

56TH CONGRESS,
1st Session.

SENATE.

DOCUMENT
No. 117.

REPORT

OF THE

NATIONAL ACADEMY OF SCIENCES

FOR

THE YEAR 1899.

JANUARY 25, 1900.—Presented by Mr. HAWLEY and ordered to be printed.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1900.

NATIONAL ACADEMY OF SCIENCES,
Washington, D. C., January 1, 1900.

SIR: In conformity with the requirements of the act of incorporation, approved March 3, 1863, I have the honor to submit herewith a report of the operations of the National Academy of Sciences for the past year.

Very respectfully,

WOLCOTT GIBBS,
President of the National Academy of Sciences.

The PRESIDENT OF THE SENATE.

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ACT OF INCORPORATION.

AN ACT to incorporate the National Academy of Sciences.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Louis Agassiz, Massachusetts; J. H. Alexander, Maryland; S. Alexander, New Jersey; A. D. Bache, at large; F. A. P. Barnard, at large; J. G. Barnard, United States Army, Massachusetts; W. H. C. Bartlett, United States Military Academy, Missouri; U. A. Boyden, Massachusetts; Alexis Caswell, Rhode Island; William Chauvenet, Missouri; J. H. C. Coffin, United States Naval Academy, Maine; J. A. Dahlgren, United States Navy, Pennsylvania; J. D. Dana, Connecticut; Charles H. Davis, United States Navy, Massachusetts; George Engelmann, Saint Louis, Mo.; J. F. Frazer, Pennsylvania; Wolcott Gibbs, New York; J. M. Gilliss, United States Navy, District of Columbia; A. A. Gould, Massachusetts; B. A. Gould, Massachusetts; Asa Gray, Massachusetts; A. Guyot, New Jersey; James Hall, New York; Joseph Henry, at large; J. E. Hilgard, at large, Illinois; Edward Hitchcock, Massachusetts; J. S. Hubbard, United States Naval Observatory, Connecticut; A. A. Humphreys, United States Army, Pennsylvania; J. L. LeConte, United States Army, Pennsylvania; J. Leidy, Pennsylvania; J. P. Lesley, Pennsylvania; M. F. Longstreth, Pennsylvania; D. H. Mahan, United States Military Academy, Virginia; J. S. Newberry, Ohio; H. A. Newton, Connecticut; Benjamin Pierce, Massachusetts; John Rodgers, United States Navy, Indiana; Fairman Rogers, Pennsylvania; R. E. Rogers, Pennsylvania; W. B. Rogers, Massachusetts; L. M. Rutherford, New York; Joseph Saxton, at large; Benjamin Silliman, Connecticut; Benjamin Silliman, junior, Connecticut; Theodore Strong, New Jersey; John Torrey, New York; J. G. Totten, United States Army, Connecticut; Joseph Winlock, United States Nautical Almanac, Kentucky; Jeffries Wyman, Massachusetts; J. D. Whitney, California; their associates and successors duly chosen, are hereby incorporated, constituted, and declared to be a body corporate, by the name of the National Academy of Sciences.

SEC. 2. *And be it further enacted,* That the National Academy of Sciences shall consist of not more than fifty ordinary members, and the said corporation hereby constituted shall have power to make its own organization, including its constitution, by-laws, and rules and regulations; to fill all vacancies created by death, resignation, or otherwise; to provide for the election of foreign and domestic members, the division

into classes, and all other matters needful or usual in such institution, and to report the same to Congress.

SEC. 3. *And be it further enacted*, That the National Academy of Sciences shall hold an annual meeting at such place in the United States as may be designated, and the Academy shall, whenever called upon by any Department of the Government, investigate, examine, experiment, and report upon any subject of science or art, the actual expense of such investigations, examinations, experiments, and reports to be paid from appropriations which may be made for the purpose, but the Academy shall receive no compensation whatever for any services to the Government of the United States.

Approved, March 3, 1863.

AN ACT to amend the act to incorporate the National Academy of Sciences.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act to incorporate the National Academy of Sciences, approved March third, eighteen hundred and sixty-three, be, and the same is hereby, so amended as to remove the limitation of the number of ordinary members of said Academy as provided in said act.

Approved, July 14, 1870.

DEPARTMENT OF STATE, June 10, 1882.

True copies.

SEVELLON A. BROWN,
Chief Clerk.

AN ACT to authorize the National Academy of Sciences to receive and hold trust funds for the promotion of science, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the National Academy of Sciences, incorporated by the act of Congress approved March third, eighteen hundred and sixty-three, and its several supplements, be, and the same is hereby, authorized and empowered to receive bequests and donations, and hold the same in trust, to be applied by the said Academy in aid of scientific investigations, and according to the will of the donors.

Approved, June 20, 1884.

DEPARTMENT OF STATE, June 24, 1884.

A true copy.

SEVELLON A. BROWN,
Chief Clerk.

REPORT

OF

THE NATIONAL ACADEMY OF SCIENCES.

SESSIONS OF THE NATIONAL ACADEMY.

During the year 1899 the Academy held three sessions. The first was the regular annual session held at Washington, April 18 to 20, inclusive. The second was a scientific session held at New York, November 14 to 16. - The third a special session, held at New York, November 15, for the transaction of business.

ANNUAL MEETING.

[Held at Washington April 18 to 20, 1899.]

The session was held at Columbian University, the President, Mr. Wolecott Gibbs, presiding.

The following-named members were present during the session:

Abbe, Agassiz, Barker, Billings, Boss, Bowditch, Brewer, Brush, Brooks, Dall, Dana, Emmons, Gibbs W., Gill, Hague, Hall, Hyatt, Langley, Minot, Morse, Newcomb, Powell, Putnam, Remsen, Schott, Verrill, Walecott, Welch, White.

REPORTS.

The President reported that no business from Congress or from the Departments had required the attention of the Academy since the publication of his last annual report to Congress.

The home secretary reported as follows:

During the year ending January 1, 1899, the President's report for the year 1898 and the second and third Memoirs of Vol. VIII have been printed and distributed to members of the Academy, foreign associates, and correspondents. A number of packages containing publications of scientific bodies were received and stored, unopened, in the Smithsonian building. The Academy is indebted to the Smithsonian Institution for distributing its publications and storing its library.

The treasurer presented his report for the year as follows:

WASHINGTON, D. C., April 18, 1899.

The President of the National Academy of Sciences.

SIR: I have the honor to transmit herewith my financial report as treasurer of the National Academy of Sciences for the year ending April 18, 1899:

Income.	General fund.	Bache fund.	Watson fund.	Draper fund.	J. Lawrence Smith fund.	Walcott Gibbs fund.	B. A. Gould fund.
Balance brought forward:							
Cash.....	\$367.05	\$2,867.96	\$2,116.63	\$1,690.15	\$971.22		
Invested.....	4,500.00	61,000.00	4,500.00		4,496.57		
Received interest during the year.....	18.26	2,172.15	1,295.30	430.25	563.89		\$915.00
Received members' tax.....	405.00						
Received invested income returned.....			4,593.71				
Deficit.....						\$3.28	
Total to be accounted for.....	1,290.31	6,010.11	4,715.64	2,090.40	2,831.68	3.28	915.00
Disbursed during the year.....	175.39	2,332.61	462.45	79.48	1,016.01	3.28	21.39
Balance:							
Cash.....	614.92	2,707.50	3,723.19	2,010.92	319.07		893.61
Invested.....	4,500.00	61,000.00	4,500.00		4,496.57		
Total accounted for.....	1,290.31	6,010.11	4,715.64	2,090.40	2,831.68	3.28	915.00
Cash balance available, less obligations.....	614.92	955.50	3,723.19	2,010.92	319.07		90.61
Uninvested.....			406.29				

a District of Columbia 3.65 per cent bonds.

b Dos Passos loan, 5 per cent.

c Sisters of the Visitation loan, 4 per cent.

d Earnshaw loan, 6 per cent.

The treasurer's bond was renewed.

Respectfully,

CHAS. D. WALCOTT, *Treasurer.*

The treasurer's report was referred to an auditing committee, consisting of Messrs. Abbe, Gill, and Hague, who, after due examination, reported as follows:

The committee appointed to examine the report of the treasurer respectfully report that they have performed this duty, and they hereby certify that the statements of expenditures, receipts, and balances correspond to the vouchers and accounts of the treasurer, and are found correct.

CLEVELAND ABBE, *Chairman.*

ARNOLD HAGUE.

THEODORE N. GILL.

WASHINGTON, April 18.

The committee appointed to examine the securities and papers found in the box of the National Academy of Sciences, safe deposit company, reported that they had examined the securities and papers, as described, and found them to correspond with the lists.

CLEVELAND ABBE, *Chairman.*

ARNOLD HAGUE.

THEODORE N. GILL.

ELECTIONS.

Messrs. Billings, Bowditch, Brush, Hague, Langley, and Newcomb were elected members of the council.

Messrs. Charles E. Beecher, Edmund B. Wilson, George C. Comstock, Théodore W. Richards, and Edgar F. Smith were elected members of the Academy.

During the year 1899 the Academy lost by death Mr. Othniel Charles Marsh, an ex-president of the Academy, who died at New Haven March 18, and Mr. Elliott Coues, who died December 25. Sophus Lie, foreign associate, died February 18; Robert W. Bunsen, August 16; and Carl Friederich Rammelsberg, December 28.

THE FOLLOWING AMENDMENT TO THE CONSTITUTION WAS ADOPTED:

SEC. 5. The Academy is to be divided into six standing committees. In this classification a member who is eminent in more than one subject may be assigned to a corresponding number of committees. The classification shall be the following:

1. Mathematics and astronomy.
2. Physics and engineering.
3. Chemistry.
4. Geology and Paleontology.
5. Biology.
6. Anthropology.

In nominating for membership in the Academy a statement must be made as to the subject or subjects in which the person nominated is eminent. Every nomination must be submitted through the secretary to all the members of the committee or committees representing the subject or subjects in which the person nominated is stated to be eminent, and in order that his name may be brought before the Academy for election, he must receive the votes of a majority of the members of the committee or committees to which his name has been referred.

REPORTS FROM TRUST FUNDS.

The President, on behalf of the board of directors of the Bache fund, reported that during the year ending January 1, 1899, the following appropriations had been made:

1899.

Mar. 7. To Dr. John S. Billings, for investigation of physiological effects of alcohol on the human body.....	\$250
Nov. 8. To Prof. Henry A. Rowland, for investigation of the solar spectrum, especially the completion of table of wave lengths and the determination of the elements whose presence in the sun causes them.....	700
Nov. 9. To Prof. A. S. Packard, in continuation of his investigation on the larval histories of the Bombycinæ moths, and for colored drawings of the same.....	100

Dr. Billings applied to the board of directors of the Bache fund for permission to use the sum of \$250, being part of unused funds in his hands from a previous appropriation. The new appropriation was for an investigation on the effects of alcohol on metabolism in the human body, and was a contribution to the investigation being made by Professor Atwater under the direction of the subcommittee of the Committee of Fifty on the Physiological and Pathological Effects of Alcohol. Permission was granted by the board of directors, and on April 8 Dr. Billings returned to the treasurer the sum of \$46.97 as unexpended. He also notified the treasurer that Dr. S. Weir Mitchell and himself would not use the appropriation of \$1,000 made to them by the board in May, 1896, for the purpose of bacteriological research.

The directors of the Benjamin Apthorp Gould fund report that the following appropriations have been made by them:

To Prof. C. L. Doolittle the sum of \$500, for a definitive reduction of the latitude observations made at the Sayre Observatory, South Bethlehem, Pa., from 1889 to 1895.

To Henry M. Parkhurst the sum of \$300, for photometric stellar observations.

Mr. Newcomb, on behalf of the trustees of the Watson fund, moved that the fifth Watson medal be awarded to David Gill, Her Majesty's astronomer at the Cape of Good Hope, for his work in perfecting the application of the heliometer to astronomical measurements, which has resulted in an important advance in astronomy of precision, especially in the determination of parallaxes of the sun and stars and of the position of the planets.

The recommendation was approved by the Academy.

Mr. Barker made the following recommendation on behalf of the Committee on the Henry Draper fund.

The Committee on the Henry Draper fund hereby recommend the award of the Henry Draper medal to Prof. James E. Keeler, Director of the Lick Observatory, for his researches in spectroscopic astronomy.

GEORGE F. BARKER, *Chairman*.

The recommendation was approved by a unanimous vote.

The following report upon the progress of spectrum work, under the direction of Mr. Henry A. Rowland, by Mr. L. E. Jewell, was presented by Mr. Rowland:

REPORT UPON THE PROGRESS OF SPECTRUM WORK SINCE THE PUBLICATION OF THE PRELIMINARY TABLE OF WAVE LENGTHS, BY L. E. JEWELL.

The published table has been carefully gone over and compared with the original, and a *table of corrections* published, including the revision for identification of solar with metallic lines as far as they were completed at the time.

The work of identification has been revised for all except a few of the less important elements over the whole extent of "Rowland's Map," and carefully compared with the published table with identifications by Rowland upon two sets of maps.

Comparisons have also been made with the old set of plates from wave length 3,700 upward as far as the plates go.

New plates have been taken of the more important elements, extending to wave length 6,100 or 6,200. These plates are much superior to the old ones in all respects except fineness of grain, but in some cases are not quite so good as are many old plates, because of the increased street traffic near the laboratory and consequent vibration of the apparatus.

The new plates have all been carefully gone over and the lines due to impurities and ghosts carefully marked; also, data have been secured for eliminating the error of wave length due to motion in the line of sight of the earth and its rotation, upon all of the new plates.

The redetermination of coincidences has been completed for iron up to wave length 62 and for all other important elements, except on some two or three plates in the green and blue spectra of these elements. Some work of identification has been done visually in the spectroscope, but comparatively little as yet.

The number of new identifications made are about as many as were given in the original table; besides many errors have been detected (though these are for the most part of unimportant lines).

Most of the new identifications have been small and in many cases exceedingly faint solar lines. This has rendered the work exceedingly difficult and tedious, many of these solar lines not being visible upon the plates containing metallic spectra. As the fine-grained map plates of Rowland are upon a somewhat different scale, this difference has made much of the work difficult and laborious.

Quite a number of fine lines in the spectrum of titanium and chromium have been found to coincide with very faint lines in the solar spectrum, which were too faint to measure with accuracy, and, although nearly all were indicated in the original notes, they were not incorporated in the published table. These lines have been measured and included in the revised table.

A number of lines due to ruthenium have been found to be present in the ultra-violet solar spectrum. Many of the plates of yttrium, scandium, and other rare elements have been measured and some progress made toward the identification of their lines.

A redetermination has been carefully made of Rowland's estimate of the number of lines of each element present in the solar spectrum and their relative importance in the solar atmosphere.

There remains yet to be done a reexamination of plates of most elements from 3,000 to 3,700, and some of the plates in the blue and green.

Some more plates will yet have to be taken where the old ones are defective or where none were taken.

It is believed that this work can be finished some time next spring. The nature of the work renders it impossible to give beforehand any exact date.

LIST OF PAPERS PRESENTED AT THE APRIL SESSION.

Ophiura Brevispina. W. K. Brooks and Caswell Grave.

The Shadow of a Planet. A. Hall.

On the Tanner Deep Sea Tow Net. A. Agassiz.

On the Acalephs of the East Coast of the United States. A. Agassiz and A. G. Mayer.

On the Limestones of Fiji. E. C. Andrews; communicated by A. Agassiz.

On the Bololo of Fiji and Samoa. W. McM. Woodworth; communicated by A. Agassiz.

On the Diamond and Gold Mines of South Africa. A. Agassiz.

The Resulting Differences Between the Astronomic and Geodetic Latitudes and Longitudes in the Triangulation Along the Thirty-ninth Parallel. H. S. Pritchett; introduced by C. D. Walcott.

Progress in Surveying and Protection of the United States Forest Reserves. C. D. Walcott.

The Work of the Division of Forestry, Department of Agriculture. Gifford Pinchot; introduced by C. D. Walcott.

On the Development by Selection of Supernumerary Mammary in Sheep. A. Graham Bell.

On Kites with Radial Wings. A. Graham Bell.

Remarks on the Work of the Nautical Almanac Office during the Years 1877-98 in the Field of Theoretical Astronomy. S. Newcomb.

Exhibition of Specimens of *Nautilus pompilius*. W. K. Brooks and L. E. Griffin.

SCIENTIFIC SESSION.

[Held in New York November 14 and 15, 1899.]

A scientific session for the reading of papers only having been called by the Council, the Academy met at Columbia University, New York, the President, Mr. Wolcott Gibbs, presiding:

The following-named members were present during the session: Abbe, Barker, Bell, Beecher, Billings, Bowditch, Brewer, Brush,

Chandler, C. F., Comstock, C. B., Dana, Emmons, Gibbs, W., Hague, Hastings, Holden, Mayo-Smith, Michelson, Newcomb, Peirce, Putnam, Richards, Rood, Verrill, Walcott, Wilson, Wood, Woodward, Wright.

The following papers were read:

TUESDAY.

Variations in Normal Color Vision. Ogden N. Rood.

The Time of Perception as a Measure of Difference in Intensity. (By invitation) J. McKeen Cattell.

Relations of Time and Space in Vision. (By invitation) J. McKeen Cattell.

The Electro-chemical Equivalents of Copper and Silver. Theodore William Richards.

Recent Results of the Henry Draper Memorial. Edward C. Pickering. Read by George F. Barker.

The Static Properties of the Atmosphere. R. S. Woodward.

The Hydrogen Vacua of Dewar. George F. Barker.

A Direct Proof of the Effect on the Eulerian Cycle of an Inequality in the Equatorial Moments of Inertia of the Earth. R. S. Woodward.

WEDNESDAY.

The Map-coloring Problem. Charles S. Peirce.

Memoir of W. A. Rogers as a Physicist. E. W. Morley.

Report of the Delegates to the Wiesbaden Congress to consider the establishment of an International Scientific Association. Henry P. Bowditch.

BUSINESS MEETING.

A business meeting of the Academy, called by the Council to consider the report of the President to Congress and such other business as might be presented, was held November 15, the President presiding.

The recommendations of the Council that the President be authorized to include in his annual report to Congress the proceedings of the present meeting as well as those of the meeting at Washington in April, 1899, and also any matters relating to Government business which may be submitted to the Academy prior to the presentation of his report, was approved. The President read an outline of his report to Congress for the year ending January 1, 1900.

The President presented to the Academy papers relating to an international congress held at Wiesbaden in October last, and asked the approval of the Academy of his course in appointing delegates to attend the preliminary meeting. He stated that the cordial assent of the Council had been obtained before replies were made, conditionally approving the project.

SEC. 2. No contract shall be binding upon the Academy which has not been first approved by the council.

SEC. 3. The assessments required for the support of the Academy shall be fixed by the Academy on the recommendation of the council.

ARTICLE VII.—OF ADDITIONS AND AMENDMENTS.

Additions and amendments to the constitution shall be made only at a stated session of the Academy. Notice of a proposition for such a change must be given at a stated session, and shall be referred to the council, which may amend the proposition, and shall report thereon to the Academy at the same session. Its report shall be considered by the Academy in committee of the whole for amendment.

The proposition as amended, if adopted in committee of the whole, shall be voted on at the next stated session, and if it receive two-thirds of the votes cast it shall be declared adopted.

Absent members may send their votes on pending changes in the constitution to the home secretary in writing, and such votes shall be counted as if the members were present.

APPENDIX B.

RULES.

I. In the absence of any officer a member shall be chosen to perform his duties temporarily, by a plurality of viva voce votes, upon open nominations.

II. On the first day of each stated session, immediately after calling the roll of members, a recording secretary shall be elected, by a plurality of members present, to assist the home secretary in keeping the records of the session.

III. The accounts of the treasurer shall be referred to an auditing committee of three members, to be appointed by the president at the meeting at which the accounts are presented, which committee shall report before the close of that session, and shall then be discharged.

The bonds, securities, and other property owned or held in trust by the Academy shall be inspected and verified by a committee to be annually appointed by the president. The report of this committee shall be presented to the Academy at its first stated session in each year and referred with the accounts to the auditing committee.

IV. A committee of arrangements, consisting of five members, shall be appointed by the president for each stated session of the Academy. This committee shall meet not less than two weeks previous to each session. It shall be in session during the meetings to make arrangements for the reception of the members, to arrange the business of each day, and, in general, to attend to all business and scientific arrangements.

It shall be the duty of the committee of arrangements to ascertain the length of time required for reading the several memoirs presented and, when it appears advisable, to recommend a limit of time to be occupied in their discussion.

V. At the meetings the order of business shall be as follows:

1. Chair taken by the president, or, in his absence, by the vice-president.
2. Roll of members called by home secretary.
3. Minutes of the preceding meeting read and approved.
4. Stated business.
5. Reports of president, secretaries, treasurer, and committees.
6. Business from council.

7. Other business.

8. On the last day of the session the rough minutes of that day's proceedings are to be read for correction.

VI. The rules of order of the Academy shall be those of the Senate of the United States, unless suspended by unanimous consent.

VII. Unless otherwise ordered by the Academy, the scientific meetings at the April session shall be held in the afternoon, the mornings being reserved for business.

VIII. The death of members shall be announced by the president on the last day of any session, when a member shall be selected by the president to furnish a biographical notice of the deceased at the next stated session. If such notice be not then furnished, another member may be selected by the president in place of the first, and so on until the duty is performed.

IX. The secretaries will receive memoirs at any time, and report the date of their reception at the next session; but no memoir shall be published unless it has been read before the Academy.

X. Memoirs shall date, in the records of the Academy, from the date of their presentation to the Academy, and the order of their presentation shall be so arranged by the secretary that, so far as may be convenient, those upon kindred topics shall follow one another.

XI. Papers from persons not members read before the Academy and intended for publication shall be referred at the meeting at which they are read to a committee of members competent to judge whether the paper is worthy of publication. Such committee shall report to the Academy as early as practicable, and not later than the next stated session.

XII. The printing of the Academy shall be under the charge of the committee of publication, to consist of the home secretary and four other members to be named by the president, with the advice and consent of the council.

XIII. The annual report of the Academy may be accompanied by a memorial to Congress in regard to such investigations and other subjects as may be deemed advisable, recommending appropriations therefor when necessary.

XIV. The proper secretary shall acknowledge all donations made to the Academy, and shall report them at the next stated session.

XV. The books, apparatus, archives, and other collections of the Academy shall be deposited in some safe place in the city of Washington. A list of the articles so deposited shall be kept by the home secretary, who is authorized to employ a clerk to take charge of them.

XVI. A stamp corresponding to the corporate seal of the Academy shall be kept by the secretaries, who shall be responsible for the due marking of all books and other objects to which it is applicable.

Labels or other proper marks of similar device shall be placed upon objects not admitting of the stamp.

XVII. The treasurer is authorized to defray, when approved by the president, all the proper expenses of committees appointed to make scientific investigations at the request of Departments of the Government, and in each case to look to the Department requesting the investigation for reimbursement to the Academy.

XVIII. Nominations for membership should state the full name, residence, the official position, and the special scientific studies of the candidate. A form of nomination shall be prepared by the home secretary.

XIX. At least sixty days before the election the members signing the nomination should furnish the home secretary with a sufficient number of printed copies of a list of the more important original works of the nominee to enable the secretary to furnish a copy to each member of the Academy.

XX. Ballots for election of members may be sent by sealing them up in a blank envelope, and inclosing this in another, across the back of which is written the name of the sender, and which is addressed to the home secretary; such envelopes will be opened only by the tellers.

XXI. All discussions as to the claims and qualifications of nominees at meetings of the Academy will be held strictly confidential, and remarks and criticisms then made may be communicated to no person who was not a member of the Academy at the time of the discussion.

XXII. Any rule of the Academy may be amended, suspended, or repealed, on the written motion of any two members, signed by them, and presented at a stated session of the Academy, provided the same shall be approved by a majority of the members present.

By a resolution adopted January 12, 1864, the President is *ex officio* a member of all government committees of the Academy.

APPENDIX C.

ORGANIZATION OF THE ACADEMY, 1900.

	Expiration of term.
GIBBS, WOLCOTT, <i>President</i>	April, 1901.
HALL, ASAPH, <i>Vice-President</i>	April, 1903.
AGASSIZ, A., <i>Foreign Secretary</i>	April, 1901.
REMSEN, IRA, <i>Home Secretary</i>	April, 1903.
WALCOTT, CHARLES D., <i>Treasurer</i>	April, 1904.

ADDITIONAL MEMBERS OF COUNCIL, 1900.

BILLINGS, J. S.	HAGUE, A.
BOYDITCH, H. P.	LANGLEY, S. P.
BRUSH, G. J.	NEWCOMB, S.

COMMITTEES OF THE ACADEMY.

On nominations of new members.

1. Mathematics and Astronomy.

ABBE, C.
BOSS, L.
CHANDLER, S. C.
COMSTOCK, G. C.
DAVIDSON, G.
ELKIN, W. L.
HALL, A.
HILL, G. W.
HOLDEN, E. S.
NEWCOMB, S.
PEIRCE, C. S.
PICKERING, E. C.
WOODWARD, R. S.
YOUNG, C. A.

2. Physics and Engineering.

ABBE, C.
ABBOT, H. L.
BARKER, G. F.
BARUS, C.
BELL, A. G.
COMSTOCK, C. B.
GIBBS, J. W.
HASTINGS, C. S.
LANGLEY, S. P.
MENDENHALL, T. C.
MICHELSON, A. A.
MITCHELL, H.
MORLEY, E. W.
MORTON, H.

2. Physics and Engineering—Continued.

PICKERING, E. C.
ROGERS, F.
ROOD, O. N.
ROWLAND, H. A.
SCHOTT, C. A.
SELLERS, W.
TROWBRIDGE, J.
WRIGHT, A. W.

3. Chemistry.

BARKER, G. F.
BRUSH, G. J.
CHANDLER, C. F.
CHATTENDEN, R. H.
CRAFTS, J. M.
DANA, E. S.
GIBBS, W.
GOOCH, F. A.
HILGARD, E. W.
HILL, H. B.
JACKSON, C. L.
JOHNSON, S. W.
MICHAEL, A.
MORLEY, E. W.
REMSEN, I.
RICHARDS, T. W.
SMITH, E. F.

4. Geology and Paleontology.

BEECHER, C. E.
DALL, W. H.

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4. Geology and Paleontology—Cont'd.

DUTTON, C. E.
EMMONS, S. F.
GILBERT, G. K.
HAGUE, A.
KING, C.
LE CONTE, J.
LESLIE, J. P.
PUMPELLY, R.
WALCOTT, C. D.
WHITE, C. A.

5. Biology.

AGASSIZ, A.
ALLEN, J. A.
BOWDITCH, H. P.
BREWER, W. H.
BROOKS, W. K.
CHITTENDEN, R. H.
DALL, W. H.
FARLOW, W. G.
GILL, T. N.
GOODALE, G. L.
HYATT, A.
MINOT, C. S.

5. Biology—Continued.

MOORE, E. S.
PACKARD, A. S.
PUTNAM, F. W.
SARGENT, C. S.
SCUDDER, S. H.
SMITH, S. I.
VERRILL, A. E.
WALCOTT, C. D.
WELCH, W. H.
WHITE, C. A.
WHITMAN, C. O.
WILSON, E. B.
WOOD, H. C.

6. Anthropology.

BILLINGS, J. S.
MAYO-SMITH, R.
MINOT, C. S.
MITCHELL, S. W.
MOORE, E. S.
POWELL, J. W.
PUTNAM, F. W.
WELCH, W. H.

On Weights, Measures, and Coinage.

MENDENHALL, T. C.
MICHELSON, A. A.

NEWCOMB, S.
PEIRCE, C. S.

YOUNG, C. A.

On the Election of Foreign Associates.

HALL, A.
AGASSIZ, A.

MITCHELL, S. W.
NEWCOMB, S.

On Publications of the Academy.

GILL, T. N.

TRUST FUNDS.

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SCUDDER, S. H.

CHANDLER, S. C.

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NEWCOMB, S., Chairman.

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ROOD, O. N.

CHANDLER, S. C.

JACKSON, C. L.

NEWCOMB, S.

The Wolcott Gibbs Fund.

JACKSON, C. L.

DROWN, T. M.

REMSEN, IRA.

MEMBERS OF THE NATIONAL ACADEMY OF SCIENCES,
JANUARY 1, 1900.

	Date of election.
ABBE, CLEVELAND.....	2017 1st. NW., Washington, D. C. 1879
ABBOT, HENRY L., U. S. A.....	Army Building, New York City. 1872
AGASSIZ, ALEXANDER.....	Cambridge, Mass. 1866
ALLEN, J. ASAPH.....	American Museum, New York City. 1876
BARKEE, GEORGE F.....	309 Locust st., Philadelphia, Pa. 1876
BARTS, CARL.....	Providence, R. I. 1892
BEECHER, CHARLES E.....	New Haven, Conn. 1899
BELL, A. GRAHAM.....	141 Connecticut ave., Washington, D. C. 1883
BILLINGS, JOHN S., U. S. A.....	32 E. Thirty-first st., New York. 1883
BOSS, LEWIS.....	Albany, N. Y. 1889
BOWDITCH, HENRY P.....	Jamaica Plain, Mass. 1887
BREWER, WILLIAM H.....	418 Orange st., New Haven, Conn. 1880
BROOKS, W. K.....	Johns Hopkins University, Baltimore, Md. 1884
BRUSH, GEORGE J.....	14 Trumbull st., New Haven, Conn. 1868
CHANDLER, CHARLES F.....	New York City. 1874
CHANDLER, SETH C.....	65 College st., Cambridge, Mass. 1888
CHITTENDEN, RUSSELL H.....	New Haven, Conn. 1890
COMSTOCK, CYRUS B., U. S. A.....	Army Building, New York City. 1884
COMSTOCK, GEORGE C.....	Washou. Observatory, Madison, Wis. 1899
CRAFTS, JAMES M.....	Marlboro' st., Boston, Mass. 1872
DALL, WILLIAM H.....	Washington, D. C. 1897
DANA, EDWARD S.....	New Haven, Conn. 1884
DAVIDSON, GEORGE.....	2221 Washington st., San Francisco, Cal. 1874
DUTTON, CLARENCE E., U. S. A.....	Ordinance Office, War Dep't., Washington, D. C. 1884
ELKIN, WILLIAM L.....	New Haven, Conn. 1895
EMMONS, SAMUEL F.....	Washington, D. C. 1892
FARLOW, W. G.....	Cambridge, Mass. 1879
GIBBS, JOSIAH WILLARD.....	New Haven, Conn. 1879
GIBBS, WOLCOTT.....	Newport, R. I. —
GILBERT, GROVE K.....	Washington, D. C. 1883
GILL, THEODORE N.....	Washington, D. C. 1873
GOOCH, FRANK A.....	New Haven, Conn. 1897
GOODALE, GEORGE L.....	Cambridge, Mass. 1890
HAGUE, ARNOLD.....	U. S. Geological Survey, Washington, D. C. 1885
HALL, ASAPH.....	12 Kirkland Place, Cambridge, Mass. 1875
HASTINGS, CHARLES S.....	New Haven, Conn. 1889

	Date of election.
HILGARD, EUGENE W.	Berkeley, Cal. 1872
HILL, GEORGE W.	West Nyack, N. Y. 1874
HILL, HENRY B.	Cambridge, Mass. 1883
HOLDEN, EDWARD S.	4 E. 3rd st., New York City. 1885
HYATT, ALPHRUS.	Soc. of Nat. History, Boston, Mass. 1875
JACKSON, CHARLES L.	6 Baylston Hall, Cambridge, Mass. 1883
JOHNSON, SAMUEL W.	54 Tremont st., New Haven, Conn. 1866
KING, CLARENCE.	Century Association, New York City. 1876
LANGLEY, SAMUEL P.	Washington, D. C. 1876
LE CONTE, JOSEPH.	Berkeley, Cal. 1875
LESLEY, J. PETER.	11 Walnut st., Philadelphia, Pa. 1890
MAYO-SMITH, RICHMOND.	65 W. 77th st., New York City. 1887
MENDENHALL, THOMAS C.	Worcester, Mass. 1889
MICHAEL, ARTHUR.	Tufts College, Mass. 1888
MICHELSON, ALBERT A.	Chicago, Ill. 1888
MINOT, CHARLES S.	Boston, Mass. 1897
MITCHELL, HENRY.	Nantucket, Mass. 1885
MITCHELL, S. WEIR.	1524 Walnut st., Philadelphia, Pa. 1865
MORLEY, EDWARD W.	Adelbert College, Cleveland, Ohio. 1897
MORSE, EDWARD S.	P. O. Box 268, Salem, Mass. 1876
MORTON, HENRY.	Hoboken, N. J. 1874
NEWCOMB, SIMON, U. S. N.	1600 P. O. NW, Washington, D. C. 1869
PACKARD, A. S.	Providence, R. I. 1872
PERCE, CHARLES S.	Milford, Pa. 1876
PICKERING, EDWARD C.	Cambridge, Mass. 1873
POWELL, JOHN W.	Washington, D. C. 1880
PUMPELLY, RAPHAEL.	Gibbs ave., Newport, R. I. 1872
PITNAM, FREDERICK W.	Cambridge, Mass. 1885
REMSEN, IRA.	Johns Hopkins University, Baltimore, Md. 1882
RICHARDS, THEODORE W.	Cambridge, Mass. 1899
ROGERS, FAIRMAN.	Albany, N. Y. 1865
ROOD, OGDEN N.	New York City 1865
ROWLAND, HENRY A.	Johns Hopkins University, Baltimore, Md. 1881
SARGENT, CHARLES S.	Jamaica Plain, Mass. 1895
SCHOTT, CHARLES A.	212 First st. SE., Washington, D. C. 1872
SCUDDER, SAMUEL H.	Cambridge, Mass. 1877
SELLERS, WILLIAM.	1600 Hamilton st., Philadelphia, Pa. 1873
SMITH, EDGAR F.	Philadelphia, Pa. 1899
SMITH, SIDNEY I.	New Haven, Conn. 1884
TROWBRIDGE, JOHN.	Cambridge, Mass. 1878
VERRILL, A. F.	New Haven, Conn. 1872
WALCOTT, CHARLES D.	Washington, D. C. 1896
WELCH, WILLIAM H.	655 St. Paul st., Baltimore, Md. 1895
WHITE, CHARLES A.	Washington, D. C. 1889
WHITMAN, CHARLES O.	University of Chicago, Chicago, Ill. 1895
WILSON, EDMUND B.	Columbia University, New York City. 1899
WOOD, HORATIO C.	1225 Chestnut st., Philadelphia, Pa. 1879
WOODWARD, ROBERT S.	183 Claremont ave., Montclair, N. J. 1896
WRIGHT, ARTHUR W.	New Haven, Conn. 1881
YOUNG, CHARLES A.	Princeton, N. J. 1872

DECEASED MEMBERS.

	Date of death.
*AGASSIZ, LOUIS.	Dec. 14, 1873
*ALEXANDER, J. H.	Mar. 2, 1867
*ALEXANDER, STEPHEN.	June 25, 1883
*BACHE, ALEXANDER DALLAS.	Feb. 14, 1867
*BAIRD, SPENCER F.	Aug. 19, 1887
BARNARD, F. A. P.	Apr. 27, 1889
BARNARD, J. G.	May 14, 1882
BARTLETT, W. H. C.	Feb. 11, 1893
*BROWN-SQUARD, CHARLES F.	Apr. 2, 1894
*CASEY, THOMAS L., U. S. A.	Mar. 25, 1896
*CASWELL, ALEXIS.	Jan. 8, 1887
*CHAUVENET, WILLIAM.	Dec. 13, 1870
*CLARKE, HENRY JAMES.	July 1, 1873
*COFFIN, JAMES H.	Jan. 6, 1873
*COFFIN, J. H. C.	Jan. 8, 1890
*COOK, GEORGE H.	Sept. 22, 1889
*COOKE, JOSIAH P.	Sept. 3, 1894
*COPE, EDWARD D.	Apr. 12, 1897
COUES, ELLIOTT.	Dec. 25, 1899
DALTON, J. C.	Feb. 2, 1889
DANA, JAMES D.	Apr. 14, 1895
*DAVIS, CHARLES H.	Feb. 18, 1877
*DRAPER, HENRY.	Nov. 20, 1882
*DRAPER, JOHN W.	Jan. 4, 1882
*EADS, JAMES B.	Mar. 8, 1887
*ENGELMAN, GEORGE.	Feb. 4, 1884
*FERREL, WILLIAM.	Sept. 18, 1891
*FRAZER, JOHN FRIES.	Oct. 12, 1872
*GABB, WILLIAM M.	May 30, 1878
GENTH, F. A.	Feb. 2, 1893
*GILLISS, JAMES MELVILLE.	Feb. 9, 1865
*GOODE, G. BROWN.	Sept. 6, 1896
*GOULD, AUGUSTUS A.	Sept. 15, 1866
GOULD, BENJAMIN A.	Nov. 27, 1896
*GRAY, ASA.	Jan. 30, 1888
*GUYOT, ARNOLD.	Feb. 8, 1884
*HADLEY, JAMES.	Aug. 1, 1864
*HALDEMAN, S. S.	Sept. 20, 1880
HALL, JAMES.	Aug. 8, 1898
*HAYDEN, F. V.	Dec. 22, 1887
*HENRY, JOSEPH.	May 13, 1878
*HILGARD, JULIUS E.	May 8, 1891
*HITCHCOCK, EDWARD.	Feb. 27, 1864
*HOLBROOK, J. E.	Sept. 8, 1871
*HUBBARD, J. S.	Aug. 16, 1863
*HUMPHRIES, A. A.	Nov. 28, 1883
HUNT, T. STERRY.	Feb. 12, 1892
*KIRKLAND, JARED P.	Dec. 10, 1877
*LANE, J. HOMER.	May 3, 1880
*LE CONTE, JOHN.	Apr. 29, 1891

* Biographical notices have been presented of those designated by an asterisk.

	Date of death.
* LE CONTE, JOHN L.	Nov. 15, 1883
LEA, MATTHEW C.	Mar. 15, 1897
LEIDY, JOSEPH	Apr. 30, 1891
* LESQUEREUX, LEO	Oct. 25, 1889
LONGSTRETH, MIERS F.	Dec. 27, 1891
* LOOMIS, ELIAS	Aug. 16, 1889
LOVERING, JOSEPH	Jan. 18, 1892
LYMAN, THEODORE	Sept. 10, 1897
* MAHAN, D. H.	Sept. 16, 1871
* MARSH, G. P.	July 23, 1882
MARSH, O. C.	Mar. 18, 1899
MAYER, ALFRED M.	July 13, 1897
* MEER, F. B.	Dec. 21, 1877
* MEIGS, M. C.	Jan. 2, 1892
* MORGAN, LEWIS H.	Dec. 14, 1881
NEWBERRY, J. S.	Dec. 7, 1892
* NEWTON, H. A.	Aug. 1, 1896
NEWTON, JOHN	May 1, 1895
* NORTON, WILLIAM A.	Sept. 21, 1883
* OLIVER, JAMES E.	Mar. 27, 1895
PETERS, C. H. F.	July 18, 1890
* POURTALES, L. F.	July 19, 1880
RODGERS, JOHN	May 5, 1882
ROGERS, ROBERT E.	Sept. 7, 1884
* ROGERS, WM. A.	Mar. 1, 1898
* ROGERS, WILLIAM B.	May 30, 1882
* RUTHERFORD, LEWIS M.	May 30, 1892
* SAXTON, JOSEPH	Oct. 26, 1873
* SILLIMAN, BENJ. ST.	Nov. 24, 1864
SILLIMAN, BENJ. JR.	Jan. 14, 1885
* SMITH, J. LAWRENCE	Oct. 12, 1883
* STIMPSON, WILLIAM	May 26, 1873
* STRONG, THEODORE	Feb. 1, 1869
* SULLIVANT, W. S.	Apr. 30, 1873
* TORREY, JOHN	Mar. 10, 1873
* TOTTEN, J. G.	Apr. 22, 1864
* TROWBRIDGE, WILLIAM P.	Aug. 12, 1892
TRUMBULL, JAMES H.	Aug. 5, 1897
* TUCKERMAN, EDWARD	Mar. 15, 1886
WALKER, FRANCIS A.	Jan. 5, 1897
* WARREN, G. K.	Aug. 8, 1882
* WATSON, JAMES C.	Nov. 23, 1880
* WATSON, SERENO	Mar. 9, 1892
* WYNLOCK, JOSEPH	June 11, 1875
* WOODWARD, J. J., U. S. A.	Aug. 17, 1884
* WORTHEN, A. H.	May 6, 1888
* WYMAN, JEFFRIES	Sept. 4, 1874

FOREIGN ASSOCIATES.

AUWERS, ARTHUR	Berlin.
BAEYER, ADOLPH (RITTER VON)	Munich.
BERTHELOT, M. P. E.	Paris.

* Biographical notices have been presented of those designated by an asterisk.

BERTRAND, J. L. F.	Paris.
GEGENBAUR, KARL	Heidelberg.
GILL, DAVID	Cape Town.
HOOKE, SIR J. D.	Kew.
KELVIN (Lord)	Glasgow.
KLEIN, FELIX	Göttingen.
KÖLLIKER, ALBERT VON	Würzburg.
LACAZE-DUTHIERS, HENRI DE	Paris.
LISTER (Lord)	London.
MOISSAN, HENRI	Paris.
POINCARÉ, HENRI	Paris.
RAYLEIGH (Lord)	London.
RICHTHOFEN, F. VON	Berlin.
STOKES, SIR GEORGE G.	Cambridge.
STRASBURGER, EDOUARD	Bonn.
STRUVE, OTTO VON	Karlsruhe.
SUËSS, EDOUARD	Vienna.
VIRCHOW, RUDOLPH VON	Berlin.
ZITTEL, KARL ALFRED (RITTER VON)	Munich.

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KARL ERNST VON BAER.	JUSTUS VON LIEBIG.
HENRY MILNE-EDWARDS.	ALEXANDER BRAUN.
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L. ELIE DE BEAUMONT.	ADOLPHE WÜRTZ.
SIR DAVID BREWSTER.	THEODORE VON OPPOLZER.
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F. W. A. ARGELANDER.	RUDOLPH CLAUDIUS.
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MICHEL CHARLES.	A. W. HOFMANN.
SIR GEORGE B. AIRY.	BARON H. VON HELMHOLTZ.
J. C. ADAMS.	K. F. W. LUDWIG.
SIR RICHARD OWEN.	LOUIS PASTEUR.
C. H. C. BURMEISTER.	AUGUST KÉKULÉ.
ARTHUR CAYLEY.	EMIL DU BOIS REYMOND.
T. H. HUXLEY.	J. J. SYLVESTER.
HUGO GYLDÉN.	KARL WEIERSTRASS.
F. F. TISSERAND.	RUDOLPH LEUCKART.
JULIUS VON SACHS.	C. F. RAMMELSBERG.
SIR RODERICK I. MURCHISON.	SOPHUS LIE.
VICTOR REGNAULT.	ROBERT W. BUNSEN.
H. W. DOVE.	

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