulture (*Vultur monachus*)	2
Egyptian vulture (*Neophron percnopterus*)	1
Turkey vulture (*Cathartes aura*)	4
Black vulture (*Catharista urubi*)	2
King vulture (*Gypagus papa*)	2
Snow pigeon (*Columba leuconota*)	2
Red-billed pigeon (*Columba flavirostris*)	4
White-crowned pigeon (*Columba leucocephala*)	2
Band-tailed pigeon (*Columba fasciata*)	4
Mourning dove (*Zenaidura macroura*)	7
Peaceful dove (*Geopelia tranquilla*)	2
Zebra dove (*Geopelia striata*)	22
Collared turtle-dove (*Turtur risorius*)	16
Cape masked dove (*Œna capensis*)	4

Australian crested pigeon (*Ocyphaps lophotes*) 16
Wonga-wonga pigeon (*Leucosarcia picata*) 12
Blue-headed quail-dove (*Starnœnas cyanocephala*) 4
Red-billed curassow (*Crax carunculata*) 1
Mexican curassow (*Crax globicera*) 2
Daubenton's curassow (*Crax daubentoni*) 2
Wild turkey (*Meleagris gallopavo silvestris*) 17
Peafowl (*Pavo cristata*) 69
Peacock pheasant (*Polylectron chinquis*) 1
Silver pheasant (*Euplocamus nycthemerus*) 1
Bobwhite (*Colinus virginianus*) 1
Curaçao crested quail (*Eupsychortyx cristatus*) 3
Scaled quail (*Callipepla squamata*) 1
Valley quail (*Lophortyx californica vallicola*) 2
Gambel's quail (*Lophortyx gambeli*) 1
Massena quail (*Cyrtonyx montezumæ*) 1
American coot (*Fulica americana*) 5
Great bustard (*Otis tarda*) 1
Common cariama (*Cariama cristata*) 1
Demoiselle crane (*Anthropoides virgo*) 7
Crowned crane (*Balearica pavonina*) 2
Whooping crane (*Grus americana*) 1
Sand-hill crane (*Grus mexicana*) 4
Australian crane (*Grus australasiana*) 1
European crane (*Grus cinerea*) 1
Lilford's crane (*Grus lilfordi*) 4
Indian white crane (*Grus leucogeranus*) 2
White-necked crane (*Grus leucauchen*) 1
Ruff (*Machetes pugnax*) 1
Black-crowned night heron (*Nycticorax nycticorax nævius*) 12
Snowy egret (*Egretta candidissima*) 3
Great blue heron (*Ardea herodias*) 1
Great black-crowned heron (*Ardea cocoi*) 1
Boatbill (*Cancroma cochlearia*) 2
Black stork (*Ciconia nigra*) 1
Marabou stork (*Leptoptilus dubius*) 1
Wood ibis (*Mycteria americana*) 1
Sacred ibis (*Ibis æthiopica*) 3
White ibis (*Guara alba*) 12
Roseate spoonbill (*Ajaja ajaja*) 2
European flamingo (*Phœnicopterus roseus*) 2
Black-necked screamer (*Chauna chavaria*) 3
Horned screamer (*Palamedea cornuta*) 1
Whistling swan (*Olor columbianus*) 4
Trumpeter swan (*Olor buccinator*) 2
Mute swan (*Cygnus gibbus*) 5
Black swan (*Chenopis atrata*) 3
Spur-winged goose (*Plectropterus gambensis*) 1
White muscovy duck (*Cairina moschata*) 1
Wood duck (*Aix sponsa*) 6
Mandarin duck (*Dendronessa galericulata*) 27
Cape Barren goose (*Cereopsis novæ hollandiæ*) 2
Lesser snow goose (*Chen hyperboreus*) 3
Greater snow goose (*Chen hyperboreus nivalis*) 1
Blue goose (*Chen cærulescens*) 2
Ross's goose (*Chen rossi*) 1
American white-fronted goose (*Anser albifrons gambeli*) 5
Barred-head goose (*Anser indicus*) 2
Chinese goose (*Anser cygnoides*) 2
Canada goose (*Branta canadensis*) 17
Hutchins's goose (*Branta canadensis hutchinsii*) 6
Cackling goose (*Branta canadensis minima*) 2
Bernicle goose (*Branta leucopsis*) 2
Upland goose (*Chloëphaga magellanica*) 1
White-faced tree duck (*Dendrocygna viduata*) 3
Fulvous tree duck (*Dendrocygna bicolor*) 2
Wandering tree duck (*Dendrocygna arcuata*) 4
Ruddy sheldrake (*Casarca ferruginea*) 1
Mallard (*Anas platyrhynchos*) 5
East Indian black duck (*Anas sp.*) 4
Black duck (*Anas rubripes*) 1
European widgeon (*Mareca penelope*) 1
Pintail (*Dafila acuta*) 2
Blue-winged teal (*Querquedula discors*) 11
Rosy-billed pochard (*Metopiana peposaca*) 1
Red-headed duck (*Marila americana*) 1
American white pelican (*Pelecanus erythrorhynchos*) 9
European white pelican (*Pelecanus onocrotalus*) 2
Roseate pelican (*Pelecanus roseus*) 2
Brown pelican (*Pelecanus occidentalis*) 5
Australian pelican (*Pelecanus conspicillatus*) 2
Florida cormorant (*Phalacrocorax auritus floridanus*) 17
Water turkey (*Anhinga anhinga*) 3
Great black-backed gull (*Larus marinus*) 1
American herring gull (*Larus argentatus smithsonianus*) 2
Laughing gull (*Larus atricilla*) 2
South African ostrich (*Struthio australis*) 4
Somali ostrich (*Struthio molybdophanes*) 1
Common cassowary (*Casuarius galeatus*) 1
Common rhea (*Rhea americana*) 2
Emu (*Dromœus novæ hollandiæ*) 2

REPTILES.

Alligator (*Alligator mississippiensis*) 27
Painted box tortoise (*Cistudo ornata*) 2
Duncan Island tortoise (*Testudo cphippium*) 2
Albemarle Island tortoise (*Testudo vicina*) 1
Gila monster (*Heloderma suspectum*) 3
Regal python (*Python reticulatus*) 3
Common boa (*Boa constrictor*) 4
Anaconda (*Eunectes murinus*) 1
Black snake (*Zamenis constrictor*) 3
Coach-whip snake (*Zamenis flagellum*) 1
Water snake (*Natrix sipedon*) 5
Common garter snake (*Eutænia sirtalis*) 1
Texas water snake (*Eutænia proxima*) 1
King snake (*Ophibolus getulus*) 3
Copperhead (*Ancistrodon contortrix*) 1

STATEMENT OF THE COLLECTION.

ACCESSIONS DURING THE YEAR.

Presented	66
Purchased	105
Born and hatched in the National Zoological Park	101
Received in exchange	187
Received from Yellowstone National Park	2
Captured in National Zoological Park	1
Deposited in National Zoological Park	12
Total	474

SUMMARY.

Animals on hand July 1, 1915	1,397
Accesssions during the year	474
	1,871
Deduct loss (by exchange, death, return of animals, etc.)	488
On hand June 30, 1916	1,383

Class.	Species.	Individuals.
Mammals	155	574
Birds	189	751
Reptiles	16	58
Total	360	1,383

VISITORS.

The number of visitors to the park during the year, as determined by count and estimate, was 1,157,110, a daily average of 3,162. This was the largest year's attendance in the history of the park. The greatest number in any one month was 248,080, in April, 1916, an average per day of 8,269. The attendance by months was as follows:

1915.—July, 71,900; August, 79,100; September, 100,200; October, 121,600; November, 90,300; December, 34,050.

1916.—January, 55,200; February, 58,380; March, 95,800; April, 248,080; May, 128,200; June, 74,300.

One hundred and sixty-one schools, classes, etc., visited the park, with a total of 8,679 individuals.

IMPROVEMENTS.

The hospital and laboratory building which was mentioned in last year's report has been nearly completed, lacking only the interior fittings and the necessary outside yards. It is a pleasing structure, built, after the designs of the municipal architect, of blue gneiss of this neighborhood, warmly colored by infiltration of iron oxide. A retaining wall was built and some grading done to provide sufficient

area near the building for quarantine quarters for such animals as do not require artificial heat. Many of the chestnut trees surrounding the building became blasted by the "chestnut blight" and had to be cut down. A roadway of tar-bound macadam was constructed about the building connecting with the nearest main driveway. Connection with the nearest sewer (in Klingle Road) has been effected. Preparation should now be made to put the laboratory into effective operation. A modest supply of the necessary apparatus should be furnished in order that suitable facilities may be available for post mortem examination by the Government bureaus cooperating with the Zoological Park.

Attention has previously been called to the fact that the topography of the park is so irregular that it is difficult to find building sites with attached yards in convenient situations without extensive grading. A case in point occurs at the site of the barn which has been used for bison and other hoofed animals. The building here, made of logs with bark on, has become unsightly by decay and requires extensive repairs. It is situated on a hill of small elevation, but the slopes of which are sufficiently steep to cause continual erosion when it is worn by the hoofs of the animals. It was therefore thought best to grade down this hill and fill up the adjoining gullies, much enlarging the area of the yards. In order to do this effectively, it was necessary to borrow earth from the prominent ridge that extends from the zebu house northwesterly to the camel yards. About 25,000 square feet will be added to the level ground previously available. Only a portion of this work will be defrayed from the current appropriation, the remainder from next year's appropriation. The work was let out by contract, very favorable terms being secured. The additional paddocks thus obtained will be used, in part, for the exhibition of the beautiful ruminants presented to the park by the Duke of Bedford.

New sheds were built in the property yard for temporarily housing these animals and others displaced during the alteration of their regular quarters.

A needed convenience was provided at the elephant's quarters by installing, at small cost, hydraulic lifts to raise the heavy doors which give access to the outside yards.

The inclosure for ducks near the flight cage was reconstructed to make it safe from raccoons, etc.

A concrete driveway was constructed in the rear of the bear yards to provide for convenient transfer of animals and care of the quarters.

A motor truck was purchased during the year to haul food supplies, for which a trip is made every day except Sunday to the market

and the fish wharf. A shelter house for the truck was built near the food house.

Preparations were begun near the close of the year for building an additional toilet room for women, to be located in the valley a little below the large flight cage.

ALTERATION OF WESTERN BOUNDARY.

It appears desirable to recapitulate for future reference the various stages through which this matter has passed.

The following appropriation was made by the act approved June 23, 1913:

> Readjustment of boundaries: For acquiring, by condemnation, all the lots, pieces, or parcels of land, other than the one hereinafter excepted, that lie between the present western boundary of the National Zoological Park and Connecticut Avenue from Cathedral Avenue to Klingle Road, $107,200, or such portion thereof as may be necessary, said land when acquired, together with the included highways, to be added to and become a part of the National Zoological Park. The proceedings for the condemnation of said land shall be instituted by the Secretary of the Treasury under and in accordance with the terms and provisions of subchapter 1 of chapter 15 of the Code of Law for the District of Columbia.

As the act requires that the proceedings be instituted by the Secretary of the Treasury, the attention of that official was called to the matter in a letter from the Secretary of the Smithsonian Institution, dated June 28, 1913. A special survey and plat of the land required was necessary, but this plat was not forwarded to the Department of Justice until November 5, 1913. Other delays ensued; the title of the various owners of the land had to be investigated, and it was not until March 11, 1914, that the District court ordered a jury to be summoned. A hearing was set for April 10, 1914, and a final hearing of the case was heard by the jury on July 2 following. The verdict of the jury was not filed until December 11, 1914. The hearing of objections to the verdict much delayed a final conclusion, especially as the time of the court was almost wholly occupied by a contest in an important will case. It was not until June 28, 1915, over two years from the passage of the appropriation act, that the court confirmed the verdict as regards the awards for damages for the land to be taken. The benefits assessed against the neighboring property were set aside by this and by a subsequent decision of January 28, 1916. The decree of the court fixed the amount required for the purchase of the land at $194,438.08. The cost of the proceedings for condemnation was $2,203.35.

The great delay caused by these legal proceedings occasioned another complication. The appropriation made by the act of June 23, 1913, was not a continuing one, but lapsed at the end of one year.

Consequently after June 30, 1915, there was nothing available to defray the purchase of the land.

An item for an additional appropriation and for a reappropriation of the original sum appropriated by the act of June 23, 1913, was submitted to Congress, but was not favorably considered by the House of Representatives. It was introduced in the Senate as an amendment to the sundry civil bill, but was dropped by the conference committee.

A similar item was offered in the Senate as an amendment to the District of Columbia appropriation bill, was accepted in Committee of the Whole, but thrown out finally in consequence of an appeal for retrenchment.

It is greatly to be regretted that this appropriation failed, as it is exceedingly desirable that the anomalous and inconvenient situation of the park should be remedied as soon as possible. It now fronts on no principal thoroughfare and attains none of the dignity which an institution controlled by the Government should have.

IMPORTANT NEEDS.

Aviary building.—Attention has been called to the need for this building in almost every annual report since 1908. The following is an extract from that document:

> The temporary bird house is crowded during the winter far beyond its proper capacity, and it is impossible to care for the birds satisfactorily. When it was built, and also at the time that additions were made, the funds available for the purpose were so small that it was necessary to build in the cheapest manner possible, so that the house has already required considerable repair and will very soon have to be largely rebuilt. The park has a good collection of birds, including a number of rare, interesting, and valuable specimens, sufficient to fill at once a large aviary and make one of the most important and attractive features of the park.

In the report for 1909 will be found the following:

> The need for a structure of this character is evident to any intelligent visitor to the park. Only a part of the collection can now be exhibited to the public, because of lack of room. A number of outdoor shelters and cages should also be provided for the exhibition of hardy birds.

Again, in the report for 1912 will be found:

> In spite of all efforts the fine collection of birds in the park is very far from being adequately housed. The wooden building in which the larger number are kept is too small, too low, insanitary, and really unworthy of a national institution. It was built in the cheapest manner to meet an emergency, and, although considerable sums have been spent on it for repairs, it is far from satisfactory. It is desired to build a suitable aviary in the western part of the park and to group about this the cages for the eagles, vultures, condors, and owls, now scattered somewhat irregularly about the grounds. It is believed that a suitable structure can be built for about $80,000.

It was again urged in 1914 as follows:

Attention has been called for several years past to the importance of erecting a suitable house for the care and preservation of the birds of the collection, most of which are now housed in a low wooden temporary structure which is by no means suitable for the purpose and has to be constantly renewed by repairs. The matter has been repeatedly urged upon Congress and an appropriation of $80,000 asked for a new structure. This is by no means an extravagant sum, as the aviaries of most zoological collections cost considerably more than this.

Also, in 1915:

Progressive deterioration of the temporary bird house again made repairs necessary there. The wooden floor, which had already been rebuilt twice, was replaced with concrete, as was also a part of the wooden foundation. The cost of this work was $700. This building is an example of the ultimate costliness of cheap temporary construction.

* * * * * * *

An aviary building is still a most urgent need, and repeated efforts have been made to secure an appropriation for this purpose.

It has been with great difficulty that the collection of birds has been kept in a fairly presentable condition. The building in which they are housed is a very common frame structure that has been repaired several times. The birds are crowded and not exhibited to advantage. In view of the fact that fine aviaries have been built at New York, Philadelphia, Boston, and Chicago, it seems most unfortunate that the national collection should have to be housed in this manner. It has been most unfavorably criticised by visitors.

The urgent needs of the park will be by no means satisfied by the construction of an aviary only. There are other buildings urgently needed for the proper housing and exhibition of the animals and the comfort of the public. Among these are the following mentioned in the report of last year:

A building for elephants, hippopotami, and similar animals.—The park has at present several interesting animals belonging to this group, including two species of elephants, two fine hippopotami, four tapirs, and other specimens. Some of these animals are large and powerful, and it is difficult to keep them safely in the insecure quarters to which it has been necessary to assign them. It is also reasonably certain that other similar animals will be added to the collection within a short time. A house for this group should be substantially constructed and occupy a space of at least 170 by 88 feet, with cages on both sides, 80 feet deep on one side and 60 feet on the other.

A public comfort building and restaurant.—This should be a building about 80 feet by 60 feet, including porches and a rest room for ladies. It is urgently needed, as the park is a considerable dis-

tance from town and is annually visited by over 1,000,000 people, including many young children. The present restaurant is so only in name, it being a makeshift affair, open on all sides, established on a temporary platform and affording no shelter during the driving and violent rainstorms that are so common here in summer. It frequently occurs that large numbers of people are drenched with rain before they can traverse the considerable distance between the deep valley in which the park is situated and a place of shelter. Most zoological parks are provided with spacious and commodious quarters of this kind.

Gatehouses.—Suitable gatehouses should be erected at the principal entrances to the park, viz: Those near Connecticut Avenue, at Quarry Road (Harvard Street), and at Adams Mill Road. It is sometimes necessary to close the entrances promptly, as in the case of the escape of an animal or for arrest of some offender. Besides this, the present entrance gates are far from dignified or suitable for a Government institution. They are properly merely temporary, awaiting the time when the boundaries of the park are definitely fixed. Each gatehouse should have not only quarters for the watchman but also toilet facilities.

Boundary fence.—In connection with this the inclosing boundary fence of the park should be considered. The present fence is of the type known as the "Page woven-wire fence."

It is believed that it would be more economical and efficient to construct a practically permanent iron fence than to replace the present nearly worn-out structure by another of similar character. It is suggested that the matter be referred to several iron-fence builders with a request for designs and prices. While the first cost of such a fence would undoubtedly be much greater, it would many times outlast the present structure and could be absolutely depended on to stop animals and men. Certain animals and game birds could be allowed to run at large within the park were it entirely certain that the fence would prevent their escape. We already have at large peacocks, wild turkeys, and squirrels, and it would be easy to considerably increase this list. It should be remembered that on several rare occasions caged animals have become loose within the park, and it is by no means certain that such accidents will not again occur. A few years ago the superintendent of the park was sued for damages alleged to be due to the escape of a wolf. The park is well wooded and a sudden heavy gale may throw tree trunks across the paddock fences, breaking them down and thus leading to the escape of the animals. Should this occur during the darkness of a stormy night it would be practically impossible for the keepers and watchmen to confine the animals again until daylight.

These improvements were urged in the last year's report. There are others perhaps equally important which are needed to bring the establishment up to the modern standard of what a zoological park ought to be. Most of these have been mentioned from time to time in other reports or have been urged upon the appropriation committees of Congress. They are briefly as follows:

Administration building.—The present office of the park is in an old dwelling house situated rather remotely from the buildings for the animals and inconveniently for the prompt and constant supervision of the operations of the park, as is the general practice in the foreign zoological gardens. A modest office building should now be erected in a central location. This would greatly expedite the general work of the park and improve the discipline of the working force. It is estimated that a building 50 by 36 feet, to contain office rooms, a drafting room, and a room for specimens would be sufficient.

Stable and forage barn.—There should be a stable and garage where the work horses and automobiles of the park could be stored. These should be on the ground floor, a storage loft for forage above. The dimensions should be at least 100 by 40 feet.

Shop.—The present shop is not large enough to accommodate conveniently the carpenters employed at the park. The woodworking plant is now dangerously near the blacksmith shop and the central heating plant. A separate building 100 by 46 feet should be erected.

Ape house.—Special quarters should be provided for the large anthropoid apes. These are probably the most interesting animals that can be exhibited and require special treatment and care. The group comprises the gorilla, the orang, several species of chimpanzee and of gibbon. They are so nearly related to man that observation and study of them is of the highest importance. The park has now only a chimpanzee, and it has been necessary to provide special quarters for him. It would be quite proper to place in the same building some of the larger species of baboons, as they require nearly the same treatment. A house for these animals should have a main building 150 by 60 feet, cages on both sides, and a wing 90 by 60 feet also, with similar cages. Outside cages should be erected along the 150 feet of the main building 18 feet deep, along the sides and end of wing 16 feet deep.

Lion house.—The house now occupied by the cat tribe is quite too small for the purpose, and it has always been intended to increase its capacity both by replacing the wooden extension by a masonry structure and by building an addition 120 feet long across the north end of the present building. This, of course, would be fitted with cages both within and without.

Reptile house.—No properly appointed house for reptiles now exists here, and the few specimens we have are inconveniently and unsuitably exhibited in the lion house. There should be a house 120 by 50 feet, with properly fitted cases on both sides and having a wing 20 by 50 feet with table exhibits. This would enable the park to exhibit all the important snakes of the United States and the principal ones of the western hemisphere, as well as the cobras and others of tropical East India; also the extremely varied group of lizards, the different species of crocodiles, etc.

Tortoise house.—Almost at the inception of the park a group of giant tortoises from the Galapagos Islands was obtained from Hon. Walter Rothschild. These still remain and might well form the nucleus of a collection of the tortoises of the world. A house 80 by 45 feet, with cages on both sides and yards 16 feet deep, would accommodate such a collection.

House for zebras, wild asses, and others of the horse family.—The park has already an interesting exhibit of this family including the Mongolian wild horse and two species of zebra. This should be enlarged and suitable quarters provided in a house 120 by 44 feet. The stalls should be on one side only and yards 50 feet deep be arranged.

House for tropical antelopes.—The teeming African fauna should be represented much more fully. It would require a house at least 175 feet by 75 with stalls on both sides and with commodious yards arranged about it in an elliptical form ranging in depth from 40 feet to 80 feet. Some of the stalls should be fitted up for giraffes.

House for tropical deer and swine.—A few specimens are already found in the collection. An adequate exhibit would require a house 100 feet by 45 feet with cages on both sides, the yards 30 feet deep on one side and 50 feet on the other.

House for marsupials.—The group of pouched animals, such as kangaroos, wallabies, opossums, wombats, Tasmanian wolves, etc., should be exhibited apart from the other mammals. These animals are dying out, rapidly diminishing in number year by year. They should have a house 120 feet by 40 feet with cages on both sides, the yards being 60 feet deep on one side, 20 feet on the other.

Pheasantry.—Besides the general aviary building, which it is hoped may soon be erected, separate quarters should be provided for certain groups of birds. Among these are the pheasants, comparatively hardy birds of very showy plumage, offering great variety. An exhibit can be secured at a reasonable expense. A house for them should be a low structure 140 by 18 feet. Visitors should not be admitted to this house; the birds would be seen in the outside yards which should be about 25 feet deep. A small appropriation will be asked of the present Congress for the establishment of a pheasantry.

Ostrich house.—The ostriches and their near relatives the emus, the rheas, and the cassowaries are so large and important that they should have a house to themselves. This should be 120 feet by 35 feet, with cages on one side only and yards giving plenty of room for exercise from 30 to 100 feet deep.

Tropical waterfowl.—These birds require heat during the cold season and the house would be really their winter quarters. During the summer they would be in the large "flight cage" or in some other outdoor inclosure. A house 120 by 50 feet, with cages on one side and one end, would be required.

Tropical birds of prey.—These require similar treatment but could not, of course, be housed with the waterfowl. A house 80 by 45 feet with cages on both sides and outside cages 18 feet deep would be needed.

Aquarium.—An exhibit of fish and other aquatic creatures is necessary to a complete survey of the domain of zoology. Such an exhibit was for a few years shown at the park and was one of the most popular features of the collection. It was installed in a rude frame structure erected for temporary use as a carpenters' shop. The tanks and other apparatus were furnished by the United States Fish Commission, having been used at the Atlanta Exposition. The building became quite unsafe and in 1901 Congress was asked to appropriate $25,000 toward the construction of a permanent structure. As this was not granted it became necessary to abandon the exhibit until such time as Congress may enable it to be properly housed. A building about 130 by 50 feet would be sufficient for the present.

Insectary.—In several European gardens an exhibit under glass is made of social and other interesting insects, such as ants, bees, wasps, butterflies, moths, etc. These have proved very attractive and are inexpensive. A house 60 feet by 30 feet with wall cases and table cases would accommodate such an exhibit.

The foregoing list merely recapitulates the needs of a fairly complete establishment such as may be seen in the European capitals. It would be well if the municipal architect, to whom the park is required to go for plans and specifications for buildings, could be asked to prepare estimates of cost for all of the above improvements to present to Congress.

In order to accommodate the buildings a considerable amount of grading should be done. The park is already cramped for space for convenient parking of vehicles upon crowded days. Over 50 automobiles and sight-seeing cars are sometimes assembled here at once, and there is great difficulty in managing them. A request for an appropriation of $4,000 for grading banks and filling ravines which was asked of Congress last year will be renewed.

Automobile.—The office of the park very much needs to have a small automobile for use in attending to the public business. The distances within the park itself are so considerable that it is a great waste of time and energy to traverse them on foot, or by horse vehicle, and the use of an automobile would greatly increase efficiency in the business of the park. The purchase does not involve any increase of the appropriation for the park, but merely the insertion of a clause in the appropriation act authorizing the purchase of a motor-propelled vehicle.

Roads.—The ordinary thoroughfares in the park were, at the close of the fiscal year, in fair condition. Nothing has been done, however, toward the repairing of the injury done by the construction by the District of the main trunk sewer known as the Rock Creek Main Interceptor. Attempts were made to get an appropriation to repair this defacement of the natural beauty of the park, but as yet without avail. The remarks then made were as follows:

> By authority of Congress a large sewer has been constructed on the right bank of Rock Creek through the entire length of the park, part of it being laid in a deep open cut, and part of it in a tunnel. A very large amount of rock has been excavated by blasting and this has been piled along the bank of the stream, destroying the natural beauty of the park by large piles of fragments of stone. While the contractor was required to "restore the surface as nearly as possible to the condition in which he found it," yet the amount of disturbance is so great that it is practically impossible to do this. It is proposed to cover these stone heaps with earth and to plant upon them trees and shrubs which will modify the unsightly appearance. A narrow road can be formed upon the top of the open cut sewer which will be a convenience to the public entering the park from the southern end.

The general appropriation for the park has remained at $100,000 per annum for six years past. This has had to suffice for the repairs and construction of buildings, the care of grounds, and the maintenance of roads and walks. In the meantime the cost of supplies, materials of all kinds, and labor has steadily increased so that there has been no opportunity to make even the most necessary improvements. The appropriations should be markedly increased, since a well-equipped zoological park is something of which the nation may well be proud.

Respectfully submitted.

Frank Baker,
Superintendent.

Dr. Charles D. Walcott,
Secretary of the Smithsonian Institution,
Washington, D. C.

Appendix 5.

REPORT ON THE ASTROPHYSICAL OBSERVATORY.

Sir: I have the honor to present the following report on the operations of the Smithsonian Astrophysical Observatory for the year ending June 30, 1916.

EQUIPMENT.

The equipment of the observatory is as follows:

(*a*) At Washington there is an inclosure of about 16,000 square feet, containing five small frame buildings used for observing and computing purposes, three movable frame shelters covering several out-of-door pieces of apparatus, and also one small brick building containing a storage battery and electrical distribution apparatus.

(*b*) At Mount Wilson, Cal., upon a leased plat of ground 100 feet square, in horizontal projection, are located a one-story cement observing structure, designed especially for solar-constant measurements, and also a little frame cottage, 21 feet by 25 feet, for observer's quarters. Upon the observing shelter at Mount Wilson there is a tower 40 feet high above the 12-foot piers which had been prepared in the original construction of the building. This tower is equipped with a tower telescope for use when observing (with the spectrobolometer) the distribution of radiation over the sun's disk.

During the year apparatus for research has been purchased or constructed at the observatory shop. The value of these additions to the instrumental equipment is estimated at $1,500.

WORK OF THE YEAR.

1. AT WASHINGTON.

Some years ago the Institution lent the Harvard College Observatory a silver-disk pyrheliometer for use at Arequipa, Peru. By request of Prof. Pickering the observations which had accumulated since August, 1912, were reduced at the Astrophysical Observatory and published by the Smithsonian Institution during the past year.[1] Owing to the high altitude of Arequipa the variations of solar radiation observed at a fixed zenith distance of the sun (as, for instance,

[1] Arequipa Pyrheliometry, Smithsonian Misc. Coll., Vol. 65, No. 9, 1916.

that whose secant is 1.2) were found to be almost wholly governed by three things—the atmospheric humidity, the distance of the sun, and the variations of the sun's emission. Hence from measurements of the humidity by the psychrometer it was possible to compute from the observed radiation the probable intensity of the solar radiation outside the atmosphere for each day. These empirical solar-constant values from Arequipa observations confirm the variations of the sun observed at Mount Wilson by the complete spectrobolometric process. Indeed, it appears that if eight or ten well-separated stations at high altitudes should be equipped with the pyrheliometer and psychrometer their combined results might well be expected to determine closely enough the sun's variations. A most interesting feature of Arequipa observations is that there is nothing anomalous about the observations of 1912 to suggest that the volcanic eruption of Mount Katmai (of June 6, 1912), which produced a great deal of dust all over the northern hemisphere, produced any turbidity of the atmosphere whatever south of the Equator.

Results of Mount Wilson solar-constant observations have been furnished in advance of publication to Dr. Bauer of the Carnegie Institution for comparison with magnetic data. He finds a close correlation between certain fluctuations of the earth's magnetic field and the variations of solar radiation.

The tower-telescope observations of the distribution of radiation along the diameter of the sun's disk, made at Mount Wilson in 1913 and 1914, having been fully reduced, a preliminary publication of them has been made by the Smithsonian Institution.[1] These results show distinctly that the average distribution of solar radiation over the solar disk varies from year to year. Greater contrast of brightness between the center and limb of the sun prevailed in 1907 and 1914 than in 1913. The change is greater for short wave lengths than for longer ones. Changes also occur from day to day. Both of these kinds of changes are found correlated with changes of the solar constant of radiation, but in opposite senses. High values of the solar radiation attend periods of greater solar activity and are associated with increased contrast of brightness between the center and edge of the solar disk. For short-period fluctuations of solar radiation, however, low values of solar radiation are associated with increased contrast. It seems reasonable to suppose that the first kind of phenomena is caused by increased convection in the sun, bringing fresh radiating surfaces forward more rapidly, thus increasing the effective solar temperature. The second kind of phenomena may be caused by temporary increases of the turbidity of the outer solar envelopes, restricting the solar emission especially at the limb.

[1] On the distribution of radiation over the sun's disk and new evidence of the solar variability, Smithsonian Misc. Coll., Vol. 66, No. 5, May, 1916.

Mount Wilson observations of 1915, including both the solar-constant work and the tower work, have been almost all reduced.

Mr. Fowle has continued at intervals between other work the reduction of his numerous observations of the transmission of rays of great wave length through long columns of air of known humidity. Many sources of error have required to be considered and eliminated, and the reading and reduction of the curves of observation was extremely tedious. The results are at length reaching such a stage that it can be seen that they fall into excellent agreement and will be of high interest in connection with studies of the earth's temperature as dependent on its radiation outward toward space. In fact, the results of Mr. Fowle's work are expected to be ready for publication within a short time.

For some years we have endeavored to design and construct an instrument capable of measuring accurately the intensity of sky light by day and of radiation outward toward the whole sky by night. At last success seems to be reached in an instrument devised by Messrs. Abbot and Aldrich and constructed by Mr. Kramer. The instrument is called the pyranometer, from the Greek words πῦρ, fire, ἀνά, up, μέτρον, a measure; thus designating an instrument adapted to measure heat coming from or going to space above. The pyranometer is somewhat after the principle of the Ångström pyrheliometer, in that the intensity of radiation is measured by electrical compensating currents, whose strength is adjusted with reference to the indications of a delicate thermocouple. A full account of the instrument has been published by the Smithsonian Institution,[1] including the tests which have been made to determine its accuracy by comparisons in solar measurements with the pyrheliometer. Complete accord between the two instruments is found at all altitudes of the sun when due regard is paid to the fact that the pyranometer presents a horizontal surface. The pyranometer seems to be suitable for botanical investigations, for it is capable of measuring the radiation even in deep shade, as in forests and greenhouses, as well as in full sun. In short, it can measure radiation in all situations where plants are accustomed to grow, except under water.

The consideration of the pyranometer has led us to undertake the determination of the constant ordinarily called "sigma" of Stefan's formula of radiation, according to which the emission of a perfect radiator per square centimeter per second is equal to the fourth power of the absolute temperature multiplied by "sigma." In recent years a good deal of disagreement has arisen as to the value of "sigma." We require to use it for certain tests of the py-

[1] The pyranometer—an instrument for measuring sky radiation: Smithsonian Misc. Coll., Vol. 66, No. 7, May, 1916.

ranometer and have devised a new method which seems very free from error for making its determination. The apparatus has been constructed and is now set up practically ready for use.

2. AT MOUNT WILSON.

Messrs. Abbot and Aldrich continued observations at Mount Wilson of the solar constant of radiation from July 1 to October 22, 1915, and renewed the expedition early in June, 1916. Besides conducting solar-constant observations and determinations of the distribution of light over the sun's disk in seven different wave lengths on each favorable day, comparisons of the pyrheliometers used ordinarily on Mount Wilson were made in both 1915 and 1916 with standard water-flow pyrheliometer No. 3. The comparisons showed no change to have occurred in the sensitiveness of secondary pyrheliometers Nos. IV and VII, on whose readings rest the solar-constant determinations made at Mount Wilson since 1906.

A good deal of attention was also given to the installation and trial of a solar cooking apparatus comprising ovens heated by oil under gravity circulation maintained by heat collected by a concave cylindric mirror of about 100 square feet surface. The apparatus seems highly promising, but owing to a couple of defects was not in satisfactory operation until after the close of the period covered by this report.

3. PROPOSED SOLAR-CONSTANT EXPEDITION.

On recommendation of the writer an allotment was made from the Hodgkins fund of the Smithsonian Institution for the purpose of duplicating the solar-constant work of Mount Wilson at the most favorable station on the earth. The expedition is being prepared and will go forward, probably to South America, in the summer of 1917. It is intended to continue solar-constant determinations by the spectro-bolometric method on every favorable day in every month of the year for several years at both Mount Wilson and the station in South America, with a view to determining the dependence of the earth's climatic conditions on the sun's variations of radiation.

SUMMARY.

Observations of several kinds have been made, reduced, and published which support one another in confirming the variability of the sun, and some of which tend to indicate dual causes of it. An expedition is proposed to occupy the most favorable station in South America for several years, beginning in 1917, for the purpose of making, in connection with the Mount Wilson observations, a full

and accurate determination of the solar variation for comparison with climatic changes. Measurements of the transmission of long-wave rays through long columns of moist air are almost ready for publication and appear to be resulting very satisfactorily. A new instrument, called the pyranometer, for measuring skylight and nocturnal radiation has been tested and found accurate.

Respectfully submitted.

C. G. Abbot,
Director Astrophysical Observatory.

Dr. C. D. Walcott,
Secretary of the Smithsonian Institution.

Appendix 6.

REPORT ON THE LIBRARY.

Sir: I have the honor to submit the following report on the operations of the library of the Smithsonian Institution during the fiscal year ending June 30, 1916:

The number of packages of books received during the year was 31,017, as compared with 29,928 packages in the year preceding. Of these 29,619 were received by mail and 1,400 through the International Exchange Service. Correspondence in connection with these included 1,241 letters and 3,997 acknowledgments on the regular printed form. The total accessions of books, pamphlets, and parts of sets aggregated 11,755.

SMITHSONIAN MAIN LIBRARY.

Publications for the main Smithsonian library are forwarded each day, after entering, to the Smithsonian deposit in the Library of Congress. Those catalogued and accessioned during the fiscal year numbered in all 18,637, which may be further described as 3,101 volumes, 739 parts of volumes, 383 pamphlets, 13,155 periodicals, 211 charts and 1,038 parts of serials to complete sets; extending the numbers in the accession book from 521,617 to 525,255.

The cataloguing included 5,045 volumes, 200 charts, and the adding of 738 new titles and the making of 5,329 typewritten cards; 3,480 printed cards from the Library of Congress for publications deposited by the Institution were filed in the catalogue. In addition, 3,596 volumes were recatalogued on standard size cards, from the old catalogue for inclusion in the new catalogue.

Documents relating to public matters and statistics of foreign countries, presented to the Smithsonian Institution largely in return for its own publications, were forwarded to the Library of Congress without stamping or recording, continuing a policy of some years standing. The publications sent in this way numbered 4,642.

Dissertations were received from Utrecht, Toulouse, Lund, Upsala, Leiden, Leipzig, Giessen, Paris, Bern, Pennsylvania, and Johns Hopkins, and from the Technical Hochschules of Berlin and Stuttgart.

Mr. Herbert A. Gill, administrator of the estate of Dr. Theodore Nicholas Gill, has presented his brother's scientific library to the Smithsonian Institution with the understanding that it is to be credited to the estate and that such publications as relate to the work of the Museum shall be placed in that library.

The securing of exchanges in return for Smithsonian publications and missing parts to complete the sets have been continued, notwithstanding war conditions abroad, and the results have added new titles and completed sets and series. In response to the requests for missing parts in the Smithsonian deposit in the Library of Congress 50 sets were completed and 1,038 parts supplied. These numbers include the completing of 30 sets in the series of publications of learned institutions and scientific societies, and the supplying of 824 parts and the completing of 20 volumes of periodicals, and the supplying of 212 separate numbers.

SMITHSONIAN OFFICE LIBRARY.

The office library includes a collection of books relating to art, the employees library, and various works of reference, besides quite an extensive aeronautical library.

In the reference room the transactions of scientific societies, and in the reading room the current foreign and domestic periodicals, have been in constant use. In the latter there are now 189 titles on the shelves.

In addition to the use of the library by the scientific staff of the Institution, almost all of the bureaus of the Government have availed themselves of the privileges of consulting and using the publications in the libraries.

From the reference and reading rooms in the Institution 3,330 publications were circulated during the year. Of these 473 were bound volumes and 2,857 were single periodicals.

Additions have been made to the aeronautical collection by way of exchange and by purchase of a few of the important works recently published. An acquisition of special value was a number of reference works formerly in the library of Maj. Baden-Powell.

A scrap book of articles from the older magazines is of interest, as describing early inventions in the arts, brought together and arranged in chronological order.

Dr. Alexander Graham Bell has continued to add to his collection of works relating to aeronautics by contributing 33 books and 37 portfolios and periodicals. This working library, which Dr. Bell used constantly while carrying on his experiments in aeronautics, will be of great value to students in the future. In addition to Dr. Bell's gift a total of 58 volumes were added during the year.

NATIONAL MUSEUM LIBRARY.

The library of the National Museum has been handicapped, as has almost every library in the country, by the nonreceipt of many European publications on account of the war.

Accessions.—There are now in the Museum library 47,713 volumes, 79,241 pamphlets and unbound papers, and 124 manuscripts. During the year just closed the accessions numbered 1,895 volumes, 2,873 pamphlets, and 72 parts of volumes.

Cataloguing.—New material was entered as received and sent out to the shelves or to the sectional libraries, so that it would be available at once to those interested. The recataloguing from the larger cards to the standard size, and the identification of the publications has been continued.

The new publications catalogued numbered 914 books, 3,157 pamphlets, and the total number of cards made was 4,669. The periodicals and parts of publications catalogued numbered 9,674, and periodical cards were made for 25 new publications; 2,025 section cards were made for periodicals assigned to sectional libraries, and 460 new periodical cards were written for the Museum library record.

There were recatalogued 135 books, 275 pamphlets, necessitating the making of 415 cards.

Exchanges.—Notwithstanding the conditions abroad, the efforts to secure missing parts and new exchanges have been continued. In connection with this work 257 letters were written, with the result that many parts that were lacking were supplied and many new titles were secured.

Loans.—During the year the loans from the general library numbered 12,085 publications, which includes books assigned to the sectional libraries, 4,978; 3,228 books borrowed from the Library of Congress, which included those from the Smithsonian collection; 207 from the Department of Agriculture library; 100 from the United States Geological Survey; 50 from the Army Medical Museum library; and 11 from other places. From the Museum shelves there were borrowed 3,511 volumes, and 1,899 section cards were made.

Binding.—The binding of the publications that have come to the Museum in parts, or paper covers, in order that they may be properly cared for and saved from destruction, is still a serious matter, as many remain unbound. It was possible this year to bind more than last year, which has relieved the situation; but it will take several years, at the present rate, to catch up with the needs of the library in this direction.

There were 799 volumes prepared and sent to the Government binder. Of this number 625 were returned to the Museum before the close of the year.

Gifts.—The following persons have contributed to the collection in the building: Dr. William Healey Dall, Dr. Edgar A. Mearns, Dr. Charles Doolittle Walcott, Dr. Oliver Perry Hay, Dr. F. Alexander McDermott, Dr. F. P. Dewey, Dr. Walter Hough, Mr. William R. Maxon, Dr. A. C. Peale estate, and the estate of Dr. Theodore Nicholas Gill.

Dall Collection.—Dr. William Healey Dall has continued to contribute to his collection of books relating to mollusks which he presented some years ago for the sectional library of the division of mollusks. Since July 1, 1915, he has added 207 titles.

Gill collection.—All the books and pamphlets from the estate of Dr. Theodore Nicholas Gill are being classified and arranged so that they can be properly distributed. From the hasty examination made in looking over the collection as it was being transferred it appears that the Museum library will have a valuable addition to its series of works relating to natural history, especially in ichthyology.

Technological series.—In this branch of the library there have been catalogued 1,052 volumes and 2,125 pamphlets, making a total of 3,177. The cards typewritten and filed in connection with this work numbered 3,505, the periodicals entered 3,631.

The books and pamphlets withdrawn for consultation in connection with the work of the Museum from this part of the library numbered 537. This is in addition to those borrowed from the central library.

The filing of cards in the scientific depository set of printed cards from the Library of Congress has been continued. Two thousand and thirty-three author cards and 4,031 subjects cards were placed in the alphabetical series.

Sectional libraries.—The checking of publications assigned to the sectional libraries has been continued as the other work would allow, and while some progress has been made the work is not near completion.

The following is a complete list of the sectional libraries:

Administration.
Administrative assistant's office.
Anthropology.
Biology.
Birds.
Botany.
Comparative anatomy.
Editor's office.
Ethnology.
Fishes.
Geology.
Graphic arts.
History.
Insects.

Invertebrate paleontology.
Mammals.
Marine invertebrates.
Materia medica.
Mechanical technology.
Mesozoic fossils.
Mineral technology.
Minerals.
Mollusks.
Oriental archeology.
Paleobotany.
Parasites.
Photography.
Physical anthropology.
Prehistoric archeology.
Property clerk.
Reptiles and batrachians.
Superintendent's office.
Taxidermy.
Textiles.
Vertebrate paleontology.

LIBRARY OF BUREAU OF AMERICAL ETHNOLOGY.

The collection of works relating to ethnology is administered by the ethnologist-in-charge, and an account of its operations will be found in the report of that bureau.

ASTROPHYSICAL OBSERVATORY LIBRARY.

The collection of reference works relating to astrophysics is in constant use, and during the year there were added 61 volumes, 20 parts of volumes, and 18 pamphlets.

NATIONAL ZOOLOGICAL PARK LIBRARY.

This library contains publications relating to the work of the park and the care of the animals, reports of other zoological parks, and works on landscape gardening. The number of publications added was 21 volumes and 5 pamphlets.

SUMMARY OF ACCESSIONS.

The accessions during the year, with the exception of the library of the Bureau of American Ethnology, may be summarized as follows:

To the Smithsonian deposit in the Library of Congress, including parts to complete sets	5,472
To the Smithsonian office, Astrophysical Observatory, and National Zoological Park	1,443
To the United States National Museum	4,840
Total	11,755

Respectfully submitted.

PAUL BROCKETT,
Assistant Librarian.

Dr. CHARLES D. WALCOTT,
Secretary of the Smithsonian Institution.

Appendix 7.

REPORT ON THE INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

Sir: I have the honor to submit the following report on the operations of the United States Bureau of the International Catalogue of Scientific Literature for the fiscal year ending June 30, 1916:

Each year 17 volumes of the catalogue are published by the Central Bureau in London, one volume for each of the following named sciences: Mathematics, mechanics, physics, chemistry, astronomy, meteorology, mineralogy, geology, geography, palaeontology, general biology, botany, zoology, anatomy, anthropology, physiology, and bacteriology.

The publication was begun in 1901, and since then all of the first 11 annual issues have been published, together with 14 volumes of the twelfth issue, 10 volumes of the thirteenth issue, and 1 volume of the fourteenth, a total of 212 regular volumes, in addition to several special volumes of schedules, lists of journals, etc.

The 14 volumes of the twelfth issue published are mathematics, mechanics, physics, chemistry, astronomy, meteorology, mineralogy, geography, palaeontology, general biology, botany, zoology, anatomy, and anthropology.

The 10 volumes of the thirteenth issue published are mathematics, mechanics, physics, astronomy, meteorology, mineralogy, geography, palaeontology, general biology, and zoology.

The one volume of the fourteenth issue published is zoology.

During the year there were 24,160 classified references to American scientific literature prepared by this bureau as follows:

Literature of—	
1908	6
1909	2
1910	75
1911	369
1912	835
1913	3,948
1914	8,750
1915	10,175
Total	24,160

It was, of course, inevitable that an international cooperative enterprise such as the International Catalogue should be affected by the

war in Europe, but it is a matter of congratulation that the preparation and publication has been continued with comparatively little change. As was pointed out in the last report the finances of the catalogue had been seriously affected on account of the inability to collect the subscriptions from Germany, Austria, Hungary, Belgium, and Poland.

Before the beginning of the war the receipts and expenditures of the London Central Bureau approximately balanced and therefore as the delinquent remittances from the five subscribing countries above mentioned amounted to almost $6,000 a year it was necessary to obtain this sum in order to continue the publication.

The Royal Society of London very generously offered to make good this loss of income and made a grant of £1,100 to enable the thirteenth annual issue to be published. The Royal Society has subsequently granted additional sums aggregating £3,750 to enable the Central Bureau to continue the publication of the catalogue without interruption.

A request having been made for assistance from the United States the Secretary of the Smithsonian Institution became so interested in the subject that he was enabled to obtain a grant of $6,000 from the Carnegie Corporation of New York for the purpose of aiding American students by making it possible for the Central Bureau to publish the fourteenth annual issue of the catalogue.

The value and service to science of the work done by the catalogue is so universally recognized that any lapse in its regular publication would be a serious calamity.

The great need for a Catalogue of Scientific Literature was felt as far back as 1855 when Prof. Joseph Henry brought the subject to the attention of the British Association for the Advancement of Science. The idea resulted in the Royal Society's Catalogue of Scientific Papers which will, when completed, be a catalogue of periodical scientific literature from 1800 to 1900.

Though this catalogue is simply a list of titles by authors' names, including only periodical literature, it soon became evident that its production was too great a task for one society or even one nation to continue; therefore in 1893 a council of the Royal Society was held and a committee was appointed to consider the question. It was agreed that international cooperation should be obtained for the production of a complete subject and author catalogue of science beginning with 1901.

The value of such a catalogue as then proposed may be estimated when it is considered that some of the most eminent scientific men of the day were members of the committee. Among the members were Lord Kelvin, Lord Rayleigh, Sir Michael Foster, Sir Joseph Lister, and Dr. Ludwig Mond. At the first meeting Prof. Armstrong

was elected chairman and he has ever since been prominently identified with the affairs of the catalogue.

To obtain international cooperation the committee caused over 200 letters to be sent to institutions and societies throughout the world and in 1895 a special meeting was called to confer with Prof. Alexander Agassiz, who advised that an international conference be called in 1896.

In the report of the committee it was stated "that in no single case was any doubt expressed as to the extreme value of the work contemplated," and "that the matter had been taken up in a most cordial manner by the Smithsonian Institution, the secretary of which, in his reply, refers to the desirability of a catalogue of the kind suggested as being so obvious that the work commends itself at once."

Three international conferences were held in London (1896, 1898, and 1900), and as a result the publication of the catalogue was undertaken.

It may be noted that among the prominent delegates attending these conferences (not including those before mentioned as members of the Committee of the Royal Society) were Sir Norman Lockyer, Prof. H. Poincaré, Prof. Simon Newcomb, Dr. John S. Billings, Right Hon. Sir. John E. Gorst, and Prof. Van't Hoff. On the advice of these and other prominent men the catalogue was begun.

The value of the catalogue is shown by the following resolution adopted 10 years after the publication was begun by the representatives of the countries participating in the work:

> That in view of the success already achieved by the International Catalogue of Scientific Literature and the great importance of the objects promoted by it, it is imperative to continue the publication of the catalogue at least during the period 1911–15 and on recommendation of the International Council during the subsequent five years 1916–20. (The International Council of the catalogue has subsequently voted to extend the work during the period 1916–20.)

This convention was presided over by Sir Archibald Geikie, then president of the Royal Society, and had among its members representatives from all of the principal countries of the world.

These men were thoroughly familiar with the service of the catalogue to the scientific men in their respective countries and voted unanimously to continue the work on account of the value and success achieved by it.

Respectfully submitted.

LEONARD C. GUNNELL,
Assistant in Charge.

Dr. CHARLES D. WALCOTT,
Secretary of the Smithsonian Institution.

Appendix 8.

REPORT ON THE PUBLICATIONS.

Sir: I have the honor to submit the following report on the publications of the Smithsonian Institution and its branches during the year ending June 30, 1916:

The Institution proper published during the year 22 papers in the series of Miscellaneous Collections, 2 annual reports, pamphlet copies of 54 papers from the general appendices of these reports, and 8 special publications. The Bureau of American Ethnology published 2 annual reports, separates of 4 accompanying papers in these reports, and 2 bulletins. The United States National Museum issued 1 annual report, 2 volumes of the proceedings, and 52 separate papers forming parts of these and other volumes, and 4 bulletins.

The total number of copies of publications distributed by the Institution and its branches was 153,262, which includes 249 volumes and separate memoirs of Smithsonian Contributions to Knowledge, 32,397 volumes and separate pamphlets of Smithsonian Miscellaneous Collections, 25,718 volumes and separate pamphlets of Smithsonian Annual Reports, 73,798 volumes and separates of National Museum publications, 12,420 publications of the Bureau of American Ethnology, 7,696 special publications, 47 volumes of the Annals of Astrophysical Observatory, 83 reports of the Harriman Alaska Expedition, and 647 reports of the American Historical Association.

SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE.

QUARTO.

The title-page, table of contents, and cover for volume 27 were issued, and there was in press at the close of the year a memoir by Dr. J. S. Foote, of Creighton Medical College, on "The comparative histology of the femur," the result of extended original research.

SMITHSONIAN MISCELLANEOUS COLLECTIONS.

OCTAVO.

Of the Miscellaneous Collections, volume 62, 2 papers were published; of volume 63, 1 paper; of volume 64, 3 papers; of volume 65, 8 papers and title-page and table of contents; of volume 66, 8 papers; in all, 22 papers, as follows:

Volume 62.

No. 4. Reports on wind tunnel experiments in aerodynamics. By J. C. Hunsaker, E. Buckingham, H. E. Rossell, D. W. Douglas, C. L. Brand, and E. B. Wilson. Hodgkins Fund. January 15, 1916. 92 pp., 5 pls. (Publ. 2368.)

No. 5. Dynamical stability of aeroplanes. By Jerome C. Hunsaker, assisted by T. H. Huff, D. W. Douglas, H. K. Chow, and V. E. Clark. Hodgkins Fund. June 30, 1916. 78 pp., 3 pls. (Publ. 2414.)

Volume 63.

No. 6. Smithsonian Physical Tables. Reprint of sixth revised edition. By F. E. Fowle. February 18, 1916. xxxvi+355 pp. (Publ. 2269.)

Volume 64.

No. 3. Cambrian Geology and Paleontology. III, No. 3. Cambrian trilobites. By Charles D. Walcott. January 14, 1916. Pp. 157–258, pls. 24–38. (Publ. 2370.)

No. 4. Cambrian Geology and Paleontology. III, No. 4. Relations between the Cambrian and pre-Cambrian formations in the vicinity of Helena, Montana. By Charles D. Walcott. June 24, 1916. Pp. 259–301, pls. 39–44. (Publ. 2416.)

No. 5. Cambrian Geology and Paleontology. III, No. 5. Cambrian trilobites. By Charles D. Walcott. In press.

Volume 65.

No. 3. A study of the radiation of the atmosphere. Based upon observations of the nocturnal radiation during expeditions to Algeria and to California. By Anders Ångström. Hodgkins Fund. August 27, 1915. 159 pp. (Publ. 2354.)

No. 6. Explorations and field work of the Smithsonian Institution in 1914. July 1, 1915. 95 pp., 1 pl. (Publ. 2363.)

No. 9. Arequipa pyrheliometry. By C. G. Abbot. Hodgkins Fund. March 1, 1916. 24 pp. (Publ. 2367.)

No. 10. A phylogenetic study of the recent crinoids, with special reference to the question of specialization through the partial or complete suppression of structural characters. By Austin H. Clark. August 19, 1915. 67 pp. (Publ. 2369.)

No. 11. A magneton theory of the structure of the atom. By A. L. Parson. November 29, 1915. 80 pp., 2 pls. (Publ. 2371.)

No. 12. The jaw of the Piltdown Man. By Gerrit S. Miller, jr. November 24, 1915. 31 pp., 5 pls. (Publ. 2376.)

No. 13. Descriptions of seven new subspecies and one new species of African birds (Plantain-Eater, Courser, and Rail). By Edgar A. Mearns. November 26, 1915. 9 pp. (Publ. 2378.)

No. 14. The sense organs on the mouth parts of the honey bee. By N. E. McIndoo. January 12, 1916. 55 pp. (Publ. 2381.)

Title-page and table of contents. June 17, 1916. v pp. (Publ. 2419.)

Volume 66.

No. 1. Descriptions of a new genus and eight new species and subspecies of African mammals. By N. Hollister. February 10, 1916. 8 pp. (Publ. 2416.)

No. 2. A list of the birds observed in Alaska and Northeastern Siberia during the summer of 1914. By F. Seymour Hersey. March 31, 1916. 33 pp. (Publ. 2408.)

No. 3. Explorations and field work of the Smithsonian Institution in 1915. May 27, 1916. 119 pp. (Publ. 2407.)

No. 4. The Ordaz and Dortal expeditions in search of El Dorado, as described on sixteenth century maps. By Rudolf Schuller. April 27, 1916. 15 pp., 2 maps. (Publ. 2411.)

No. 5. On the distribution of radiation over the sun's disk and new evidences of the solar variability. By C. G. Abbot, F. E. Fowle, and L. B. Aldrich. Hodgkins Fund. May 23, 1916. 24 pp., 1 pl. (Publ. 2412.)

No. 6. Phonetic transcription of Indian languages. In press.

No. 7. The Pyranometer—an instrument for measuring sky radiation. By C. G. Abbot and L. B. Aldrich. Hodgkins Fund. May 23, 1916. 9 pp. (Publ. 2417.)

No. 8. Three new African shrews of the genus Crocidura. By N. Hollister. May 23, 1916. 3 pp. (Publ. 2418.)

SMITHSONIAN ANNUAL REPORTS.

Report for 1914.

The completed volume of the Annual Report of the Board of Regents for 1914 was received from the Public Printer in August, 1915.

Annual Report of the Board of Regents of the Smithsonian Institution showing operations, expenditures, and condition of the Institution for the year ending June 30, 1914. xi+729 pp., 155 pls. (Publ. 2321.)

The general appendix contained the following papers, small editions of which were printed in pamphlet form:

The radiation of the sun. By C. G. Abbot. 16 pp., 4 pls. (Publ. 2322.)

Modern theories of the sun. By Jean Bosler. 8 pp., 2 pls. (Publ. 2323.)

The form and constitution of the earth. By Louis B. Stewart. 14 pp. (Publ. 2324.)

Some remarks on logarithms apropos to their tercentenary. By M. d'Ocagne. 7 pp., 2 pls. (Publ. 2325.)

Modern views on the constitution of the atom. By A. S. Eve. 9 pp. (Publ. 2326.)

Gyrostats and gyrostatic action. By Andrew Gray. 16 pp., 10 pls. (Publ. 2327.)

Stability of aeroplanes. By Orville Wright. 8 pp. (Publ. 2328.)

The first man-carrying aeroplane capable of sustained free flight—Langley's success as a pioneer in aviation. By A. F. Zahm. 6 pp., 8 pls. (Publ. 2329.)

Some aspects of industrial chemistry. By L. H. Baekeland. 25 pp. (Publ. 2330.)

Explosives. By Edward P. O'Hern. 27 pp., 7 pls. (Publ. 2331.)

Climates of geologic time. By Charles Schuchert. 35 pp. (Publ. 2332.)

Pleochroic haloes. By J. Joly. 15 pp., 3 pls. (Publ. 2333.)

The geology of the bottom of the seas. By L. de Launay. 24 pp. (Publ. 2334.)

Recent oceanographic researches. By Ch. Gravier. 10 pp. (Publ. 2335.)

The Klondike and Yukon goldfield in 1913. By H. M. Cadell. 20 pp., 6 pls. (Publ. 2336.)

The history of the discovery of sexuality in plants. By Duncan S. Johnson. 24 pp. (Publ. 2337.)

Problems and progress in plant pathology. By L. R. Jones. 13 pp. (Publ. 2338.)

Plant autographs and their revelations. By Jagadis Chunder Bose. 23 pp. (Publ. 2339.)

The National Zoological Park and its inhabitants. By Frank Baker. 34 pp., 41 pls. (Publ. 2340.)

On the habits and behavior of the herring gull. By R. M. Strong. 31 pp., 10 pls. (Publ. 2341.)

Notes on some effects of extreme drought in Waterberg, South Africa. By Eugène N. Marais. 12 pp. (Publ. 2342.)

Homœotic regeneration of the antennae in a Phasmid or walking-stick. By H. O. Schmit-Jensen. 14 pp., 2 pls. (Publ. 2343.)

Latent life: Its nature and its relations to certain theories of contemporary biology. By Paul Becquerel. 15 pp. (Publ. 2344.)

The early inhabitants of western Asia. By Felix v. Luschan. 25 pp., 12 pls. (Publ. 2345.)

Excavations at Abydos. By Edouard Naville. 7 pp., 3 pls. (Publ. 2346.)

An examination of Chinese bronzes. By John C. Ferguson. 6 pp., 14 pls. (Publ. 2347.)

The rôle of depopulation, deforestation, and malaria in the decadence of certain nations. By Felix Regnault. 5 pp. (Publ. 2348.)

The story of the chin. By Louis Robinson. 11 pp., 12 pls. (Publ. 2349.)

Recent developments in the art of illumination. By Preston S. Millar. 18 pp., 2 pls. (Publ. 2350.)

The loom and spindle: Past, present, and future. By Luther Hooper. 49 pp., 11 pls. (Publ. 2351.)

The demonstration play school of 1913. By Clark W. Hetherington. 29 pp. (Publ. 2352.)

Sketch of the life of Eduard Suess (1831–1914). By Pierre Termier. 10 pp. (Publ. 2353.)

Report for 1915.

The report of the executive committee and proceedings of the Board of Regents of the Institution, and the report of the Secretary, both forming part of the Annual Report of the Board of Regents to Congress, were issued in pamphlet form in December, 1915:

Report of the executive committee and proceedings of the Board of Regents of the Smithsonian Institution for the year ending June 30, 1915. 21 pp. (Publ. 2380.)

Report of the Secretary of the Smithsonian Institution for the year ending June 30, 1915. 110 pp. (Publ. 2379.)

Small editions of the following papers, forming the general appendix of the report for 1915, were issued in May, 1916, and the complete volume was received from the printer in June:

Review of astronomy for the year 1913, by P. Puiseux. 9 pp. (Publ. 2383.)

The utilization of solar energy, by A. S. E. Ackermann. 26 pp., 6 pls. (Publ. 2384.)

The constitution of matter and the evolution of the elements, by Ernest Rutherford. 36 pp., 5 pls. (Publ. 2385.)

Submarine signalling, by R. F. Blake. 11 pp. (Publ. 2386.)
The earthquake in the Marsica, Central Italy, by Ernesto Mancini. 4 pp., 1 pl. (Publ. 2387.)
Atlantis, by Pierre Termier. 16 pp. (Publ. 2388.)
Evidences of primitive life, by Charles D. Walcott. 21 pp., 18 pls. (Publ. 2389.)
The place of forestry among natural sciences, by Henry S. Graves. 13 pp. (Publ. 2390.)
Lignum Nephriticum, by W. E. Safford. 28 pp., 7 pls. (Publ. 2391.)
Impressions of the voices of tropical birds, by Louis Agassiz Fuertes. 25 pp., 16 pls. (Publ. 2392.)
The Eskimo Curlew and its disappearance, by Myron H. Swenk. 16 pp., 1 pl. (Publ. 2393.)
Construction of insect nests, by Y. Sjöstedt. 7 pp., 3 pls. (Publ. 2394.)
Olden time knowledge of Hippocampus, by C. R. Eastman. 9 pp., 4 pls. (Publ. 2395.)
Heredity, by William Bateson. 36 pp. (Publ. 2396.)
Some aspects of progress in modern zoology, by Edmund B. Wilson. 14 pp. (Publ. 2397.)
Linguistic areas in Europe: Their boundaries and political significance, by Leon Dominian. 35 pp., 5 maps. (Publ. 2398.)
Excavations at Tell el-Amarna, Egypt, in 1913–14, by Ludwig Borchardt. 13 pp., 13 pls. (Publ. 2399.)
Vaccines, by L. Roger. 8 pp. (Publ. 2400.)
Progress in reclamation of arid lands in the Western United States, by John B. Beadle. 22 pp., 13 pls. (Publ. 2401.)
Some recent developments in telephony and telegraphy, by Frank B. Jewett. 21 pp. (Publ. 2402.)
Sir David Gill, by A. S. Eddington. 12 pp. (Publ. 2403.)
Walter Holbrook Gaskell, by J. N. Langley. 10 pp. (Publ. 2404.)

Special publications.

The following special publications were issued in octavo form:

Publications of the Smithsonian Institution issued between January 1 and June 30, 1915. Published July 20, 1915. 2 pp. (Publ. 2372.)
Publications of the Smithsonian Institution issued between January 1 and September 30, 1915. October 25, 1915. 2 pp. (Publ. 2377.)
Publications of the Smithsonian Institution issued between January 1 and December 31, 1915. January 27, 1916. 3 pp. (Publ. 2405.)
Publications of the Smithsonian Institution issued between January 1 and March 31, 1916. April 20, 1916. 1 p. (Publ. 2413.)
Classified list of Smithsonian publications available for distribution, October 15, 1915. November 4, 1915. iv+32 pp. (Publ. 2375.)
Opinions rendered by the International Commission on Zoological Nomenclature. Opinion 67. April 27, 1916. Pp. 177–182. (Publ. 2409.)
Rules and regulations for the conduct of the work of the National Advisory Committee for Aeronautics. July 16, 1915. 5 pp.
Sources of nitrogen compounds in the United States. By Chester G. Gilbert. June 30, 1916. 12 pp. (Publ. 2421.)

PUBLICATIONS OF THE UNITED STATES NATIONAL MUSEUM.

The publications of the National Museum are: (*a*) The annual report to Congress; (*b*) the Proceedings of the United States Na-

tional Museum; and (*c*) the Bulletin of the United States National Museum, which includes the Contributions from the United States National Herbarium. The editorship of these publications is vested in Dr. Marcus Benjamin.

During the year the Museum published an annual report, 2 volumes of the Proceedings and 52 separate papers forming parts of these and other volumes, and 4 bulletins.

The issues of the Proceedings were as follows: Volume 48; volume 49, papers 2092, 2094 to 2130, and the complete volume; volume 50, papers 2131 to 2138; Annual Report of the United States National Museum for 1915.

The bulletins were as follows:

Bulletin 50, The Birds of North and Middle America, part 7, by Robert Ridgway.

Bulletin 91, Report on the Turton collection of South African marine mollusks, with additional notes on other South African shells contained in the United States National Museum, by Paul Bartsch.

Bulletin 92, Bibliographic index of American Ordovician and Silurian fossils (two volumes), by Ray S. Bassler.

Bulletin 94, Handbook and descriptive catalogue of the meteorite collections in the United States National Museum, by George P. Merrill.

PUBLICATIONS OF THE BUREAU OF AMERICAN ETHNOLOGY.

The publications of the bureau are discussed in appendix 2 of the Secretary's report. The editorial work of the bureau has continued in charge of Mr. J. G. Gurley, editor.

During the year, 2 annual reports and 2 bulletins were issued, as follows:

29th Annual Report of the Bureau of American Ethnology (containing an accompanying paper, "The Ethnogeography of the Tewa Indians," by John Peabody Harrington).

30th Annual Report of the Bureau of American Ethnology (containing two accompanying papers, "Ethnobotany of the Zuni Indians," by Matilda Coxe Stevenson, and "An Inquiry into the animism and folklore of the Guiana Indians," by Walter E. Roth), and a "List of publications of the Bureau of American Ethnology."

Bulletin 57. An Introduction to the Study of the Maya Hieroglyphs, by Sylvanus Griswold Morley.

Bulletin 62. Physical anthropology of the Lenape or Delawares, and of the Eastern Indians in general, by Aleš Hrdlička. In press.

REPORT OF THE AMERICAN HISTORICAL ASSOCIATION.

The annual reports of the American Historical Association are transmitted by the association to the Secretary of the Smithsonian Institution and are communicated to Congress under the provisions of the act of incorporation of the association.

The annual report for 1913 (2 volumes) was published during the year, and the first volume of the 1914 report was in press at the close of the fiscal year.

REPORT OF THE NATIONAL SOCIETY OF THE DAUGHTERS OF THE AMERICAN REVOLUTION.

The manuscript of the Eighteenth Annual Report of the National Society of the Daughters of the American Revolution for the year ending October 11, 1915, was communicated to Congress on March 28, 1916.

THE SMITHSONIAN ADVISORY COMMITTEE ON PRINTING AND PUBLICATION.

The editor has continued to serve as secretary of the Smithsonian advisory committee on printing and publication. This committee passes on all manuscripts offered for publication by the Institution or its branches, and considers forms of routine, blanks, and various other matters pertaining to printing and publication. Eighteen meetings were held during the year and 96 manuscripts were acted upon.

Respectfully submitted.

A. HOWARD CLARK, *Editor.*

Dr. CHARLES D. WALCOTT,
Secretary of the Smithsonian Institution.

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