# SCIENCE



FRIDAY, FEBRUARY 10, 1899.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson N. Y.

## *THE SMITHSONIAN INSTITUTION.* *

FINANCES.

THE permanent funds of the Institution are as follows:

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|---|---|---|
| Bequest of Smithson, 1846 | | $515,169.00 |
| Residuary legacy of Smithson, 1867 | | 26,210.63 |
| Deposits from savings of income, 1867 | | 108,620.37 |
| Bequest of James Hamilton, 1875 | $1,000.00 | |
| Accumulated interest on Hamilton fund, 1895 | 1,000.00 | |
| | | 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 |
| Portion of residuary legacy, T. G. Hodgkins, 1894 | | 8,000.00 |
| Total permanent fund | | 912,000.00 |

The appropriations made by Congress for the fiscal year 1899 were as follows:

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| International Exchanges, Smithsonian Institution, 1899 | $21,000 |
| American Ethnology, Smithsonian Institution, 1899 | 50,000 |
| Astrophysical Observatory, Smithsonian Institution, 1899 | 10,000 |
| National Museum, Smithsonian Institution, 1899: | |
| Furniture and fixtures | 35,000 |
| Heating and lighting | 14,000 |

* From the report of S. P. Langley, Secretary of the Smithsonian Institution, for the year ending June 30, 1898.

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| Preservation of collections | 165,000 |
| Postage | 500 |
| Galleries | 10,000 |
| Books | 2,000 |
| Rent of workshops | 4,500 |
| Building repairs | 4,000 |
| Purchase of library of the late G. Brown Goode | 5,000 |
| National Zoological Park, 1899 | 65,000 |

HAMILTON FUND.

The original amount of $1,000, the bequest of Mr. James Hamilton, of Pennsylvania, received by the Institution in 1874, was increased in 1895 to $2,000 by the addition of accumulated interest under authority given by the Regents in their meeting of January 23, 1895, the sum of $150 expended from the income of fund in 1876 for explorations having been refunded. The present income, together with interest accumulated since 1895, seems to warrant some definite application of the interest on the bequest, and I am now considering a plan of lectureships in accordance with the testator's purpose.

AVERY FUND.

Concerning the Avery fund I have to report that by a decision of the Supreme Court of the United States the Institution has obtained a clear title to the property on Capitol Hill claimed by the heirs of Mrs. Avery.

It may be recalled that the testator, while leaving his property absolutely at the disposal of the Regents, expressed a wish that it might be made useful in promoting researches on the Ether, after certain mathmatical and phonetic publications and certain researches connected with a special form of telescope have been made. The moneys received from the estate are as yet too small to carry out any part of this purpose but the last.

BUILDINGS.

No alterations were made in the Smithsonian Building during the year except such slight repairs as seemed necessary to keep it in good condition. The space in the rear of the building, however, which for a number of years had been occupied by unsightly and dangerous storage sheds and workshops, has been cleared of these and graded into a lawn, thus greatly improving the surroundings.

In the park south of the building, and at a distance sufficient to prevent annoyance, there has been erected a temporary wooden building of two stories for the use of the taxidermists and for other purposes.

The investigations being prosecuted in the Astrophysical Observatory requiring more space than is available in the old structure, plans have been approved and some progress made toward the erection of some very simple additions authorized by Congress at its last session by a clause permitting the expenditure for this purpose of an unexpended balance.

Four additional galleries have been erected in the Museum building, three for exhibition purposes and one to serve as an increase for the quarters for the Library, thus adding 6,650 square feet to the floor space of the Museum, 6,040 square feet of which is available research for exhibition purposes.

The promotion of original research has always been one of the principal functions of the Institution. Investigations in the anthropological, biological and geological divisions of science have been extensively carried on through the departments of the National Museum, and in the Bureau of American Ethnology there have also been special inquiries into Indian customs and languages. These lines of research being well represented by its bureaus, it has remained for the Institution proper to devote its energies more especially to some of the physical sciences.

The Secretary himself has carried on re-

searches in the solar spectrum, which, by the active assistance of the aid in charge, have produced results now shortly to be published. They are believed to be important and are referred to in another portion of this report.

The Secretary has not wholly discontinued the studies which he has made in regard to aerodromic experiments, and it is perhaps not improper that he should state that these have attracted the attention of other departments so far that during the war with Spain a commission was directed by the Secretaries of War and the Navy to inquire into them with a view of their possible utility in war. This is not the place to state the results of these inquiries.

The Secretary desires to repeat, however, that his time is almost solely given to administrative work, and that what he has been able to do in these directions has been done largely in hours which he might consider his own.

HODGKINS FUND.

Although the Hodgkins fund competition announced by the Institution in the widely distributed circular of March 31, 1893, was definitely closed so long ago as December 31, 1894, a very general interest is still expressed in the subject, and specialists in our own and other countries not infrequently forward copies of their original published memoirs as contributions to the Hodgkins fund library of the Institution.

Frequent applications for grants are received, and, notwithstanding the fact that the limitations on the use of the fund do not permit it to be employed for the support of an investigation, unless under the exceptional conditions of the first published announcement, it has still been found practicable to approve several awards during the past year.

As noted in my last report, in July, 1897, an additional grant of $400 was made to Mr. A. Lawrence Rotch, of the Blue Hill Meteorological Observatory, Readville, Mass., and in the following October a further grant of $250 was approved to Mr. Rotch. These sums are to be devoted to experiments with automatic kites, for determining, by means of self-recording instruments, meteorological data in atmospheric strata inaccessible except by some mechanical method of exploring the atmosphere, and it will be of possible interest to the Board to learn that during the past year, and (to slightly anticipate), shortly after its close, experiments of remarkable success and interest have been made by Mr. Rotch, and, among others, that kites have been flown to the unprecedented height of 11,086 feet above the station, carrying up with them meteorological instruments which recorded the height, the pressure of the wind, the dew point, and other facts of interest at these great altitudes.

Those who remember the situation at Blue Hill, one of the highest landmarks on the Atlantic coast north of the southern shores of the Gulf, and the aspect of the hills, blue with the distance from which they take their name, may be struck by the certainly notable fact that in these experiments the kites sent up from Blue Hill, and held there at the station, were occasionally directly over the distant ocean.

November 1, 1897, a grant of $500 was made to Professor William Hallock, of Columbia University, New York City, for an investigation having for its object the complete analysis of a particle of air under the influence of articulate sounds, thus contributing a study of the atmosphere in one of its most important functions, that of a conveyer of speech.

In February, 1898, a final grant of $250 was made to Drs. Lummer and Pringsheim, of the Physical Institute of the University of Berlin. The investigation begun by

them, in 1893, to determine the ratio of the specific heats, at constant pressure and volume, for air, oxygen, carbon dioxide and hydrogen has now so far progressed that the memoir submitted by Drs. Lummer and Pringsheim, noting the results already attained by them, has been published by the Institution in the Smithsonian Contributions to Knowledge.

A German edition of this original memoir, with the consent of the Institution, is to be published by the authors, and it is understood that, if found desirable, their researches will be further prosecuted under the direction of the Physikalisch-Technische Reichsanstalt, of Berlin, Professor Dr. Kohlrausch, the President, having courteously signified the readiness of that institution to furnish the means necessary for the purpose.

In February, 1898, an additional grant was made to Mr. E. C. C. Baly, of University College, London, to enable him to continue his research upon the decomposition of the atmosphere by electricity and upon the ozonizing of mercury. The report of Mr. Baly stating the result of these investigations is now awaited by the Institution.

A grant of $250 to Professor Arthur G. Webster, of Clark University, Worcester, Mass., was approved in May, 1898, for the continuation of a research on the properties of air in connection with the propagation of sound, special effort being directed to the securing of data relating to the influence of the viscosity of air on expiring or vanishing sounds. An instrument devised by Professor Webster for use in this investigation gives the physical measure of sound, not only when constant, but when rapidly varying. It is expected that this research will furnish results of high practical value in connection with the question of the acoustics of auditoriums, and will contribute information upon points that have not heretofore been satisfactorily investigated.

A paper embodying the results of the interesting research, described in the Secretary's report for 1894, primarily conducted under a grant from the Hodgkins fund to Dr. J. S. Billings and Dr. S. Weir Mitchell, and continued, under their supervision, by Dr. D. H. Bergey, of the Laboratory of Hygiene, University of Pennsylvania, has been published in the Smithsonian Miscellaneous Collections.

### NAPLES TABLE.

Among the applications for the occupancy of the Smithsonian seat at the Naples table during the years 1897–98, the following have been favorably acted upon:

Dr. Bradley M. Martin, of the University of Chicago, whose work has been chiefly in the field of the algæ, and who has published several papers detailing his researches, was appointed for November, 1897, his period at Naples to be supplemented by additional investigation in the laboratory of Dr. Strasburger, of the University at Bonn.

Dr. H. W. Conn, of the department of biology, Wesleyan University, received the appointment for six weeks early in the year 1898; Dr. Dohrn, the Superintendent of the station, kindly arranging for his accommodation, although the Smithsonian table was occupied at that time. The fact that Dr. Dohrn finds himself not only willing, but able, to provide for two or, as in this case, even three students at the Smithsonian table during the same period is a courtesy much appreciated by the Institution.

Dr. D. M. Mottier, of the State University of Indiana, who wished to supplement his investigations at Bonn and Leipzig by some weeks at Naples, was appointed for the months of March and April, 1898.

Dr. W. T. Swingle, of the United States Department of Agriculture, now honorary custodian of algæ in the United States National Museum, occupied the Smithsonian

seat at Naples for an additional month during the spring of 1898.

Dr. J. H. Gerould, of Dartmouth College, who prosecuted his investigations in the laboratory of Professor De Lacaze-Duthiers, at Roscoff, Finisterre, France, during the summer, was appointed to the Smithsonian table at Naples for the month of November, 1898.

EXPLORATIONS.

In the plan of organization of the Institution, among examples of objects for which appropriations may be made, are cited:

Explorations in descriptive natural history and geological, magnetical and topographical surveys to collect materials for the formation of a Physical Atlas of the United States.

Ethnological researches, particularly with reference to the different men in North America; also explorations and accurate surveys of the mounds and other remains of the ancient people of our country.*

The first grant made by the Institution for scientific exploration and field research was in 1848 to Spencer F. Baird, of Carlisle, for exploration of the bone caves and the local natural history of southeastern Pennsylvania; and during the half century that has elapsed since the grant to that eminent man, who afterwards became the Secretary of the Institution, every possible encouragement and support has been given to natural history and ethnological explorations in America and throughout the world. The income of the Institution has not permitted the expenditure of large sums for this purpose, but valuable advice and instructions have been freely given to explorers connected with Government and private expeditions, and agents of the Institution have in very many cases participated in these explorations. In recent years a vast amount of such work has been carried on by the bureaus under direction of the Institution, a work made possible by Congressional appropriations for this purpose.

As soon as there seemed a possibility of acquiring new territories as a result of the present Spanish-American war I began formulating plans for exploring the possible new regions, and in my next estimates to be sent to Congress I expect to ask definitely for appropriations under which exploring parties may be sent to them.

It is hardly necessary to recall the lasting impression that the French Government made throught the researches of the corps of savants sent along with the expedition to Egypt. It would seem incumbent upon this Government, not only from practical economic purposes, but as a contribution to the general intelligence of mankind, to institute scientific inquiry as to the natural history, geology, geography, ethnology, archæology and scientific utilities of any new possessions it may acquire. These inquiries should be made coherently and without clashing on the part of the various Government interests involved.

During the present year investigations among the American Indians have been conducted by the Bureau of Ethnology, and several collaborators of the Institution have made natural history explorations.

PUBLICATIONS.

Secretary Henry said: "It is chiefly by the publications of the Institution that its fame is to be spread through the world, and the monument most befitting the name of Smithson erected to his memory." From the beginning of the Institution a considerable portion of its annual income has been expended in publishing the Smithsonian Contributions to Knowledge and the Smithsonian Miscellaneous Collections. Through these series, supplemented by the Annual Reports printed at the direct expense of the Government, and the publications of the National Museum, the Bureau

*Smithsonian Report, 1846, pp. 6. 7.

of Ethnology and the American Historical Association, issued under the direction of the Institution, nearly all branches o human knowledge are represented in the works published during the last fifty years, which form a library of nearly 250 volumes, besides several hundred pamphlet reprints of the memoirs and articles contained in the serial volumes.

*Contributions to Knowledge.*—One new memoir of this series was unpublished during the year, the result of the investigations by Drs. Lummer and Pringsheim, of Charlottenburg, Germany, on the ratio of the specific heats at constant pressure and at constant volume of air, oxygen, carbon dioxide and hydrogen. This research was aided by a grant from the Hodgkins fund of the Smithsonian Institution. After a period of notable advance the kinetic theory of gases seems to have fallen into temporary abeyance, possibly from a fundamentally imperfect understanding of their behavior. Progress in the knowledge of this fundamental nature of gases may reasonably be looked for from interpretative researches on their thermal capacity, and this paper may be considered as a step in this direction. Aside from its exceptional portance in thermodynamics, the heat ratio is of interest as affording a clue to the character of the molecule, and Drs. Lummer and Pringsheim, using a new method, appear to have for the first time reached coincident results on the incoercible gases examined.

The original edition of the Secretary's memoir on 'The Internal Work of the Wind,' published in 1893, having become exhausted, some additional copies have been printed from the stereotype plates, in which a few minor changes have been made.

The Secretary now has in preparation for this series a review of his investigations in aerodynamics, and in particular of experiments in developing the principles and methods of mechanical flight.

*Miscellaneous Collections.*—In this series five works have been published since my last report. These are a Catalogue of Scientific and Technical Periodicals, by Dr. H. C. Bolton; Catalogue of Pacific Coast Earthquakes, by Professor E. S. Holden; Review and Bibliography of Metallic Carbides, by Professor J. A. Mathews; Bibliography of Metals of the Platinum Group, by Professor J. L. Howe, and a report by Dr. D. H. Bergey on the results of experiments to determine whether impure atmosphere produces a detrimental influence upon the animal organism as shown in greater susceptibility to certain diseases.

There have been also reprinted from the stereotype plates new editions of the Smithsonian Meteorological, Geographical and Physical Tables. A Supplement to the Bibliography of Chemistry, by Dr. H. C. Bolton, containing about 4,000 additional titles, is in hand, and about half of the volume had been printed at the close of the year.

*Smithsonian Reports.*—The annual reports of the Institution for the year 1896 and 1897 had not been issued at the close of the fiscal year, although the volume for 1896 was in the Government bindery and presswork was in progress on the report for 1897, their completion having been delayed by the imperative need of supplying documents required by Congress for the military departments 'by reason of the Spanish-American war.

*National Museum Publications.*—In addition to the Museum volume of the Smithsonian report, two series of publications are issued directly by the Museum, the Proceedings and the Bulletin. Of the first series Volume XIX. was completed in bound form, the separate papers having previously been isssued as pamphlets, and seventeen papers comprising Volume XX. were distributed in pamphlet form during the year. A pamphlet containing instruc-

tions for collecting scale insects was published as Part L. of Bulletin 39, and a circular was issued relating to the collection and preservation of the bones and teeth of the Mastodon and Mammoth.

*Bureau of Ethnology reports.*—The seventeenth report of the Bureau of Ethnology, for the year ending June 30, 1896, was sent to the Public Printer on July 6, 1897, and proof reading was completed before June 30, 1898, but actual presswork has not begun. The eighteenth report is also in the printers' hands, but no progress has been made beyond the revision of some first proofs.

*Astrophysical Observatory publications.*—There has been prepared and is now ready for publication a full report on the results of the researches carried on in the Astrophysical Observatory since its establishment and this work will probably be printed in quarto form during the next fiscal year, the cost of the publication being charged to the appropriation for the Observatory under authority of Congress.

LIBRARY.

The number of accessions to the library has been greater than at any time heretofore, the total entries of volumes, parts of volumes, pamphlets and charts reaching 40,715, an increase of nearly 5,000 over the previous year. The greater part of this has been sent to the Library of Congress to be placed with the Smithsonian deposit.

The Museum library shows a greatly increased use over last year. The limited quarters assigned for library purposes in the Museum are so greatly crowded that it has become necessary to provide additional book room, for which purpose a gallery directly adjoining the library has been erected and fitted with shelves, where space is provided for 18,000 volumes. This is rendered necessary by the purchase for the Museum, by Congressional appropriation, of the scientific library of the late Dr. G. Brown Goode. The Institution is especially fortunate in being able to obtain this library and the Museum now has the benefit of possessing the collections of books both of Professor Baird and Dr. Goode.

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## *THE AGRICULTURAL EXPERIMENT STATIONS.**

THIS is the fourth annual report on the work and expenditures of the agricultural experiment stations in the United States, made by the Director of the Office of Experiment Stations, under instructions from the Secretary of Agriculture. As heretofore, the report is based on three sources of information, viz, the annual financial statements of the stations, rendered on the schedules prescribed by the Secretary of Agriculture, in accordance with the Act of Congress; the printed reports and bulletins of the stations, and the reports of personal examinations of the work and expenditures of the stations made during the past year by the Director, Assistant Director and one other expert officer of the Office of Experiment Stations. The stations in all the States and Territories were visited since the previous report was transmitted to Congress.

During the past year the stations have, as a rule, steadily pursued their investigations. There have been a smaller number of changes in the workers; the general management has been less subject to radical and unwise changes; much useful work has been accomplished, and the facilities for investigations have been increased.

RELATIONS OF COLLEGES AND STATIONS.

There has been much activity during the past year in the developing and strengthening of courses of instruction in agricul-

* From Report to Congress on Work and Expenditures of Agricultural Experiment Stations for 1898.