THE

AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA
FOR PROMOTING USEFUL KNOWLEDGE

YEAR BOOK 1937

JANUARY 1, 1937 – DECEMBER 31, 1937

THE AMERICAN PHILOSOPHICAL SOCIETY
INDEPENDENCE SQUARE
PHILADELPHIA
1938

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CHARTER *

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AN ACT

for incorporating the American Philosophical Society held at Philadelphia for promoting useful knowledge.

L.S.

Whereas the cultivation of useful knowledge, and the advancement of the liberal arts and sciences in any Country, have the most direct tendency towards the improvement of agriculture, the enlargement of trade, the ease and comfort of life, the ornament of society, and the encrease and happiness of mankind; **And whereas** this country of North America, which the goodness of Providence hath given us to inherit, from the vastness of its extent, the variety of its climate, the fertility of its soil, the yet unexplored treasures of its bowels, the multitude of its rivers, lakes, bays, inlets, and other conveniences of navigation, offers to these United States one of the richest subjcts of cultivation, ever presented to any people upon earth; **And whereas** the experience of ages shows that improvements of a public nature, are best carried on by societies of liberal and ingenious men, uniting their labours, without regard to nation, sect or party, in one grand pursuit, alike interesting to all, whereby mutual prejudices are worn off, a humane and philosophical spirit is cherished, and youth are stimulated to a laudable diligence and emulation in the pursuit of wisdom; **And whereas**, upon these principles,

* Original Charter, Granted in 1780. Articles of Amendment added 1935.

divers public-spirited gentlemen of Pennsylvania and other American States did heretofore unite themselves, under certain regulations, into one voluntary Society, by the name of "The American Philosophical Society held at Philadelphia, for promoting useful knowledge," and by their successful labours and investigations, to the great credit of America, have extended their reputation so far, that men of the first eminence in the republic of letters in the most civilized nations of Europe have done honour to their publications, and desired to be enrolled among their members; **And whereas** the said Society, after having been long interrupted in their laudable pursuits by the calamities of war, and the distresses of our Country, have found means to revive their design, in hopes of being able to prosecute the same with their former success, and being further encouraged therein by the public, for which purpose they have prayed us, "the Representatives of the Freemen of the Commonwealth of Pennsylvania," that they may be created One Body Politic and Corporate forever, with such powers, privileges, and immunities, as may be necessary for answering the valuable purposes which the said Society had originally in view.

Wherefore, in order to encourage the said Society in the prosecution and advancement of all useful branches of knowledge, for the benefit of their country and mankind.

[Section I.] **Be it enacted, and it is hereby enacted by the Representatives of the Freemen of the Commonwealth of Pennsylvania, in General Assembly met, and by the authority of the same,** That the Members of the said American Philosophical Society heretofore voluntarily associated for promoting useful knowledge, and such other persons as have been duly elected Members and Officers of the same, agreeable to the fundamental laws and regulations of the said Society, comprized in twelve sections, prefixed to their first volume of transactions, published in Philadelphia by William and Thomas Bradford in the year of our Lord one thousand seven hundred and seventy-one, and who shall in

all respects conform themselves to the said laws and regulations, and such other laws, regulations and ordinances, as shall hereafter be duly made and enacted by the said Society, according to the tenor hereof, be and forever hereafter shall be, One Body Corporate and Politic in Deed, by the name and style of "The American Philosophical Society held at Philadelphia, for promoting useful knowledge," and by the same name they are hereby constituted and confirmed One Body Corporate and Politic, to have perpetual succession, and by the same name they and their successors are hereby declared and made able and capable in law, to have, hold, receive, and enjoy lands, tenements, rents, franchises, hereditaments, gifts, and bequests of what nature so ever, in fee simple or for term of life, lives, years or otherwise, and also to give, grant, let, sell, alien, or assign the same lands, tenements, hereditaments, goods, chattels, and premises, according to the nature of the respective gifts, grants, and bequests, made to them the said Society, and of their estate therein. **Provided**, that the amount of the clear yearly value of such real estate do not exceed the value of ten thousand bushels of good merchantable wheat.

[SECTION II.] **And be it further enacted by the authority aforesaid**, That the said Society be, and shall be for ever hereafter able and capable in law to sue, and be sued, plead and be impleaded, answer and be answered unto, defend and be defended in all or any of the courts or other places, and before any Judges, Justices, and other person or persons, in all manner of actions, suits, complaints, pleas, causes, and matters, of what nature or kind so ever, within this Commonwealth; and that it shall and may be lawfull to and for the said Society, for ever hereafter to have and use one common seal in their affairs, and the same at their will and pleasure to break, change, alter and renew.

[SECTION III.] **And be it further enacted by the authority aforesaid**, That for the well governing of the said Society, and ordering their affairs, they shall have the following officers, that is to say, one Patron, who shall be his

Excellency the President of the Supreme Executive Council * of this Commonwealth, for the time being, and likewise one President, three Vice Presidents, four Secretaries, three Curators, one Treasurer, together with a Council of twelve members; and that on the first Friday of January next, between the hours of two and five in the afternoon, as many of the members of the said Society as shall have paid up their arrears due to the Society, and shall declare their willingness to conform to the laws, regulations and ordinances of the Society then duly in force, according to the tenor hereof, by subscribing the same, and who shall attend in the Hall or place of meeting of the said Society, within the time aforesaid, shall chuse by ballot, agreeable to the fundamental laws and regulations herein before referred to, one President, three Vice Presidents, four Secretaries, three Curators, and one Treasurer, and at the same time and place, the members met and qualified as aforesaid shall in like manner chuse four members for the Council, to hold their offices for one year, four more members for the Council to hold their offices for two years, and four more members for the Council, to hold their offices for three years. And on the first Friday in January, which shall be in the year of our Lord one thousand seven hundred and eighty-two, and so likewise on the first Friday of January, yearly and every year thereafter, between the hours of two and five in the afternoon, the Members of the said Society met and qualified as aforesaid, shall chuse one President, three Vice Presidents, four Secretaries, three Curators and one Treasurer, to hold their respective offices for one year, and four Council Men to hold their offices for three years: *Provided* that no person residing within the United States shall be capable of being President, Vice President, Secretary, Curator, Treasurer, or member of the Council, or of electing to any of the said offices, who is not capable of electing and being elected to civil offices within the State in which he resides. *Provided also*, that nothing herein

* [Now His Excellency the Governor of this Commonwealth.]

contained shall be considered as intended to exclude any of the said Officers or Councillors, whose times shall be expired, from being re-elected, according to the pleasure of the said Society; and of the day, hours and place of all such elections, due notice shall be given by the Secretaries, or some one of them, in one or more of the public newspapers of this State, agreeable to the said fundamental laws and regulations before referred to.

[SECTION IV.] **And be it further enacted by the authority aforesaid,** That the Officers and Council of the said Society shall be capable of exercising such power for the well governing and ordering the affairs of the Society, and of holding such occasional meetings for that purpose, as shall be described, fixed, and determined by the statutes, laws, regulations and ordinances of the said Society, hereafter to be made. *Provided always,* that no statute, law, regulation or ordinance shall ever be made or passed by the said Society, or be binding upon the members thereof, or any of them, unless the same hath been duly proposed, and fairly drawn up in writing, at one stated meeting of the Society, and enacted or passed at a subsequent meeting at least the space of fourteen days after the former meeting, and upon due notice in some of the public News papers, that the enacting of statutes and laws, or the making and passing ordinances and regulations, will be part of the business of such meeting; nor shall any statute, law, regulation or ordinance be then or at any time enacted or passed, unless thirteen members of the said Society, or such greater number of members as may be afterwards fixed by the rules of the Society, be present, besides such quorum of the Officers and Council, as the laws of the Society for the time being may require, and unless the same be voted by two-thirds of the whole body then present; all which statutes, laws, ordinances and regulations, so as aforesaid duly made, enacted and passed, shall be binding upon every member of the said Society, and be from time to time inviolably observed, according to the tenor and effect thereof; pro-

vided they be not repugnant or contrary to the laws of this Commonwealth, for the time being in force and effect.

And whereas nations truly civilized (however unhappily at variance on other accounts) will never wage war with the Arts and Sciences, and the common Interests of humanity:

[SECTION V.] **Be it further enacted by the authority aforesaid,** That it shall and may be lawful for the said Society by their proper officers, at all times, whether in peace or war, to correspond with learned Societies, as well as individual learned men, of any nation or country, upon matters merely belonging to the business of the said Society, such as the mutual communication of their discoveries and proceedings in Philosophy and Science; the procuring books, apparatus, natural curiosities, and such other articles and intelligence as are usually exchanged between learned bodies, for furthering their common pursuits; **Provided always,** That such correspondence of the said Society be at all times open to the inspection of the Supreme Executive Council of this Commonwealth.

[Signed] *JOHN BAYARD,*
Speaker.

Enacted into a Law at Philadelphia on Wednesday the fifteenth day of March anno Domini one thousand seven hundred and eighty.

[Signed] *THOMAS PAINE,*
Clerk of the General Assembly.

COMMISSION FOR THE COMPILATION OF THE LAWS OF PENNSYLVANIA PRIOR TO 1800.

CLERK'S OFFICE,
1211 BETZ BUILDING.

JAMES T. MITCHELL, HENRY FLANDERS, } *Commissioners.* CHAS. R. HILDEBURN, *Clerk.*

PHILADELPHIA, March 12, 1898.

Compared, revised and found to be a correct copy of the original enrollment in the archives of the Commonwealth, by me the custodian of the said original as clerk of the commissioners appointed under the act of May 19, 1887, entitled, AN ACT FOR THE COMPILATION AND PUBLICATION OF THE LAWS OF THE PROVINCE AND COMMONWEALTH OF PENNSYLVANIA PRIOR TO THE YEAR ONE THOUSAND EIGHT HUNDRED, P.L. 1887, pp. 129 and 130.

CHAS. R. HILDEBURN,
Clerk of the Commissioners.

Witness as to Chas. R. Hildeburn:

WM. NEWBOLD ELY,
JULIUS F. SACHSE.

SEAL Sworn to and subscribed before me
this 19th day of May, 1898.

JAMES P. STERRETT,
Chief Justice of the Supreme Court of Pennsylvania.

ARTICLES OF AMENDMENT

Article I

Notwithstanding the Proviso at the end of the first paragraph following the preamble of this Charter, or any other proviso thereof, the Society shall have the capacity and authority without limitation by this Charter to purchase, take, receive, lease as lessee, take by gift, devise or bequest, or otherwise acquire, and to own, hold, use, and otherwise deal with any and all real or personal property, or any interest therein, wherever situated.

Article II

Any provisions of this Charter which are purely administrative in their nature, including those concerning the officers, the members of the council, and the date and time of meetings, may be altered by a law, regulation or ordinance of the Society duly adopted and not repugnant or contrary to the laws of this Commonwealth.

CERTIFICATE OF ACCEPTANCE

1. The name of the accepting corporation is The American Philosophical Society held at Philadelphia for promoting useful knowledge.

2. The American Philosophical Society was created by the Act of Assembly approved March 15, 1780, L.B. No. 1, 363.

3. The American Philosophical Society herewith accepts the Constitution of Pennsylvania and the provisions of the Nonprofit Corporation Law.

4. The acceptance made herewith was duly authorized by a meeting of the members called for that purpose, held in Philadelphia on the 6th day of December, 1935.

Roland S. Morris
President

C. F. Skinker
Assistant Secretary

SEAL Filed this 12th day of December, 1935

J. Warren Mickle
Deputy Secretary of the Commonwealth

Recorded in
Miscellaneous Corporation
Record Book 210, P. 125

II

LAWS

(As Amended April 24, 1936)

Chapter I

Of the Members both resident and foreign: their classification, nomination, and election; suspension and forfeiture of membership.

Art. 1. The resident members of the Society are elected from among citizens or residents of the United States who have achieved distinction in the sciences or humanities, in letters, in the practice of the arts or of the learned professions, or in the administration of affairs. Their number may not exceed five hundred, nor may more than twenty-five be elected in any one year.

Art. 2. The foreign members of the Society are elected from among persons who are neither citizens nor residents of the United States, and who are of the greatest eminence for their attainments in science, letters, or the liberal arts. Their number may not exceed sixty, nor may more than five be elected in any one year.

Art. 3. Every member, whether resident or foreign, shall be classified according to his expressed wishes, or in accordance with his principal activities or contributions to knowledge, in one of the following four classes: *

* In accordance with general usage, the following more or less clearly defined fields of science and learning within the four Classes have been recognized by the Society: Class I. Mathematics; Astronomy; Physics; Chemistry; Engineering. Class II. Geology, Paleontology, Geography; Zoology, Anatomy; Botany, Bacteriology; Anthropology, Psychology; Physiology, Pathology; Medicine, Pharmacology, Surgery. Class III. Political Sciences; Modern History; Jurisprudence; Administration, Government; Affairs. Class IV. Ancient, Medieval and Cultural History; Archaeology; Philology and Languages; Literature, Fine Arts.

Class I. Mathematical and Physical Sciences
Class II. Geological and Biological Sciences
Class III. Social Sciences
Class IV. Humanities

ART. 4. In each of the four classes of members there shall be a Committee on Membership consisting of a Chairman and four others members, appointed by the President.

ART. 5. It shall be the duty of the Committee on Membership of each class to prepare an "eligible list" of not more than twenty-five persons who are judged most worthy of resident membership in that class; and a list of not more than six who are judged most worthy of foreign membership in the class. This list shall be revised from year to year.

ART. 6. Before December first in each year the Chairman of each Committee on Membership shall submit this *eligible list* to all members of his class, together with all *continued nominations* within that class which are carried over from the previous year by request of three or more members. Blank spaces shall be provided for the addition of *new nominations*. Members of the class shall be requested to use these lists as a *preliminary ballot*, to check or write on them the names of those persons whom they wish to propose for membership, and to sign and return this ballot to the Secretaries before January first.

ART. 7. Before February first each Committee on Membership shall select from this *preliminary ballot* the names of those persons, not more than ten in number in each class, who have received the highest number of votes for resident membership, and the names of those persons, not more than three in number in each class, who have received the highest number of votes for foreign membership.

ART. 8. It shall be the duty of each Committee on Membership to prepare, with such outside assistance as it may choose, a brief biographical sketch of each of the nominees so selected, listing his profession, position, qualifications, and important publications or contributions to science, lit-

erature, art or affairs. The names of these nominees, together with the biographical sketch of each, shall then be printed in alphabetical order under each class, and shall be sent confidentially to all members of the Society not later than March first. Members shall be invited to return to the Secretaries before April first a *preference ballot* on which they have checked the names of not more than twenty-five nominees for resident membership and of not more than five for foreign membership.

Art. 9. The Council at the meeting next preceding the General Meeting of the Society in the month of April, notice of which shall be given at least two weeks in advance, shall select by ballot from the list of nominees residing within the United States a number not exceeding twenty-five, and of non-residents of the United States a number not exceeding five, to be recommended to the Society for election. In this selection special weight shall be given to the votes of members in the preference ballot. The names of the nominees so chosen, arranged alphabetically in classes, shall be reported to the Society at its next ensuing session.

Art. 10. Election to membership, both resident and foreign, shall be by ballot at the General Meeting of the Society in the month of April. A two-thirds vote of those present and voting shall be necessary to elect.

Art. 11. The members are mutually pledged not to mention out of the Society any recommendations, nominations, or proposals for membership; and all papers relating thereto shall be destroyed within three months from the date of the election to membership, except those papers which relate to recommendations, nominations, or proposals that are continued in accordance with the regulations prescribed in Art. 6 of this Chapter.

Art. 12. Every person who is elected a resident or foreign member shall signify his acceptance in writing within one year after the mailing of notification of such election. In default of such acceptance the election shall be void.

Art. 13. The formal admission of a member into the Society shall be at his first attendance at a meeting of the Society after his election and in the manner and form following: He shall subscribe the Laws in the Roll Book and be introduced to the President, who, taking him by the hand, shall say:

"By the authority and in the name of the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge, I do admit you a Member thereof."

Art. 14. The Society may from time to time assess membership dues in accordance with its needs and policies. Any person who shall refuse or neglect to pay such assessment for two years, after two or more notifications from the Treasurer, shall be reported to the Society as delinquent and his name shall be stricken from the roll of members.

Art. 15. The membership of any resident or foreign member may, for good and sufficient cause, and upon recommendation by the Council, be terminated by the Society at a General Meeting by a vote of two-thirds of the members attending, provided, however, that the total number of members so attending shall be not less than thirty.

Chapter II

Of the Patron and Elective Officers; qualifications, nominations and elections, terms of office, suspension or removal, vacancies.

Art. 1. The Governor of Pennsylvania shall be ex-officio the Patron of the Society.

Art. 2. The elective Officers of the Society shall be a President, three Vice-presidents, two Secretaries, a Curator, a Treasurer, and twelve Councillors.

Art. 3. No person save the Treasurer, who may be a Corporation, shall be capable of holding any elective office as defined above, who is not a citizen of the United States.

Art. 4. Nominations to the elective offices of the Soci-

ety are made by the Committee on Nominations as hereinafter provided, and may also be made by petition signed by not less than twenty members, in such manner as may be prescribed by the Committee on Nominations and approved by the Council.

Art. 5. The election of Officers shall be held at the General Meeting in the month of April at a time duly announced in the programme. The election shall be by ballot, a majority of all ballots cast being requisite for election. In the event that no candidate for a given office shall receive such a majority, a second ballot shall be taken and election shall be by plurality of votes cast.

Art. 6. The terms of all elective Officers, except Councillors, are of one year, commencing upon the close of the General Meeting at which they are elected. They shall serve until the election and acceptance of their successors and are eligible for reëlection.

Art. 7. The terms of Councillors are of three years, commencing upon the close of the General Meeting at which they are elected. They shall serve until the election and acceptance of their successors, but are ineligible for reelection until one year after the expiration of their terms of office.

Art. 8. Any elective Officer may be suspended or removed from office, for good and sufficient cause, at a meeting of the Council, by a vote of two-thirds of all its members.

Art. 9. A vacancy occurring in any elective office may be filled for the unexpired term by vote of a majority of the Council.

Chapter III

Of the Officers and their duties

Art. 1. The President shall preside at the meetings of the Society and Council; he shall appoint all committees, and designate their chairmen, except as otherwise pro-

vided in the Laws, and shall be ex-officio a member of all committees except the Committee on Nominations.

ART. 2. The VICE-PRESIDENTS shall preside at meetings of the Society and Council, in the absence of the President, in rotation in order of seniority of continuous service. In the event of the death or disability of the President, the senior Vice-president shall act as President until the vacancy shall be filled.

ART. 3. The SECRETARIES shall have the custody of the Seal of the Society, shall record the proceedings of the Society and the Council, shall notify all acts of the Society and the Council to those concerned, shall conduct the correspondence of the Society and Council, shall maintain the authentic list of resident and foreign members, and shall have the custody of the Society's files and records. The Secretaries shall arrange among themselves each year as to the distribution and performance of their duties, and shall report such arrangement to the Council; they shall also have power to delegate the performance of their duties to the Assistant Secretary or Executive Officer.

ART. 4. The CURATOR shall have charge of the Cabinet, and shall supervise the maintenance, exhibit, and use of the Society's collections, and shall advise the Council with respect to their increase, disposal, or temporary loan. He shall be ex-officio a member of the Committee on the Hall.

ART. 5. The TREASURER may be a person, as defined in Chap. II, Art. 3, or a trust company or other suitable financial corporation of the State of Pennsylvania. He shall collect and receive all moneys due or payable to the Society or entrusted to its care, and all gifts and bequests made to it. He shall pay all bills due by the Society when properly approved, in accordance with appropriations authorized by the Society or the Council, or in accordance with the terms of trust funds established for specific purposes. He shall deposit the funds and securities of the Society in its name with such banks or trust companies in

the State of Pennsylvania as may be approved by the Committee on Finance.

Art. 6. The Treasurer shall keep accounts in good and regular order of all receipts and expenditures and of all moneys or other property in his hands, and shall report them, and present them for audit, as may be required by the Committee on Finance.

Art. 7. The Treasurer may, if authorized by vote of the Committee on Finance, employ an assistant treasurer or a trust company or other suitable financial corporation of the State of Pennsylvania, approved by the Committee on Finance, for the performance of such duties as may be delegated to such agent.

Art. 8. The Treasurer shall give bond, at the expense of the Society, for the faithful execution of all his trusts, in such amount as may be required by the Committee on Finance.

Art. 9. The Treasurer shall, upon the expiration of his term of office, deliver over to the Committee on Finance, for transmittal to his successor, the books, papers, moneys, and property remaining in his hands.

Chapter IV

Of the Council and the Annual Budget

Art. 1. The Council shall consist of the Officers, the twelve Councillors, and the Chairmen of the Committees on Finance, Research, Publications, Library and Hall.

Art. 2. The Council shall hold at least three meetings a year, and nine members shall constitute a quorum at any meeting, provided, however, that for the adoption of the budget a vote of a majority of all the members shall be requisite. Minutes of the proceedings and acts of the Council shall be regularly kept.

Art. 3. The Council shall make recommendations for membership in the Society as provided in Chap. I, Art. 9, of the Laws, and elect members of the Committees on Re-

search and Publications as provided in Chap. 5, Arts. 5 and 8.

ART. 4. The Council shall, at such time as they may fix, ask all Committees to submit estimates of their needs for the ensuing fiscal year which, together with the report of receipts and expenditures by the Committee on Finance, shall be made the basis for the annual budget to be submitted by the Council to the Society for its approval at the General Meeting in April.

ART. 5. The Council shall have power to take action for the Society in legal matters, to manage its affairs, and to assume its administration, to make contracts or to authorize them to be made in the name of the Society, except as otherwise provided.

ART. 6. The Council shall require reports to be presented to it at least once a year by such officers, committees, and employees of the Society as they may designate, or as may be required by the Laws to present such reports, and shall, through the President, present an annual report to the Society on the state of its affairs.

ART. 7. The Council shall have power to appoint an administrative executive officer, and to fix his term of service, duties and compensation.

CHAPTER V

Of the Committees of the Society

ART. 1. There shall be four COMMITTEES ON MEMBERSHIP, one in each class, each composed of five members whose appointment and duties are prescribed in Chap. I, Arts. 4–8.

ART. 2. There shall be a COMMITTEE ON FINANCE, consisting of the President and Treasurer, ex-officio, and not fewer than five other members who shall be nominated by the President and elected by the Society at the General Meeting in April. A majority of the Committee shall constitute a quorum at any meeting. The Committee shall

keep a record of all its acts and proceedings, which shall be communicated to the Council.

ART. 3. The Committee on Finance shall have the general superintendence of the financial concerns of the Society. It shall have the custody and control of all the securities and investments of the Society, both real and personal, with full power and authority to buy and to sell, and to invest and reinvest the same; including the power to purchase and to sell real estate and to make leases thereof, to satisfy mortgages and extinguish ground rents, and to direct the placing of all such insurances as it may deem necessary; as well as to borrow on the credit of the assets of the Society, to create mortgages thereon, and to make such improvements, repairs and alterations to real estate as it may deem necessary. It shall have power to authorize the proper Officers of the Society to execute the necessary papers to effect all purchases, sales and assignments of property, both real and personal; to execute and to satisfy mortgages, to extinguish ground rents and to transfer registered securities; to subscribe to bond-holders' agreements to plans of reorganization involving any securities held by the Society or in which it has an interest, and to do all such acts as are necessary in pursuance of the foregoing powers.

ART. 4. The Committee on Finance shall always have access to the Treasurer's books, accounts, and vouchers, and shall cause an audit of such accounts to be made at least once a year. It shall require from the Treasurer an annual report of all the operations of the treasury, which it shall present to the Council with an annual statement of estimates of receipts and expenditures. With the approval of the Council it shall determine the fiscal year of the Society and, in case of emergency needs, authorize appropriations over and above the annual budget.

ART. 5. There shall be a COMMITTEE ON RESEARCH, consisting of the President, ex-officio, and of not fewer than six other members, representative of the four classes, who shall serve for three years and who shall be nominated by

the President and elected by the Council. A majority of the Committee shall constitute a quorum at any meeting, and shall be requisite for any vote disposing of funds that may be allotted to the Committee. The Chairman, or a member designated by the Chairman, of the Committee on Publications, and of the Committee on Meetings, may sit with the Committee on Research but shall not vote.

Art. 6. The Committee on Research shall, with the approval of the Council, prescribe regulations for receiving and considering proposals for the advancement of knowledge through investigation. It may take such action as it shall see fit with respect to proposals received by it, and may, with the approval of the Council, itself initiate and cause to be executed investigations for the advancement of knowledge. It shall certify to the Treasurer all disbursements to be made from funds appropriated to it by the Council, and may allot therefrom such sums as it may see fit, on such conditions as it may prescribe, for the investigations approved by it. It shall require reports of the expenditures of all sums so allotted, and of the progress of all investigations aided thereby. It may withhold assistance in the event that the said reports are judged unsatisfactory.

Art. 7. The Committee on Research shall report all its acts to the Council, and from time to time submit reports to the Society on the progress of the investigations aided by it, and on the contributions to the advancement of knowledge made by them.

Art. 8. There shall be a Committee on Publications, consisting of the President, ex-officio, and of not fewer than six other members, representative of the four classes, who shall serve for three years, and who shall be nominated by the President and elected by the Council. A majority of the Committee shall constitute a quorum at any meeting, and shall be requisite for any vote disposing of funds that may be allotted to the Committee. The Chairman, or a member designated by the Chairman, of the Committee on

Research and of the Committee on Meetings, may sit with the Committee on Publications but shall not vote.

ART. 9. The Committee on Publications shall supervise the contents, editing, printing, publication, distribution, and sale of all publications issued by the Society or in its name. It shall have power to employ necessary editorial assistance, and, with the approval of the Council, to appoint an Editor and to determine his duties and fix his compensation. It shall cause the necessary contracts for the manufacture of the Society's publications to be drawn up and executed. It shall certify to the Treasurer all bills which it shall have examined and approved for expenses attending the publications, as well as all disbursements to be made from funds appropriated to the Committee by the Council.

ART. 10. The Committee on Publications shall, with the approval of the Council, prescribe regulations for receiving and considering proposals for publication, and may take such action as it shall see fit with respect to proposals so received, including the allotment of funds appropriated to the Committee by the Council. The Committee shall have power to appoint referees or special sub-committees to assist it in the examination of material presented to it for publication and, in its discretion, to give honoraria for services so rendered. It shall report all its acts to the Council.

ART. 11. There shall be a COMMITTEE ON MEETINGS, consisting of the President, ex-officio, and of not fewer than four other members representative of the four classes. The Committee shall be appointed by the President and shall have power to add to its numbers. A majority of the Committee shall constitute a quorum at any meeting and shall be requisite for any vote disposing of funds that may be allotted to the Committee. The Chairman, or a member designated by the Chairman, of the Committee on Research and of the Committee on Publications, may sit with the Committee on Meetings but shall not vote.

ART. 12. The Committee on Meetings shall be charged with the preparation of the scientific and scholarly programs of all meetings of the Society, and of all meetings held under its auspices, and with the organization of discussions, symposia, and conferences. It shall have power to name special sub-committees to assist it, and to invite suitable persons, whether members of the Society or not, to participate in such programs, discussions, symposia, etc. The Committee shall have power to use such funds as may be appropriated to it by the Council for defraying the expenses of the programs, discussions, etc., organized by it, and shall certify to the Treasurer all disbursements to be made from such funds.

ART. 13. The Committee on Meetings shall transmit to the Committee on Publications all papers, communications, reports, and other materials which it may recommend for publication.

ART. 14. There shall be a COMMITTEE ON LIBRARY, consisting of the President, ex-officio, and of not fewer than six other members, representative of the four Classes, who shall serve for three years and who shall be appointed by the President.

ART. 15. The Committee on Library shall supervise the administration of the Library, and shall, with the approval of the Council, prescribe regulations for its government and use. The Committee shall have power, with the approval of the Council, to employ a Librarian, determine his duties, and fix his compensation. It shall have charge of the exchange of publications, and shall have power to expend income of trust funds established specifically for purposes of the Library. The Committee shall prepare estimates of expenditures for the maintenance and increase of the Library, and shall certify to the Treasurer all bills properly payable and all disbursements to be made from funds appropriated by the Council for the purposes of the Library.

Art. 16. There shall be a Committee on Hall, consisting of the President and Curator, ex-officio, and such other members as may be appointed by the President. They shall serve for three years and shall have charge of the Hall of the Society and of its furniture and fixtures and shall direct all necessary repairs.

Art. 17. There shall be a Committee on Nomination of Officers consisting of five members,—a Chairman, appointed by the President, and the four Councillors who are entering the third year of their term of service.

Art. 18. The Committee shall, not later than December first, invite all members of the Society to submit to it informal suggestions for nominations to all offices to be filled by election at the next General Meeting.

Art. 19. The Committee shall then communicate to all members of the Society, not later than February first, a report presenting one nomination to each office to be filled by election at the next General Meeting. Nominations may also be made by petition if signed by twenty or more members and submitted to the Chairman not later than March first. Notice of such nomination must be sent to all members by April first.

Art. 20. The Committee shall prepare for use in the elections at the General Meeting a ballot in which shall be included, under each position to be filled by election, the name of the Committee's nominee, and the names, in alphabetical order, of any nominees included in petitions duly received in accordance with the Laws.

Chapter VI

On the Meetings of the Society

Art. 1. The Stated Meetings of the Society shall be on the first Friday of every month from November to March, save as the President and Council may from time to time determine.

Art. 2. A General Meeting shall be held in the month of April on days designated by vote of the Council, adopted at least three months before the date fixed therefor, at which it shall be lawful to transact all business which might be transacted at any Stated Meeting.

Art. 3. Special meetings may be called at any time by order of the President, or, in his absence or disability, by order of a Vice-president, or by vote of the Council, for the consideration of matters of scientific or scholarly interest or for the transaction of such business as shall be specified in the order or vote calling the meeting.

Chapter VII

Of the Publications of the Society

Art. 1. The publications of the Society shall consist of *Proceedings, Transactions, Memoirs,* and of such other serial or separate publications as may be authorized by the Council upon recommendation by the Committee on Publications.

Art. 2. The *Proceedings* shall contain the proceedings, acts, and reports of the Society, the Council, the Committees, and the Officers. They shall also contain those papers read before the Society at its meetings that may be selected by the Committee on Publications from among the papers transmitted to it by the Committee on Meetings. The *Proceedings* shall be distributed without charge, as issued, to all members who express a desire to receive them.

Art. 3. The *Transactions* shall consist of contributions in the form of monographs, treatises, collections of documents, and other materials, approved by the Committee on Publications. The *Transactions* shall be issued in complete parts, one or more of which may constitute a volume. They may be supplied to any member on such conditions or terms as may be prescribed by the Committee on Publications.

Art. 4. The *Memoirs* shall consist of works approved by the Committee on Publications. They shall be issued in such form as shall make possible their assembly in volumes according to subject matter, or to fields of knowledge. They may be supplied to any member on such conditions or terms as may be prescribed by the Committee on Publications.

Chapter VIII

Of the Laws of the Society and their Amendment

Art. 1. No amendment or supplement to these laws, nor any new law shall be made or passed by the Society, unless the same has been duly proposed in writing at a Stated Meeting of the Society and enacted at the subsequent General Meeting; due notice of the proposed law or amendment having been sent by mail at least fourteen days before the said General Meeting to the members qualified to vote thereon.

Art. 2. At the General Meeting no amendment or supplement to these laws shall be made, nor shall any new law be made, unless there be present a quorum of at least twenty members, of whom not fewer than five shall be members of the Council, and the same be voted by two-thirds of the whole body present.

III

OFFICERS AND STANDING COMMITTEES

1937–1938

OFFICERS

PATRON

The Governor of Pennsylvania

PRESIDENT

Roland S. Morris

VICE-PRESIDENTS

Edwin G. Conklin   Robert A. Millikan   Henry H. Donaldson †

SECRETARIES

John A. Miller   William E. Lingelbach

CURATOR

Albert P. Brubaker

TREASURER

Fidelity-Philadelphia Trust Company

EXECUTIVE OFFICER

Edwin G. Conklin

COUNCILLORS

Elected in 1935	Elected in 1936	Elected in 1937
Frank Aydelotte	Joseph Erlanger	Edward Capps
Isaiah Bowman	Max Farrand	Luther P. Eisenhart
Edward P. Cheyney	Marshall S. Morgan	Alfred N. Richards
Harlow Shapley	George H. Parker	John M. Scott

† Deceased January 23, 1938.

STANDING COMMITTEES

The President is ex-officio a member of all committees except the Committee on Nomination of Officers. The first member named in each committee is Chairman. The Executive Officer sits with all Committees but does not vote unless regularly a member.

FINANCE

William P. Gest
Thomas S. Gates
John S. Jenks
Marshall S. Morgan
Charles J. Rhoads
J. Henry Scattergood

HALL

J. Bertram Lippincott
Paul P. Cret
Lawrence J. Morris
J. Rodman Paul
John M. Scott
Albert P. Brubaker, Curator

RESEARCH

Edwin G. Conklin
William F. Albright
Arthur F. Buddington
Alfred V. Kidder
John A. Miller
Alfred N. Richards
W. F. G. Swann
Hugh S. Taylor

PUBLICATIONS

Henry H. Donaldson †
Cyrus Adler
Frank Aydelotte
Edwin G. Conklin
John A. Miller
Oswald Veblen
James T. Young
Arthur W. Goodspeed, Editor

MEETINGS

Edwin G. Conklin
Cyrus Adler
Henry H. Donaldson †
Waldo G. Leland
William E. Lingelbach
John A. Miller
Harlow Shapley
Hugh S. Taylor
Rodney H. True

LIBRARY

St. George L. Sioussat
George A. Barton
Rhys Carpenter
Waldo G. Leland
William E. Lingelbach
Horace C. Richards
Harlow Shapley
Rodney H. True

† Deceased January 23, 1938.

COMMITTEES ON MEMBERSHIP

CLASS I. MATHEMATICAL AND PHYSICAL SCIENCES

W. F. G. Swann
Donald H. Andrews
William F. Durand
Luther P. Eisenhart
Harlow Shapley

CLASS II. GEOLOGICAL AND BIOLOGICAL SCIENCES

Detlev W. Bronk
Edward W. Berry
Charles B. Davenport
Edward M. East
Earnest A. Hooton

CLASS III. SOCIAL SCIENCES

Ernest M. Patterson
Charles A. Beard
Edward P. Cheyney
Edward S. Corwin
William P. Gest

CLASS IV. HUMANITIES

Waldo G. Leland
William F. Albright
Gilbert Chinard
Josiah H. Penniman
William Lyon Phelps

COMMITTEE ON NOMINATION OF OFFICERS

James A. Montgomery, Chairman

Frank Aydelotte
Isaiah Bowman
Edward P. Cheyney
Harlow Shapley
Retiring Councillors

IV

ABSTRACTS FROM THE MINUTES OF THE MEETINGS OF THE SOCIETY DURING 1937

JOINT MEETING WITH THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND AFFILIATED AND ASSOCIATED SOCIETIES

January 2, 1937

Edwin G. Conklin, Vice-president, in the Chair

The following papers * on Viruses and Virus Diseases were presented by the persons named:

W. M. Stanley, Rockefeller Institute for Medical Research, Princeton, N. J. (Read by Dr. Carl Ten Broeck.) "Some Biochemical Investigations on Crystalline Tobacco Mosaic Virus Proteins."

Ralph W. G. Wycoff, Rockefeller Institute for Medical Research, Princeton, N. J. "The Ultra-centrifugal Concentration of Viruses and other Biologically Active Proteins."

Stuart Mudd, Professor of Bacteriology, University of Pennsylvania School of Medicine. "Labile Bacterial Antigens and Methods of their Preparation and Preservation."

Yale Kneeland, Jr., Columbia University, College of Physicians and Surgeons. "The Rôle of a Filterable Virus in Upper Respiratory Infection."

George Packer Berry, Professor of Bacteriology, University of Rochester. "The Transformation of the Virus of Rabbit Fibroma (Shope) into that of Infectious Myxomatosis (Sanarelli)."

* Proc. Amer. Philos. Soc. 77: 447–476.

JOINT MEETING WITH REPRESENTATIVES OF FOUNDATIONS, SOCIETIES, UNIVERSITIES AND INSTITUTIONS ADMINISTERING FUNDS IN AID OF RESEARCH

February 19, 20, 1937

Friday, February 19, 10 A.M.–1 P.M.; 2–5 P.M.

EDWIN G. CONKLIN, Vice-president, in the Chair

Round Table Discussion of Methods and Results of Grants-in-aid of Research *

The following members and guests took part in the discussion: Waldo G. Leland, W. F. G. Swann, Karl T. Compton, Marston T. Bogert, Roger Adams, Warren Weaver, Lawrence K. Frank, George D. Birkhoff, Franz Boas, Robert T. Crane, Edwin G. Conklin, Albert F. Blakeslee, Solomon S. Lefschetz, William E. Lingelbach, Henry Norris Russell.

In the afternoon the discussion was continued by Waldo G. Leland, Edwin G. Conklin, W. F. G. Swann, Conyers Read, Marston T. Bogert, Franz Boas, Cyrus Adler, Luther P. Eisenhart, E. R. Long, Robert T. Crane, Warren Weaver, Forest R. Moulton, Karl T. Compton, C. R. Longwell, Frederick P. Keppel, Aleš Hrdlička, Roger Adams, Frank Aydelotte, George D. Birkhoff, John C. Merriam and Charles B. Lipman.

Friday, February 19, 8:15 P.M.

Frederick P. Keppel, President of the Carnegie Corporation of New York, spoke on "The Responsibility of Endowments in the Promotion of Knowledge."

Saturday, February 20, Executive Session, 9:30 A.M.

ROLAND S. MORRIS, President, in the Chair

Mr. Morris gave a detailed account of the splendid work done during the past year by the Committee on Finance

* PROC. AMER. PHILOS. SOC. 77: 561–620.

and an account of the financial standing of the Society. Concerning the Building and Endowment Fund he stated that, if contributors so requested, it would be necessary to return to them the money given specifically for a new building on the Parkway.

The following resolution was approved:

> *Resolved* That the Executive Officer, Edwin G. Conklin, be authorized to affix the seal of the American Philosophical Society to documents to be executed under seal in the absence of the Secretaries.

Saturday, February 20, 10 A.M.

Roland S. Morris, President, in the Chair

General Topic: The Most Important Methods of Promoting Research as viewed by Representatives of

1. Research Foundations and Institutions,
   John C. Merriam, President Carnegie Institution of Washington.
   Warren Weaver, Director Natural Sciences, Rockefeller Foundation.
2. Learned Societies, Academies and Councils,
   Waldo G. Leland, Permanent Secretary, American Council of Learned Societies.
3. Universities, Professional and Technical Schools,
   Alexander G. Ruthven, President University of Michigan.
   Frank Aydelotte, President Swarthmore College.
4. Research Workers and Recipient Institutions,
   Edward P. Cheyney, Chairman Faculty Committee on Research, University of Pennsylvania.
   Detlev W. Bronk, Director Eldridge R. Johnson Foundation for Medical Physics, University of Pennsylvania.

ANNUAL GENERAL MEETING

April 22, 23, 24, 1937

Thursday, April 22, 10 A.M.

Roland S. Morris, President, in the Chair

Karl K. Darrow, Frederick G. Novy and Cecilia Payne Gaposchkin, recently elected members, subscribed the laws and were admitted into the Society.

The following papers were read by the persons named:

Edwin P. Adams, Professor of Physics, Princeton University. I. "Electrostatic Problems Connected with Thick Cylindrical Shells."

II. "The Resistance of Cylindrical Conductors at High Frequencies." (Read by title.)

Frank Benford, Physicist Research Laboratory, General Electric Company. (Introduced by Dr. Langmuir.) "The Law of Anomalous Numbers."

Donald H. Menzel, Professor of Astrophysics, Harvard College Observatory, and Joseph C. Boyce. (Introduced by Dr. Shapley.) "The Spectrum of the Solar Corona."

Cecilia Payne Gaposchkin, Astrophysicist Harvard College Observatory. "Magnitudes and Colors of Southern Stars."

Karl K. Darrow, Physicist Bell Telephone Laboratories. "The Ideas of Wave and Corpuscle in the Evolution of Physics."

W. F. G. Swann, Director Bartol Research Foundation of the Franklin Institute. "Certain Elements in the Philosophy of Modern Atomic Theories."

Walker Bleakney,* Assistant Professor of Physics, Princeton University. "The Use of the Mass-spectrograph in the Investigation of Isotopes in Molecules."

* Recipient of Grant from The Penrose Fund.

William D. Harkins,* Professor of Physical Chemistry, University of Chicago. "A Theory of Nuclear Constitution and Stability, and of the Mechanism of Nuclear Reactions."

Robert D. Fowler, Chemistry Department, Johns Hopkins University. (Introduced by Dr. Andrews.) "The Deuterium Reaction as a Source of Neutrons."

Thursday, April 22, 2 P.M.

Edwin G. Conklin, Vice-president, in the Chair

Ermine C. Case, William L. Bryant and Jacob R. Schramm, recently elected members, subscribed the Laws and were admitted into the Society.

The following papers were read by the persons named:

Ermine C. Case, Director and Curator of Vertebrates, Museum of Paleontology, University of Michigan. "The Skull and Brain of a Paleoniscid Fish from the Upper Pennsylvanian of Western Missouri."

Richard M. Field,* Associate Professor of Geology, Princeton University, and Vice-Chairman American Geophysical Union. "The Geophysical Exploration of Ocean Basins."

William B. Scott,* Professor Emeritus of Geology, Princeton University. "A Report of Progress on the White River Monograph on the Artiodactyla."

Glenn L. Jepsen, Assistant Professor of Geology, Princeton University. (Introduced by Dr. W. B. Scott.) "Discovery of Rodents in the Paleocene."

George H. Shull, Professor of Botany and Genetics, Princeton University. "A Dominant Yellow-green Mutation in Shepherd's-purse Having the Genetical Behavior of the Yellow Mouse."

William Trelease, Professor Emeritus of Botany, University of Illinois. "A Mexican Puzzle (*Yucca Howard-Smithii*)." (Read by title.)

Elmer D. Merrill, Professor of Botany, Administrator of Botanical Collections, Harvard University. "On the Significance of Certain Oriental Plant Names in Relation to Introduced Species."

Albert F. Blakeslee, Director Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor. "Taste Acuity for the Bitter and Sweet in Mannose."

Ulric Dahlgren, Professor of Biology, Princeton University. "Some Habits and Structures of an Unusual Aloeocoel Turbellarian Worm."

George H. Parker, Professor Emeritus of Zoology, Harvard University and H. P. Brower. "The Lag of Chromatophoral Responses and the Storage of Neurohumors."

Friday, April 23, Executive Session, 10 A.M.

ROLAND S. MORRIS, President, in the Chair

The Executive Officer reported that the following donations from the home of our late Secretary, Dr. I. Minis Hays, were presented by his daughters, Mrs. Casper F. Goodrich and Miss Annie Hays, and thanks were ordered to be sent the donors:

Coins and Medals:

Silver medal by Dupré struck in honor of Benjamin Franklin in 1784.

White plaster-of-paris medal in honor of Alexander Hamilton.

Bronze medal in honor of Louis Pasteur, 1922.

Badges commemorating—Great Central Sanitary Fair, 1864; Founder's day of the Carnegie Institute, Pittsburgh, 1907; Founder's week of Philadelphia, 1908.

Bronze bas-relief of Woodrow Wilson struck about 1924.

Photographs (framed):

George Ord. After portrait by John Nagle.

Mrs. Stevenson's house on Craven Street where Benjajamin Franklin lived while in London.

Engravings (framed):

Carolus Linnaeus. By Andorf of Berlin after the painting by H. Hollander.

Five bookcases.

The Secretary reported that a marble bust of George B. Wood, President of the Society from 1859 until his death in 1879, and a mahogany book case had been received from the Walter Wood Estate.

A list of members who had died since the last meeting was read. (See p. 329.)

The President read his report for the year 1936–1937 which is on file.

President Morris gave a full account of the Building and Endowment Fund, informing the members that at the present time there is held by the Girard Trust Company under the Trust Deed of this fund a sum of $1,160,675. Of this sum there is some $700,000 in cash to provide for the return of any contributions that should be demanded, since it is not certain that the Society can hold these contributions in view of the change of building plans which were made. Mr. Morris reported that letters had been sent to all the living contributors to the Building and Endowment Fund and that to date a large number of replies had been received and that not a single contributor to the Fund had disapproved of the action of the Society in remaining on Independence Square.

A letter was read from Judge Curtis Bok, the grandson of the late Cyrus H. K. Curtis who had contributed $200,000 to this Fund, giving the family's approval of the Society's change of plans.

Mr. Morris then stated that the Building and Endowment Fund was a Trust created by the Society in 1900 with the Girard Trust Company and that the Deed provided that the funds deposited there in trust from various donors

to the Society should be used for the acquisition of property, real estate, for building, for improvements to our present buildings or any buildings that might subsequently be erected and for no other purposes. Mr. Morris stated that both the Committee on Finance and the Council had agreed that it would be well to leave that Fund in trust for the present, investing a substantial portion of it, and in the future to use the income from it for the maintenance of the present building, its furnishings and for keeping it in repair.

The proceedings of the Council were submitted and approved. The following resolutions recommended by Council were unanimously adopted:

> *Resolved,* That The American Philosophical Society held at Philadelphia for Promoting Useful Knowledge does hereby approve and authorize the Building Fund Committee and the officers of this Society to take all action necessary to make effective the resolutions adopted by the Building Fund Committee of this Society on April 15, 1937, and subsequently approved by the Committee on Finance of this Society on April 15, 1937, as follows:
>
> *Resolved,* That the Building Fund Committee acting under said Deed of Trust recommend that Girard Trust Company, Depositary for the American Philosophical Society's Building Fund, pay from Principal of said Fund to the Society $53,726.58 to reimburse the Society for the expenses of refitting, altering and furnishing the Society's buildings, for the use and occupation of the Society and its property, as follows:

Hall Alterations	$28,763.45
Hall Equipment	9,103.38
Library Alterations, refitting equipment and expenses in connection therewith	12,269.75
Portraits of Dr. Dercum, Dr. Penrose and Prof. Russell	3,590.00
Total	$53,726.58

Resolved, That the Committee recommend to the Society that it authorize the said expenditure from the said Building Fund by a two-thirds vote of the members present at each of two stated meetings of the Society, to be held within three months of each other as provided in the said Deed of Trust.

Resolved, That this Committee recommend that the proper officers of the Society be authorized by the Society at the said two meetings, to execute under the seal of the Society duly attested by its proper officers, such certificates or other papers as may be necessary to be delivered to the said Girard Trust Company in order to give the said company, as Depositary under the said Deed of Trust sufficient notice, information, warrant and authority to make such expenditure.

Resolved, That Girard Trust Company of Philadelphia, Depositary under the Building Fund Agreement of June 4, 1900, be requested to invest $400,000 in United States Government obligations maturing within five years, or in securities contained in said list, attached and made part of these minutes, and that Messrs. John S. Jenks and M. S. Morgan be appointed a committee of two, with full authority to determine the amount of each particular security to be purchased.

The following resolutions of the Council were also approved:

Resolved, That the Committee on Finance of the American Philosophical Society, held at Philadelphia for Promoting Useful Knowledge, authorize the sale of the Holmes Farm in Washington and Hamilton Townships, Mercer County, New Jersey, consisting of one hundred and fifty-seven (157) acres, more or less, for Eight Thousand Dollars ($8,000), cash; And

Be it further *Resolved,* That the President of the Society, Roland S. Morris, and the Secretary, John A. Miller or William E. Lingelbach, be hereby authorized to execute the necessary papers to effect the sale and to transfer title of the property to the purchaser.

Resolved, That the Committee on Finance of the American Philosophical Society, held at Philadelphia for Promoting Useful Knowledge, authorize the sale of No. 1712 Rittenhouse Street, Philadelphia, Pennsylvania, for Ten Thousand Dollars ($10,000), (payable Five Tousand Dollars ($5,000) in cash, and Five Thousand Dollars ($5,000) in a first mortgage for one year at 5 per cent per annum); And

Be it further *Resolved,* That the President of the Society, Roland S. Morris, and the Secretary, John A. Miller or William E. Lingelbach, be hereby authorized to execute the necessary papers to effect the sale and to transfer title of the property to the purchaser.

Dr. Conklin gave a full account of the work of the Committee on Research and stated that copies of his report were on the table for distribution.*

Dr. Donaldson reported for the Committee on Publications and copies of all publications published during the year were displayed.

Dr. Sioussat reported for the Committee on Library and stated that copies of the printed report had been sent through the mail to all members of the Society.

The Treasurer's report was submitted with the Auditor's report.

The following Committee on Finance was unanimously elected for the year 1937–1938:

William P. Gest, *Chairman*	Marshall S. Morgan
Thomas S. Gates	Charles J. Rhoads
John S. Jenks	J. Henry Scattergood

The above Committee was appointed to serve also as the Society's Committee on Building Fund.

The Society proceeded to the election of officers and members. Mr. Morris appointed Henry A. Sanders to act as clerk and St. George L. Sioussat and William E. Lingelbach to act as judges of election.

* Proc. Amer. Philos. Soc. 77: 621–629.

The tellers subsequently reported that the following officers and members had been duly elected:

President

Roland S. Morris

Vice-presidents

Edwin G. Conklin
Robert A. Millikan
Henry H. Donaldson

Secretaries

John A. Miller
William E. Lingelbach

Curator

Albert P. Brubaker

Treasurer

Fidelity-Philadelphia Trust Company

Executive Officer

Edwin G. Conklin

Councillors

(To serve for three years)

Luther P. Eisenhart
Alfred N. Richards
John M. Scott
Edward Capps

Members

CLASS I—MATHEMATICAL AND PHYSICAL SCIENCES

Resident

Eric Temple Bell, Pasadena, Calif.
Vannevar Bush, Belmont, Mass.
James Franck, Baltimore, Md.
Ernest Orlando Lawrence, Berkeley, Calif.
Charles Edward Kenneth Mees, Rochester, N. Y.
Otto Struve, Williams Bay, Wis.

Foreign

Werner Heisenberg, Leipzig, Germany

CLASS II—GEOLOGICAL AND BIOLOGICAL SCIENCES

Resident

Thomas Barbour, Cambridge, Mass.
Henry Bryant Bigelow, Cambridge, Mass.
Herbert Spencer Gasser, New York, N. Y.
Ralph Stayner Lillie, Chicago, Ill.
William Pepper, Philadelphia, Pa.
Alfred Marston Tozzer, Cambridge, Mass.
Hans Zinsser, Boston, Mass.

Foreign

Sir Frederick Gowland Hopkins, Cambridge, England
Hans Spemann, Freiburg, Germany

CLASS III—SOCIAL SCIENCES

Resident

Herbert Eugene Bolton, Berkeley, Calif.
Edmund Ezra Day, New York, N. Y.
Herbert Funk Goodrich, Philadelphia, Pa.
Nathan Hayward, Philadelphia, Pa.
Samuel Eliot Morison, Boston, Mass.
George Washington Norris, Philadelphia, Pa.

CLASS IV—HUMANITIES

Resident

William Scott Ferguson, Cambridge, Mass.
Robert Frost, S. Shaftsbury, Vt.
Herbert Putnam, Washington, D. C.
Edward Sapir, New Haven, Conn.
Preserved Smith, Ithaca, N. Y.
John S. P. Tatlock, Berkeley, Calif.

Foreign

Charles Marie Joseph Bédier, Paris, France
Sir Frederic George Kenyon, London, England

In 1935 Mrs. John F. Lewis gave ten thousand ($10,000) dollars to the American Philosophical Society in memory of her late husband to establish "the John F. Lewis Fund, the income to be used each year as an award to the American citizen who shall announce at any general or special meeting of the Society and publish among its papers some truth which the Council of the Society shall deem worthy of the award." The Society approved the recommendation of Council that the first John F. Lewis Prize of three hundred ($300) dollars and diploma be presented to Ralph E. Cleland of Goucher College, Baltimore, for his work entitled:

"Cyto-taxonomic Studies on Certain Oenotheras from California." (Read April 19, 1934. Proc. Amer. Philos. Soc., 75: 339–429.)

"A Cyto-genetic and Taxonomic Attack upon the Phylogeny and Systematics of *Oenothera* (Evening Primrose) with Special Reference to the Sub-genus *Onagra*." (Read April 18, 1935. Proc. Amer. Philos. Soc., 77: 477–544.)

Friday, April 23, 12 M.

Roland S. Morris, President, in the Chair

Dr. Conklin presented Professor Cleland for the John F. Lewis Prize in the following citation:

In 1901 Professor Hugo de Vries of Amsterdam startled the world by his epoch-making book "Die Mutationstheorie," which was based in large part on his studies of variation in the evening primrose, *Oenothera lamarckiana*.

In 1906 Professor de Vries attended the Bicentennial Celebration of the Birth of Benjamin Franklin and read a paper here, April 18, on "Elementary Species in Agriculture" which was published in our Proceedings, Volume 45, pp. 149–156.

I recall that Professor Henry Fairfield Osborn spoke against the mutation theory of evolution by jumps, and Professor de Vries begged me to say in reply, since he mistrusted his English, that the jumps need not be very great. Dr. Daniel T. MacDougal and

others took part in the discussion and soon everyone was discussing it. The American Philosophical Society has been a forum for the discussion of this subject ever since. In particular Dr. Bradley M. Davis has presented many papers on the doubtful parentage and probable origin of *Oenothera lamarckiana*. Dr. George H. Shull has described several new mutants and linkage groups and his work is of such importance both in evolution and heredity that in 1935 the Committee on Research made a grant to Dr. Shull in support of his studies on linkage and chromosome configuration in *Oenothera* (Grant No. 77).

On April 19, 1934, Professor Ralph E. Cleland of Goucher College, Baltimore, read a paper at the Annual General Meeting on "Cyto-taxonomic Studies on Certain Oenotheras from California," which was published in our PROCEEDINGS, Volume 75, pp. 339–429. And again at the Annual General Meeting in 1935 he presented a paper on "A Cyto-genetic and Taxonomic Attack upon the Phylogeny and Systematics of *Oenothera* (Evening Primrose) with Special Reference to the Sub-genus *Onagra*" which was published under the title "Species Relationships in *Onagra*" in our PROCEEDINGS, Volume 77, pp. 477–544. This notable work of Professor Cleland has been carried on under severe handicaps and has yielded results of great importance, showing that the evolution and classification of this classical group of plants can be successfully studied by means of chromosome configurations. The Committee on Research has been glad to assist Professor Cleland by means of four grants (Nos. 22, 55, 85 and 134) and as a final recognition and benediction on him and his work the Society has recommended him for the first award of the John F. Lewis Prize.

The prize was then awarded by President Morris and a check for three hundred ($300) dollars was presented to Professor Cleland by Mrs. John F. Lewis and her son, who were present. A diploma was ordered to be prepared certifying this Award.

The following papers were read by the persons named:

Charles B. Davenport, Formerly Director Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor. "Postnatal Changes in the Form of the Nose."

Francis G. Benedict, Director Nutrition Laboratory, Carnegie Institution of Washington, Boston. "Race: A Factor in Human Metabolism."

Leonard G. Rowntree,* Director Philadelphia Institute for Medical Research, J. H. Clark, Arthur Steinberg, N. H. Einhorn, N. K. Schaffer and William Ziegler. "The Thymus and Certain of Its Chemical Constituents in Relation to Growth and Development."

Friday, April 23, 2 P.M.

HENRY H. DONALDSON, Vice-president, in the Chair

The following papers were read by the persons named:

Aleš Hrdlička, Curator Division of Physical Anthropology, United States National Museum. "Typogeny in the Human Body and Skeleton."

George Crile, Director Research Laboratories, Cleveland Clinic Foundation and Daniel P. Quiring. "Alligator, Shark, Porpoise, and Man." (Read by Dr. Quiring.)

Robert M. Yerkes, Director Laboratory of Comparative Psychobiology, School of Medicine, Professor of Psychobiology, Yale University, and S. D. Shirley Spragg. "The Nature of Morphine Addiction in Chimpanzee."

Robert H. Gault, Professor of Psychology, Northwestern University. (Introduced by Dr. Donaldson.) "Psychologic and Other Implications in Vibro-tactile Phenomena."

Ernest Glen Wever, Associate Professor of Psychology, Princeton University, and Charles W. Bray. (Introduced by Dr. Conklin.) "A Comparative Study of the Electrical Responses of the Ear."

Edward L. Thorndike, Professor of Psychology, Columbia University. "How Pernicious are Disparities in Wealth?"

* Recipient of Grant from the Penrose Fund.

Friday, April 23, 8 P.M.

The R. A. F. Penrose, Jr., Memorial Lecture

Irving Langmuir, Associate Director Research Laboratory, General Electric Company, spoke on "The Surfaces of Solids and Liquids."

Saturday, April 24, 10 A.M.

Robert A. Millikan, Vice-president, in the Chair

The following papers were read by the persons named:

Roland S. Morris. "The Michaux Fund."

Rodney H. True, Professor of Botany, Director Botanical Garden and of the Morris Arboretum, University of Pennsylvania. "Michaux, Botanist and Explorer."

Leicester B. Holland, Chief Division of Fine Arts, Library of Congress, and Professor of Fine Arts, University of Pennsylvania. "The Historic American Buildings Survey and Its Results."

William A. Nitze, Professor of Romance Languages and Literatures, University of Chicago. "A Co-operative Medieval Project: The High History of the Grail."

Arthur O. Lovejoy, Professor of Philosophy, Johns Hopkins University. "The Historiography of Ideas."

Jesse S. Reeves, Professor of Political Science, University of Michigan. "The Poems on the Indies by Dati."

Edward P. Cheyney, Professor Emeritus of History, University of Pennsylvania. "John Fitch, Inventor of the Steamboat, and The American Philosophical Society."

Harrison S. Morris. "Illusions."

Saturday, April 24, Executive Session, 3:30 P.M.

Roland S. Morris, President, in the Chair

On motion the resolutions concerning the Building Fund were again presented and unanimously adopted. In accordance with the requirements of the Deed of Trust with the Girard Trust Company these resolutions were previously submitted in writing at the meeting of the Society on Friday morning, April 23. (See p. 40.)

The Chairman of each Class of members presented the recommendations and changes suggested at the Class meetings which had been held to consider the most important means of promoting the interests of the Classes and the welfare of the entire Society.

After some consideration the following resolution was approved by the Society:

> *Resolved*, That the Chairmen representing the four Classes at this meeting together with the Executive Officer, Edwin G. Conklin and the Chairman of the Committee on Publications, Henry H. Donaldson, be appointed to serve as an Investigating Committee on Publications to report to the Society at some future meeting.

Saturday, April 24, 7:30 P.M.

The annual dinner was held at the Bellevue-Stratford Hotel, President Morris presiding.

Dr. Dugald C. Jackson spoke on the Life and Work of Elihu Thomson; Miss Agnes Repplier on her Impressions of Research in Modern Science; Dr. James T. Shotwell on International Peace; and Dr. Charles R. Lanman on his Reminiscences of the Earliest Years of Johns Hopkins University.

AUTUMN GENERAL MEETING

November 26, 27, 1937

Friday, November 26, 9:30 A.M.

Roland S. Morris, President, in the Chair

The following papers were read by the persons named:

Ernest W. Brown,* Professor Emeritus of Mathematics, Yale University, and W. J. Eckert. "The Verification of the Lunar Theory."

Charles P. Olivier,* Professor of Astronomy, Director Flower Observatory, University of Pennsylvania. "Study of Long-Enduring Meteor Trains."

Harlow Shapley, Director Harvard College Observatory. "The Distribution of Eighty-seven Thousand Galaxies in the South Galactic Polar Cap." (Read by title.)

Harry Rowe Mimno,* Assistant Professor of Physics and Communication Engineering, Harvard University. "Ionosphere Observations Conducted During the Solar Eclipse of June 19, 1936."

J. W. Beams,* Professor of Physics, University of Virginia, and L. B. Snoddy. "Propagation of Luminosity and Potential in Gaseous Discharges."

W. F. G. Swann,* Director Bartol Research Foundation of the Franklin Institute, and W. E. Ramsey. "Cosmic Ray Showers Below Sea Level."

Everett S. Wallis,* Associate Professor of Chemistry, Princeton University. "Some Investigations in the Field of the Sterols and Gonadotropic Hormones."

Lawrence Martin, Chief Division of Maps and Incumbent Chair of Geography, Library of Congress. (Introduced by Dr. Hobbs.) "The Log of Palmer's Discovery of Antarctica."

* Recipient of Grant from the Penrose Fund.

William H. Hobbs, Professor Emeritus of Geology, University of Michigan. "The Discovery of the American Salient of the Antarctic Continent."

William B. Scott, Professor Emeritus of Geology, Princeton University. "The White River Artiodactyla." (Read by title.)

Elsa G. Allen,* Resident Doctor in Ornithology, Cornell University. "American Ornithology Before Audubon."

L. G. Rowntree,* Director Philadelphia Institute for Medical Research, Arthur Steinberg, William R. Brown, George M. Dorrance and E. F. Ciccone. "Production of Malignant Neoplasms in Rats."

Esther M. Greisheimer,* Professor of Physiology, Woman's Medical College of Pennsylvania. "Anesthesia." (Read by title.)

Friday, November 26, 1:30 P.M.

EDWIN G. CONKLIN, Vice-president, in the Chair

Charles Edward Kenneth Mees, recently elected member, subscribed the Laws and was admitted into the Society.

The following Symposium, arranged by the American Geophysical Union, was presented on "The Geophysical Exploration of the Ocean Bottom:"

Richard M. Field, Chairman Committee Geophysical and Geological Study of Ocean Basins, American Geophysical Union; Chairman International Commission on Continental and Oceanic Structure; Associate Professor of Geology, Princeton University. "The Importance of Geophysics to Submarine Geology."

G. T. Rudé, Chief Division of Marine Operations, United States Coast and Geodetic Survey. (Read by Lt. Paul E. Smith.) "New Methods in Marine Surveying."

Henry C. Stetson, Research Associate in Submarine Geology, Woods Hole Oceanographic Institution. "Present Status of the Problem of Submarine Canyons."

Charles Piggot, Physical Chemist, Geophysical Laboratory, Carnegie Institution of Washington. "The Technique of Securing Undisturbed Core-samples."

W. H. Bradley, Geologist, United States Geological Survey. "The Geological Survey's Work on the Piggot North Atlantic Deep Sea Cores."

Maurice Ewing, Assistant Professor of Physics, Lehigh University. "Marine Gravimetric Methods and Surveys."

Harry H. Hess, Assistant Professor of Geology, Princeton University. "Geological Results of the Gravimetric Cruise of the U.S.S. 'Barracuda.'"

N. H. Heck, Chief Division of Terrestrial Magnetism and Seismology, United States Coast and Geodetic Survey. "The Rôle of Earthquakes and Seismic Methods in Submarine Geology."

J. A. Fleming, Director Department of Terrestrial Magnetism, Carnegie Institution of Washington. "Terrestrial Magnetism and Oceanic Structure."

The Symposium was followed immediately by a Round Table Discussion, Alfred C. Lane, in the Chair.

Friday, November 26, 8:15 P.M.

Lecture by William Lyon Phelps, Professor Emeritus of English Literature, Yale University; Subject: "Truth and Poetry."

Saturday, November 27, Executive Session, 9:30 A.M.

Roland S. Morris, President, in the Chair

President Morris presented to Dr. Ralph E. Cleland, Goucher College, Baltimore, the diploma which accom-

panies the John F. Lewis Prize awarded to Dr. Cleland last spring.

A list of members who had died since the last meeting was read (see p. 329).

President Morris gave a full account of the financial situation of the Society and stated that the increase in the assets of the Society was due in large part to the transfer from the Building Fund to the endowments of the Society of the gift of $500,000 which had been made by Eldridge R. Johnson. Mr. Morris stated that Mr. Johnson's family had most generously given permission to transfer this sum, which Mr. Johnson had subscribed for a building, to the establishment of the Eldridge Reeves Johnson Fund, the income of which to be used for research and the principal held intact for the present time.

A resolution was ordered to be prepared by the Executive Officer in appreciation of this gift.

President Morris also reported that the late Dr. Judson Daland, who was not a member of this Society, had bequeathed his residuary estate of about $300,000 to the American Philosophical Society to establish the Judson Daland Foundation for Research in Clinical Medicine, the income only from which shall be used by the Society to promote research in clinical medicine. For the information of members Mr. Morris presented a Minute on Dr. Daland which had been adopted by the Medical Board of the Philadelphia General Hospital. This Minute, as corrected to conform with the terms of the bequest, was ordered to be placed on the records of the Society:

"Judson Daland, M.D., was born in New York City on July 11, 1860, and was graduated from the University of Pennsylvania in 1882. He died on August 14, 1937, from the remote effects of an automobile accident sustained in England two years previously.

"From his early days Doctor Daland manifested traits of character that soon made him an outstanding figure in medical research. He was aided in this by close personal association with William Pepper, Provost of the University of Pennsylvania, at the time when study of the blood and rapid advances in organic chemistry

were in the making. He was an omnivorous reader and writer. He travelled extensively, almost over the civilized world in his avid search for the causes of disease and in the study of ethnology and paleontology.

"He was a student of no mean accomplishment. He was a friend to the medical student and the young doctor. His carriage seemed to show aloofness but this was only for the purpose of testing the individual. Once satisfied that the person was a worthy student and searcher after truth, Doctor Daland warmed to him and proved to be a worthy counselor and advisor to those who learned to know him for his real worth.

"He was associated with the medical department of the University of Pennsylvania from 1882 to 1892.

"From 1903 to 1916 he was Professor of Clinical Medicine at the Medico-Chirurgical College of Philadelphia, advancing to Professor in Medicine when that worthy institution became the Graduate School in Medicine of the University of Pennsylvania, retiring in 1921 to become Emeritus Professor.

"He was a loyal citizen of the United States. He was given a commission as Commander in the Medical Corps of the United States Navy and was called upon to give advice and suggestion on many occasions during the World War. He was also the custodian of many secret missions during his service and was commended by the Surgeon General for his meritorious work.

"Doctor Daland was a member of a large number of social, scientific and medical organizations. He was always on the side of right and uniformly championed the best interests of the medical profession, especially in medical economics. He reached a high plane of confidence among his medical confrères as was evidenced by a very large consultation practice.

"He was a noted athlete. He swam the Straits of Messina, famed in mythology as the site of Scylla and Charybdis. He swam the Hellespont. He discarded the wearing of an overcoat in his later years, was always meticulously attired and presented a striking example of the well-dressed, cultured gentleman.

"He discovered evidence of surgical operations on skulls in Peru; studied sleeping sickness in British Central Africa; wrote about the tsetse fly; cholera in Naples; plague and leprosy in India; and diseases of the Eskimo Indians in Alaska. He escaped the earthquake in Japan in 1923, being away from Tokio at the time on an ethnologic hegira to study a race of Japanese pigmies.

"He was a collector of the finer examples of art, especially in the Orient, and willed several pieces of superb statuary to certain members of his Medical Board.

"He was the second president and one of the founders of the Philadelphia Institute for Medical Research which was planned as a memorial to Pasteur at the centennial celebration of his birth in 1922. This institute is housed in the Philadelphia General Hospital, in the building formerly known as the 'brick building' of the tuberculosis department.

"He possessed a large library which was devised to Doctor Charles A. E. Codman, The Philadelphia County Medical Society, and the Free Library of Philadelphia, in the order named.

"Doctor Daland's last published scientific article appeared in *International Clinics*, Vol. 1, Series 46, 1936, which was read before the Section on Medicine, College of Physicians of Philadelphia, November 26, 1934, the title being 'Clinical Observations on Onchocerciasis,' the result of studies made by him in Guatemala in 1934.

"Doctor Daland served as a member of the visiting medical staff of the Philadelphia Hospital from 1892 to 1895, later becoming Honorary Consulting Physician to this hospital. He also served for several years as a member of the examining board for resident physicians when the civil service rules were very rigid.

"The bulk of his estate, amounting to over $200,000, was left to the American Philosophical Society as an endowment to be known as the Judson Daland Foundation for Research in Clinical Medicine. He directed that the income from the Endowment Fund, less 10 per cent, shall be used by the Society for research in clinical medicine.

"In a supplementary letter he expressed the wish that the American Philosophical Society through its Committee on Grants [Research] give periodically to the Philadelphia Institute for Medical Research the income, provided that at all times the Institute, in the opinion of this Committee, merits such income and can carry on useful work thereby.

"Doctor Daland's remains were cremated, the ashes to be placed in an urn, which will rest in the building of the American Philosophical Society and will bear this inscription—JUDSON DALAND, SEARCH FOR THE TRUTH."

Mr. Morris reported that the ashes of Dr. Daland, if the Society approves, will be placed in a suitable container concealed in the wall over which a bronze tablet will be placed inscribed with his name and the words "Search for the Truth." It was moved and seconded that this bequest be accepted under the terms specified.

Mr. Morris reported that it was necessary to have additional space for the use of the Library in the Drexel Building. This additional space together with that now occupied covers approximately 11,000 square feet and a lease had been executed for this at a rental of $8,700 a year for a term of five years from March 1, 1938. On motion this was approved.

Dr. Sioussat, Chairman of the Committee on Library, gave a short account of the Library work and stated that a fuller report would be printed in the forthcoming number of the YEAR BOOK.

The purchase of the lot on the southeast corner of Fifth and Sansom Streets to be used for a future Library Building was considered. This matter was referred to the Committee on Finance with a request that they look into the advisability of purchasing this ground for such a building.

Dr. Conklin, as Chairman of the Committees on Research and Meetings gave a detailed account of the work done by these two Committees.

Dr. Sioussat, Chairman of the Committee on Library, informed the Society of the recent acquisition of the Thomson Papers and stated that all the papers had not been received as yet but that Owen D. Young had promised to send Dr. Thomson's papers now in the possession of the General Electric Company to the Society in the very near future.

Dr. Donaldson, Chairman of the Committee on Publications, presented his report.

J. Bennett Nolan reported on the ceremony in connection with the restoration of the grave of William Temple Franklin in Père Lachaise Cemetery in Paris, for which the American Philosophical Society had contributed a sum of money to cover the cost of the necessary repairs. Mr. Nolan reported that the United States Ambassador, Mr. Bullitt, was present as well as the representatives of the French Government and the various American Societies in

Paris, and that he and Dr. Edward P. Cheyney represented the Society on this occasion.

Saturday, November 27, 10:30 A.M.

HENRY H. DONALDSON, Vice-president, in the Chair

Rhys Carpenter, James Franck and William Hammond Wright, recently elected members, subscribed the Laws and were admitted into the Society.

The following papers were read by the persons named:

G. H. Parker, Professor Emeritus of Zoology, Harvard University. "Do Nerves Influence the Color Changes in Fishes Through Effects on the Blood Supply?" (Read by title.)

E. A. Culler,* Professor of Psychology, University of Illinois. "Effects of Curare upon Cortical Function."

William R. Amberson * (now Professor of Physiology, University of Maryland), Thomas P. Nash, Arthur G. Mulder and Dorothy Binns, College of Medicine, University of Tennessee. "The Relationship Between Tissue Chloride and Plasma Chloride."

Ethel Browne Harvey,* Research Worker, Department of Biology, Princeton University. "Parthenogenetic Merogony or Development of Eggs without Nuclei."

Rudolf Höber,* Visiting Professor of Physiology, University of Pennsylvania, and Elinor Moore. "Experiments Concerning the Secretory Activity of the Liver."

Rhys Carpenter, Professor of Archaeology, Bryn Mawr College. "The Language of Mycenean Greece, Archaeologically Considered."

* Recipient of Grant from the Penrose Fund.

Emory R. Johnson, Professor of Transportation and Commerce, University of Pennsylvania. "Panama Canal Tolls and Vessel Measurement Rules."

William E. Lingelbach,* Professor of Modern European History, University of Pennsylvania. "Recent Developments in Belgian Neutrality." (Read by title.)

Earle R. Caley,* Assistant Professor of Chemistry, Princeton University. "The Composition of Ancient Greek Bronze Coins."

H. U. Hall,* Formerly Curator Section of General Ethnology, University Museum, University of Pennsylvania. "The Sherbro of Sierra Leone."

Saturday, November 27, 2 P.M.

Roland S. Morris, President, in the Chair

A special session of the members for the consideration of the publications of the Society was called to order.

The report of the Committee on Inquiry concerning the publications of the Society was read by Dr. Conklin (see p. 110).

Mr. Morris stated that this was not a unanimous report of the Committee on Inquiry and that it had not as yet been adopted by the Committee on Publications. He also stated that a special committee consisting of two members, namely Dr. Veblen and Dr. Swann, had been appointed to draw up a report and that this report should be submitted to the Committee on Publications before any further steps could be taken.

There being no further business the meeting was adjourned by the presiding officer.

JOINT MEETING WITH THE AMERICAN HISTORICAL ASSOCIATION

December 29, 1937

Independence Hall, 2:30 P.M.

Chairman, FREDERIC L. PAXSON, University of California

In the absence of President Morris, Dr. William E. Lingelbach made the welcoming address.

The following papers were read by the persons named:

Charles A. Beard, Formerly Professor of Politics, Columbia University. "Historiography and the Constitution."

Max Farrand, Director Henry E. Huntington Library. "If James Madison Had Had a Sense of Humor."

William W. Crosskey, University of Chicago, in collaboration with Leonard Bloomfield, University of Chicago, "The Language of the Fathers."

A reception was tendered by the American Philosophical Society to members of the American Historical Association and Societies meeting concurrently in the Hall of the Society at 4:30 o'clock, at which approximately five hundred guests were present. An exhibit illustrative of the wealth of Americana in the Society's Library was made in the library rooms in the Drexel Building.

V

REPORTS OF COMMITTEES

1. REPORT OF THE COMMITTEE ON MEETINGS

For about one hundred and fifty years the American Philosophical Society's Stated Meetings occurred every two weeks, usually the first and third Friday nights of each month from October to June. In 1906 Dr. I. Minis Hays proposed the holding of an Annual General Meeting in the last week in April which should last for three days and would be so attractive that members from a distance would attend. The success of these General Meetings was so great that they became the chief attraction of the Society and the fortnightly meetings correspondingly declined in importance. In the latter part of this period there was frequently a very small attendance at these meetings, and in 1911 it was decided to hold Stated Meetings monthly instead of fortnightly. This continued until 1935, but the attendance was often embarrassingly small, in spite of the earnest attempt to have an excellent address, followed by a social reception. Under these conditions it seemed desiderable to institute a radical change in our method of holding meetings. At the General Meeting in 1936 the Society approved the plan of holding an Autumn General Meeting in November in addition to the Annual General Meeting in April, and to hold special meetings only when matters of importance or occasions of general interest warranted it. In short this plan contemplates fewer Stated Meetings but longer and more important ones.

The first Autumn General Meeting was held on the Friday and Saturday following Thanksgiving Day, November 27 and 28, 1936. There were one hundred and eighty-seven persons in attendance and twenty-six papers were read, seventeen of them by recipients of grants from the Penrose Fund. The Friday Evening Lecture was given in the Hall

of the Society by Sir D'Arcy W. Thompson, Professor of Natural History in St. Andrews University, and President of the Royal Society of Edinburgh, on "Astronomy in the Classics." Professor Thompson is a distinguished classical scholar as well as a scientist and the address was notable for its historical character and its literary charm. The lecture was followed by a reception and on both days of the meeting luncheon was served in the Hall. Out of town members and guests were entertained at the Benjamin Franklin Hotel as at the Annual General Meeting.

On January 2, 1937, a Special Meeting was held in conjunction with the American Association for the Advancement of Science on which occasion two hundred and seventeen persons were registered as in attendance and a very important symposium on "Viruses and Virus Diseases" was presented by five leading authorities in this field; these addresses were published in our PROCEEDINGS, Vol. 77, No. 4. This session was followed by luncheon for members and invited guests in the Hall of the Society, after which our guests were transported to the Academy of Natural Sciences and the Franklin Institute where they were guided through the Museums and the Planetarium and entertained at tea.

On February 4, another Special Meeting was held in connection with the celebration by the Church Club of the one hundred and fiftieth anniversary of the ordination of Bishop William White, who was one of the first Secretaries of the American Philosophical Society and later Vice-President. A supper was served by the Church Club. About one hundred and thirty persons were in attendance.

On February 9 the Henry La Barre Jayne Lecture was given in the Hall of the Society by Professor Harlow Shapley of the Harvard College Observatory on the subject "Recent Discoveries in Astronomy." About one hundred and fifty persons were present and the lecture was followed by a reception. All expenses of the meeting were

met by the Henry La Barre Jayne Memorial Fund. It is most appropriate and desirable that this important lectureship commemorating one of our beloved members and officers should be permanently associated with the American Philosophical Society.

On February 19 and 20 a Joint Meeting of this Society and some thirty-five other organizations that are engaged in administering funds in aid of research was held in the Society's Hall. About one hundred and twenty-five persons were present, those from out of the city being guests of the Society as at our General Meetings. Morning and afternoon of the first day (Friday) of the meeting were given to a round table conference on methods and results of promoting research. The evening lecture was given by Frederick P. Keppel, President of the Carnegie Corporation, on "The Responsibility of Endowments in the Promotion of Research," which was followed by a reception. On Saturday there was a symposium on "The Most Important Methods of Promoting Research," in which the speakers were President John C. Merriam of the Carnegie Institution of Washington, Mr. Warren Weaver of the Rockefeller Foundation, Dr. Waldo G. Leland of the American Council of Learned Societies, President Alexander G. Ruthven of the University of Michigan, President Frank Aydelotte of Swarthmore College, Professor E. P. Cheyney of the University of Pennsylvania, and Dr. Detlev W. Bronk of the Eldridge Reeves Johnson Foundation of the University of Pennsylvania. These addresses and discussions at the conference were published in our PROCEEDINGS, Vol. 77, No. 4. It was the general opinion that the meeting was a very valuable one and that similar meetings should be held in the future.

On March 5 in the Hall of the Society the Award of the John Scott Medal and Honorarium by the Board of Directors of City Trusts of Philadelphia was made to

Dr. William D. Coolidge, Schenectady, N. Y.—for the application of a new principle in x-ray tubes.

Dr. Irving Langmuir, Schenectady, N. Y.—for physical-chemical discoveries resulting in improved incandescent lamps.

Dr. Evarts A. Graham, St. Louis, Mo.—for his application of the x-ray to the study and diagnosis of gall-bladder conditions.

The Annual General Meeting of 1937 was held on April 22, 23 and 24 with one hundred and twenty-three members and about one hundred guests in attendance. Thirty-three papers were read and the R. A. F. Penrose, Jr., Memorial Lecture was given by Dr. Irving Langmuir of the General Electric Company on "The Surfaces of Solids and Liquids," followed by the usual reception in the Hall of the Society. Executive Sessions of the Society were held on Friday morning, April 23, and on Saturday afternoon, April 24, and at the latter session reports were received from representatives of the four classes of members on the methods by which the publications of the Society could be made more useful. A committee representative of the four classes was appointed to report on this subject to the Society at some future meeting. As in preceding years some one hundred and five members and invited persons were guests of the Society at the Benjamin Franklin Hotel and about one hundred at luncheon in the Hall of the Society on each of the three days of the meeting. The annual dinner at the Bellevue-Stratford Hotel was attended by two hundred and eight guests and addresses were given by Miss Agnes Repplier, Dr. Dugald C. Jackson, Dr. James T. Shotwell and Dr. Charles R. Lanman.

On May 25 the Colonial Dames of America, Pennsylvania Chapter, held a reception in the Hall of the Society, after the exercises and addresses in Independence Hall in commemoration of the opening of the Constitutional Convention in that Hall one hundred and fifty years ago. Among the speakers, Vice-president Edwin G. Conklin ad-

dressed the meeting on "The American Philosophical Society and the Founders of our Government." * The close connection between the framers of the Constitution and the American Philosophical Society was emphasized by the opening of the door of the Society's Hall on Independence Square, which had been closed for about fifty years. Through this door about six hundred members of the Colonial Dames came from Independence Hall into the Hall of the Society for the reception.

The second Autumn General Meeting was held on November 26 and 27, 1937, the Friday and Saturday following Thanksgiving Day. Twenty-four papers were read in the morning sessions of both days and the afternoon of Friday was devoted to a symposium, which had been organized by the American Geophysical Union, on "The Geophysical Exploration of the Ocean Bottom." Nine papers were presented in this symposium which was followed by a round table conference. Both symposium papers and conference discussion are in course of publication in our PROCEEDINGS. Sixty-six members and about one hundred guests were in attendance. The Friday evening lecture was given by Dr. William Lyon Phelps, Professor Emeritus of English Literature, Yale University, on "Truth and Poetry." This notable lecture was followed by a reception in the Hall of the Society.

The last meeting of the year was held in connection with a session of the American Historical Association on December 29 in commemoration of the Constitutional Convention of 1787. Addresses by Charles A. Beard, Max Farrand and William W. Crosskey were given in Independence Hall, and by loud speakers to an overflow audience in old Congress Hall. After these addresses the members of the Historical Association were received and entertained in the Hall of this Society, and in its Library in the Drexel Building many valuable historic documents were exhibited.

* Pennsylvania History, Oct. 1937.

Thus there were held nine public meetings in the Hall of the American Philosophical Society during 1937. These have been very successful and it has been demonstrated that we can have good and well-attended meetings if we follow the plan of our Annual General Meetings rather than that of the old fortnightly or monthly meetings. In the judgment of the Committee on Meetings this new plan should be continued in the future.

The Committee consists of the following members: Edwin G. Conklin, *Chairman,* Cyrus Adler, Henry H. Donaldson, Waldo G. Leland, William E. Lingelbach, John A. Miller, Harlow Shapley, Hugh S. Taylor, Rodney H. True, Roland S. Morris, *President.*

EDWIN G. CONKLIN, *Chairman.*

2. REPORT OF THE COMMITTEE ON HALL

During and immediately preceding the year 1937 a considerable number of relatively minor changes have been made in the construction and equipment of the Hall of the Society. Among these may be enumerated the following:

1. Paving with concrete the south areaway and the areas under the windows on Fifth Street to prevent drainage into the basement.

2. Removal of unused pipes and wires in the basement and sub-basement.

3. Laying a new floor in the janitor's room in the basement.

4. Opening the door on Independence Square, which had been closed for about fifty years, thus giving additional light and ventilation in the front hall and providing a much needed connection with Independence Square and its buildings.

5. All busts, portraits and historical objects have been plainly labeled.

6. Eight portraits which were in need of attention have been rebacked and cleaned by an expert, viz.,

George Ord, painted by T. Henry Smith after original by John Nagle.
John Vaughan, painted by Thomas Sully.
François André Michaux, painted by Rembrandt Peale.
Joseph Priestley, painted by Rembrandt Peale.
Robert Patterson, painted by Rembrandt Peale, after original by Rembrandt Peale.
George Bacon Wood, painted by Mrs. Margaret Lesley Bush-Brown, after the portrait by Samuel B. Waugh.

Louis Agassiz, painted by Daniel Huntington.
Henry M. Phillips, painted by K. C. B. Neilson.

7. A portrait of Henry Norris Russell, President of the American Philosophical Society, 1932–33, by Howard Russell Butler, and a medallion of Henry H. Donaldson, Vice-president, 1935–38, by R. Tait McKenzie were purchased and hung in the Members' Room.

8. One hundred and fifty upholstered folding chairs and three large tables were purchased.

9. A mahogany bookcase received from the estate of Walter Wood was reconditioned and placed in the Executive Office and bound sets of all the Society's publications have been placed in it.

10. Five bookcases and two coat racks were received from the daughters of our late Secretary, I. Minis Hays, and in addition three large coat racks were built and placed in the basement.

11. A case for the five volumes of Audubon's Birds of America and a wall case for William Penn's Charter of Privileges of the Colonists of Pennsylvania (1701) were made and placed in the Reception Room.

12. A new projection outfit and screen were installed in the Lecture Hall.

The Committee consists of the following members: J. Bertram Lippincott, *Chairman*, Paul P. Cret, Lawrence J. Morris, J. Rodman Paul, John M. Scott, Roland S. Morris, *President*, and Albert P. Brubaker, *Curator*. Edwin G. Conklin, *Executive Officer*, sits with the Committee.

J. Bertram Lippincott, *Chairman*.

3. REPORT OF THE COMMITTEE ON THE LIBRARY

The Committee on the Library has the honor to present the following report for the calendar year 1937. The first part of the report has been prepared by the Librarian.

I. Report of the Librarian

Additional Equipment Acquired.

In the Annual Report for 1936 it was stated that a further extension of shelf room would be required in a very short time. In October 1937, arrangements were made to secure 1,500 square feet of additional space on the second floor of the Drexel Building, immediately adjoining the present quarters. The Society has now renewed for a term of five years the lease on the present quarters, together with this latest addition. The new lease becomes effective March 1, 1938. The addition will provide space for the shelving of from 8,000 to 10,000 volumes, and also afford a room for committee meetings or for exhibition purposes, and two offices. This will entail the purchase and erection of new stacks and another general shifting of the books in the Library. About 10,000 books are still stored in the old Library in the Hall of the Society. When additional stacks are erected, approximately 5,000 volumes from the classes of Geology and Meteorology will be transferred to the Library in the Drexel Building.

Holdings of the Library.

At the close of 1937 the total number of volumes in the Library is 81,657, of pamphlets 49,051, of maps 5,457. At the close of 1936 the corresponding figures were: books, 80,918; pamphlets, 48,468; maps, 5,374.

Additions to the Library.

Exclusive of serials and of the newly acquired Elihu Thomson Papers (an account of which is given in detail later in this report), there have been added to the Library, 739 volumes, 583 pamphlets, 83 maps, 7 manuscripts, 3 photographs, 2 photostats, 1 broadside, 8 medals and 1 plaque. Of these there have been acquired by gift, 108 volumes, 429 pamphlets, 76 maps, 2 manuscripts, 3 photographs, 2 photostats, 1 broadside, 8 medals and 1 plaque; by purchase, 631 volumes, 154 pamphlets, 7 maps, 5 manuscripts.

The purchases have been on account of the following:

Funds	Purpose	Vol.	Pam.	Serials	Maps	Mss.
General	Unrestricted	278	79	87		4
Balch	International Law	2		3		
Boyé	Chemistry and Geology	1		2		
Carlier	Unrestricted	12	6	9		
Franklin	Unrestricted	11	1	3		
Jefferson	Unrestricted	2		2		
Magellanic	Navigation, Astronomy, Natural Philosophy			7		
Michaux	Forestry, Botany, Agriculture	61	27	56		
Norris	Unrestricted	35	6	2		
Phillips	Archaeology, Philology	187	30	118	1	
Proud	Unrestricted	29	1	5		1
Seybert	Unrestricted	10	4	3	1	
Tilghman	Unrestricted	3		3		

Donations to the Library.

Mr. Roland S. Morris, President of the American Philosophical Society, has again made a generous donation of books and pamphlets to the Library, largely in the field of Social Science.

Mr. John F. Lewis, Jr., has presented in his mother's name a letter dated Philadelphia, October 22, 1827, from Peter S. DuPonceau, the senior Vice-President of the American Philosophical Society, addressed to Benjamin Chew, Jr., and Edward S. Burd, executors of the estate of William Tilghman, relative to Tilghman's bequest to this Society.

William Tilghman, at one time Chief Justice of the Supreme Court of Pennsylvania, was elected a member of the American Philosophical Society, April 19, 1805. He served as Councillor from 1806 to 1817; as Vice-President from 1816 to 1818; and as President from January 7, 1825, until his death, April 30, 1827. He bequeathed in his will the sum of $200 to this Society, the income of which was to be used for the purchase of books. In the 110 years since his death, the original principal of $200 has increased to nearly $2,000. This fund is still known as the Tilghman Fund, and the income used for the purchase of books.

Mrs. H. C. Tilghman Hough has given to this Society a letter dated Philadelphia, July 26, 1824, signed by William Tilghman, John Vaughan and N. Chapman, Committee of the American Philosophical Society, and addressed to Mrs. Anne Patterson, relative to the death of her husband, Robert Patterson, late President of the American Philosophical Society.

Mrs. Francis T. Redwood has presented a copy of John Locke's book, *Some Thoughts Concerning Education*, published in London, 1745. Mrs. Redwood is the great-great granddaughter of Thomas Hopkinson, whose autograph is on the title-page of the book. He was the first president of the "American Philosophical Society," one of the ancestor societies whose union in 1769 constituted the present Society.

Among those who have made donations to the Library, may be mentioned the following: Edwin H. Barbour; George Simpson Eddy; Max Farrand; Harrold E. Gillingham; Gustavus Harkness; Alban W. Hoopes; the Mutual Assurance Company; J. Bennett Nolan; the Peabody Museum of Salem; the Rosenbach Company; Mrs. F. W. Shaefer; St. George L. Sioussat; and the University of Pennsylvania Library.

Important Purchases Made by the Library.

Representative titles in the various classes are here given:

Astronomy, Mathematics, and Physics

Bessel, Friedrich Wilhelm.
Fundamenta astronomiae pro anno MDCCLV deducta ex observationibus viri incomparabilis James Bradley in specula astronomica Grenovicensi per annos 1750–1762 institutis. Regiomonti, In commissis apud Frid. Nicolovium, 1818.

Brahe, Tycho.
Tychonis Brahe Dani Opera omnia, edidit I. L. E. Dreyer . . . 15 vol. Hauniae, In Libraria Gyldendaliana, 1913–1929.

Brunet, Pierre.
L'introduction des théories de Newton en France au xviii siècle . . . Par Pierre Brunet . . . Vol. 1. Paris, A. Blanchard, 1931.

Copernicus, Nicolaus.
Nicolai Copernici Thorvnensis De revolvtionibvs orbivm caelestivm libri vi. Ex avctoris avtographo recvdi cvravit Societas copernicana thorvnensis. Accedit Georgii Ioachimi Rhetici De libris revolvtionvm narratio prima. Thorvni, Svmptibvs Societatis Copernicanae, 1873.

Curtis, Harvey Lincoln.
Electrical measurements; precise comparisons of standards and absolute determinations of the units, by Harvey L. Curtis . . .1st ed. New York and London, McGraw-Hill Book Company, Inc., 1937.

Gordon, Andrew.
Versuch einer Erklärung der Electricität, herausgegeben von Andreas Gordon. Erfurt, Joh. Heinr. Nonne [1745].

Gunther, Robert William Theodore.
Early science in Cambridge. By R. T. Gunther . . . Oxford, University Press, 1937.

Houston, William Vermillion.
Principles of mathematical physics, by William V. Houston . . . 1st ed. New York and London, McGraw-Hill Book Company, Inc., 1934.

International control in the non-ferrous metals, by William Yandell Elliott, Elizabeth S. May, J. W. F. Rowe, Alex Skelton [and] Donald H. Wallace. New York, The Macmillan Company, 1937.

Koller, Lewis Richard.
The physics of electron tubes, by L. R. Koller . . . 2nd ed. New York and London, McGraw-Hill Book Company, Inc., 1937.

Paracelsus.
The Hermetic and alchemical writings of Aureolus Philippus Theophrastus Bombast, of Hohenheim, called Paracelsus the Great. Now for the first time faithfully tr. into English. Ed. with a biographical preface, elucidatory notes, a copious Hermetic vocabulary, and index, by Arthur Edward Waite . . . 2 vol. London, J. Elliott and Co., 1894.

Young, Matthew.
An enquiry into the principal phaenomena of sounds and musical strings. By Matthew Young . . . Dublin, Hill, 1784.

Botany, Agriculture, Forestry

Apuleius *Barbarus*.
The Herbal of Pseudo-Apuleius from the ninth-century manuscript in the abbey of Monte Cassino [Codex Casinensis 97] together with the first printed edition of Joh. Phil. de Lignamine [Editio princeps Romae 1481] both in facsimile, described and annotated by F. W. T. Hunger . . . Leyden, E. J. Brill, 1935.

Blatter, Ethelbert.
Some beautiful Indian trees, by . . . E. Blatter and Walter S. Millard . . . London, Bale, 1937.

Chew, Arthur P.
The response of government to agriculture; an account of the origin and development of the U. S. Department of Agriculture, on the occasion of its 75th anniversary . . . Washington, U. S. Government Printing Office, 1937.

Dioscorides.
The Greek herbal of Dioscorides . . . Englished by John Goodyer . . . edited and first printed . . .by Robert T. Gunther. Oxford, University Press, 1934.

Gleichen-Russwurm, Wilhelm Friedrich, Freiherr von.
Das neueste aus dem Reiche der Pflanzen . . . beschrieben . . . von Wilhelm Friederich Freiherrn von Gleichen, genannt Russworm . . . Hrsg . . . von Johann Christoph Keller . . . [Nürnberg], Gedruckt bei C. de Launoy . . . 1764.

Hartlib, Samuel, editor.
Samuel Hartlib, his legacie: or an enlargement of the discourse of husbandry used in Brabant and Flaunders . . . the second edition . . . with an appendix . . . London, Printed . . . for Richard Wodenothe, 1652.

Heresbach, Conrad.
The whole art of husbandry contained in foure bookes . . . first written by Conrade Heresbatch . . . then translated by Barnaby Googe . . . now renewed, corrected, enlarged, and adorned with all the experiments and practises of our English nation, which were wanting in the former editions, by . . . Gervase Markham. London, More, 1631.

Lehmann, Ernst.
Der Schwarzrost, seine Geschichte, seine Biologie und seine Bekämpfung in Verbindung mit der Berberitzenfrage, von Ernst Lehmann und Hans Kum-

mer in Gemeinschaft mit Hans Dannenmann. München . . . Lehmanns Verlag, 1937.

Marie-Victorin, Frère.
Flore laurentienne; illustrée de 22 cartes et de 2800 dessins par frère Alexandre. Montréal, Imprimerie de La Salle, 1935.

Scot, Reginald.
A perfite platforme of a hoppe garden and necessarie instructions for the making and mayntenaunce thereof . . . nowe newly corrected and augmented by Reynolde Scot . . . London, Henrie Denham, 1576.

Tulasne, Louis René.
Selecta fungorum carpologia of the brothers L. R. and C. Tulasne, translated into English by W. B. Grove . . . edited by A. H. Reginald Buller . . . and C. L. Shear . . . Oxford, The Clarendon Press, 1931.

Vitman, Fulgenzio.
. . . De medicatis herbarum facultatibus liber; ex veteri medicorum fide, ex probata nuperorum observatione, ex privato quarumdam gentium usu methodo botanica . . . 2 vol. Faventiae, Sumptibus Josephi Antonii Archii, MDCCLXX.

[Weston, Sir Richard.]
A discours of husbandrie used in Brabant and Flanders: showing the wonderful improvement of land there; and serving as a pattern for our practice in this common-wealth; the second edition, corrected and inlarged [by Samuel Hartlib]. London, William Du-Gard, 1652.

Art and Archaeology

Botta, Paul Emile.
Monument de Ninive, découvert et décrit par M. P. E. Botta; mesuré et dessiné par M. E. Flandin . . . 5 vol. Paris, Imprimerie Nationale, 1849–50.

British Museum. Dept. of Coins and Medals.
Catalogue of the coins of ancient India by John Allan . . . London, Trustees of British Museum, 1936.

Davies, Mrs. Nina M. (Cummings).
Ancient Egyptian paintings selected, copied, and described by Nina M. Davies, with the editorial assistance of Alvan H. Gardiner . . . 3 vol. Chicago, The University of Chicago Press, 1936.

Davies, Norman de Garis.
Paintings from the tomb of Rekh-mi-Rē at Thebes, by Norman de Garis Davies and Charles K. Wilkinson. New York, [Plantin Press], 1935. (The Metropolitan Museum of Art. Egyptian Expedition Publications. Vol. X.)

Furtwängler, Adolf.
Die antike Gemmen, Geschichte der Steinschneidekunst im klassischen Altertum. 3 vol. Leipzig und Berlin, Giesecke und Devrient, 1900.

Lanckoronski, Karl, Grafen von.
Städte Pamphyliens und Pisidiens, unter Mitwirkung von G. Niemann und E. Petersen, hrsg. von Karl Grafen Lanckoronski . . . 2 vol. Wien, Tempsky, 1890–1892.

Leyden. Rijksmuseum van Oudheden.
Beschreibung der aegyptischen Sammlung des Niederländischen Reichsmuseums der Altertümer in Leiden. Vol. 1–14. Haag, M. Nijhoff, 1905–1932.

Der obergermanisch-raetische Limes des Römerreiches; im Auftrage der Reichs-Limeskommission hrsg. von . . . O. von Sarwey [und] F. Hettner . . . Lief. 1 +. Heidelberg, Petters, 1894 +.

Riegl, Alois.
Die spätrömische Kunst-Industrie nach den Funden in Österreich-Ungarn . . . 2 vol. Wien, 1901–1923.

Roeder, Günther.
Ägyptische Bronzewerke . . . Glückstadt . . . Augustin, 1937.

Stackelberg, Otto Magnus, Freiherr von.
Die Graeber der Hellenen. Von O. M. Baron von Stackelberg. Berlin, G. Reimer, 1837.

Wien. Akademie der Wissenschaften. Limeskommission.
Der römische Limes in Österreich. Heft 1–16. Wien, Hölder, 1900–1926.

Winter, Franz.
Der Alexandersarkophag aus Sidon, von Franz Winter . . . Strassburg, K. J. Trübner, 1912.

Early Scientific Works before 1700

Agricola, Georg.
Georgii Agricolae Medici libri quinque de mensuris & ponderibus, in quibus plaeraque à Bvdaeo & Portio parum animaduersa diligenter excutiuntur; opus nunc primum in lucem aeditum . . . Parisiis, Excudebat Christianus Wechelus . . . M.D.XXXIII.

Bartholin, Erasmus.
De naturae mirabilibus, qvaestiones academicae . . . Hafniae, Sumptibus Petri Hauboldi . . . Anno CIↃIↃ CLXXIV.

Cesalpino, Andrea.
De metallicis libri tres . . . Noribergae, Recusi, curante Conrado Agricola, MDCII.

Euclides.
La prospettiva di Evclide, nella quale si tratta di quelle cose, che per raggi diritti si veggono . . . In Fiorenza . . . de 'Giunti, MDLXXIII.

Fontana, Gaetano.
Institutio physico-astronomica, adiecta in fine appendice geographica . . . Mutinae, Typis Antonij Capponi, ac HH. Pontiroli . . . M.DC.XCV.

Psellus, Michael Constantine.
. . . Sapientissimi Pselli Opus dilucidum in quattuor mathematicas disciplinas, arithmeticam, musicam, geometriam et astronomiam . . . Venetiis, [per Stephanum de Sabio], MDXXXII.

Biography

Cutler, William Parker.
Life, journals and correspondence of Rev. Manasseh Cutler . . . By his grandchildren, William Parker Cutler and Julia Perkins Cutler . . . 2 vol. Cincinnati, R. Clarke and Co., 1888.

Mayo, Lawrence Shaw.
John Endecott, a biography . . . Cambridge, Harvard University Press, 1936.

Armes, Ethel Marie.
Stratford Hall, the great house of the Lees, by Ethel Armes; with an introduction by Franklin D. Roosevelt. Richmond, Va., Garrett and Massie, Inc., 1936.

Beveridge, Albert Jeremiah.
Abraham Lincoln, 1809–1858 . . . 4 vol. Boston, Houghton Mifflin, c1928.

Beveridge, Albert Jeremiah.
The life of John Marshall . . . 4 vol. Boston and New York, Houghton Mifflin, 1916–1919.

Mill, John Stuart.
Autobiography . . . London, Longmans, Green, Reader and Dyer, 1873.

Gibson, James E.
Dr. Bodo Otto, and the medical background of the American revolution . . . Springfield, Ill., Thomas, c1937.

Saint-Aulaire, Auguste Félix, Comte de.
Talleyrand . . . translated from the French by George Frederic Lees and Frederick J. Stephens. New York, Macmillan Company, 1937.

Read, Conyers.

Mr. Secretary Walsingham and the policy of Queen Elizabeth, by Conyers Read . . . 3 vol. Cambridge, At the Harvard University Press; Oxford, At the Clarendon Press, 1925.

History

Bieber, Ralph P., editor.

The Southwest historical series; a series of historical documents, hitherto unpublished . . . depicting social and economic conditions in the Southwest during the nineteenth century . . . edited by Ralph P. Bieber. Glendale, Calif., The Arthur H. Clark Company, 1931–37. (Vol. 1–5, published to date.)

Byrd, William.

William Byrd's histories of the dividing line betwixt Virginia and North Carolina, with introduction and notes by William K. Boyd . . . Raleigh, North Carolina Historical Commission, 1929.

Cobbett, William.

History of the regency and reign of King George the Fourth. 2 vol. London, Printed by Mills, Jowett and Mills . . . published by William Cobbett, 1830.

Fite, Emerson David.

A book of old maps, delineating American history from the earliest days down to the close of the Revolutionary war, compiled and edited by Emerson D. Fite & Archibald Freeman . . . Cambridge, Harvard University Press, 1926.

Gayarré, Charles Etienne Arthur.

Louisiana; its colonial history and romance. By Charles Gayarré. 2 vol. New York, Harper and Brothers, 1851–52. (Published later as Vol. 1–2 of his History of Louisiana. Title-page of Vol. 2 reads: Louisiana: its history as a French colony. Third series of lectures . . . New York, J. Wiley, 1852.)

Mackenzie, Frederick.
Diary of Frederick Mackenzie, giving a daily narrative of his military services as an officer of the regiment of Royal Welch fusiliers during the years 1775–1781 in Massachusetts, Rhode Island and New York . . . 2 vol. Cambridge, Harvard University Press, 1930.

Partido Revolucionario Cubano.
La revolucion del 95, según correspondencia de la Delegación Cubana en Nueva York . . . Vol. 1–5. Vedado, Habana, Editorial Habanera, 1932–37. (Biblioteca Histórica Cubana.)

Bibliography

Abbott, Wilbur Cortez.
A bibliography of Oliver Cromwell, a list of printed materials relating to Oliver Cromwell, together with a list of portraits and caricatures. Cambridge, Harvard University Press, 1929.

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A guide to the resources of the American Antiquarian Society; a national library of American history. Worcester, Mass., 1937.

American book prices current—serially. New York, Bowker, 1937 +.

The American bookfinder: a weekly exchange of out of print books . . . Vol. 1, no. 34 +. New York, Bowker, 1937 +.

American newspapers 1821–1936, a union list of files available in the United States and Canada, edited by Winifred Gregory under the auspices of the Bibliographical Society of America . . . New York, The H. W. Wilson Company, 1937.

Annual bibliograhy of Islamic art and archaeology, India excepted . . . edited by L. A. Mayer . . . Vol. 1. Jerusalem, Divan Publishing House, 1937.

Associated booksellers and catalogues . . . sponsored by Want List, the accredited weekly magazine of the American old book trade. No. 1 +. New York, 1937 +.

Beale, Joseph Henry, compiler.

A bibliography of early English law books, compiled by Joseph H. Beale. Cambridge, Harvard University Press, 1926.

Berthold, Arthur, compiler.

Union catalogues, a selective bibliography . . . with an introduction by Ernest Cushing Richardson. [Philadelphia], Union Library Catalogue of the Philadelphia Metropolitan Area, 1936.

Besterman, Theodore.

The beginnings of systematic bibliography, by Theodore Besterman. 2nd edition, rev. London, Oxford University Press [1936].

Bliss, Henry Evelyn.

A system of bibliographic classification, by Henry Evelyn Bliss. 2nd ed. New York, The H. W. Wilson Company, 1936.

The book review digest . . . 1928 +, edited by Marion A. Knight, Mertice M. James, Matilda L. Berg . . . New York, The H. W. Wilson Company, 1929 +.

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A working bibliography of Greek law, by George M. Calhoun and Catherine Delamere; with an introduction by Roscoe Pound. Cambridge, Harvard University Press, 1937.

Cappon, Lester Jesse.

Virginia newspapers, 1821–1935; a bibliography with historical introduction and notes by Lester J. Cappon. New York, D. Appleton-Century Company, 1936.

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Catalogue of the Wymberley Jones De Renne Georgia Library at Wormsloe, Isle of Hope near

Savannah, Georgia. [Compiled by Azalea Clizbee.] 3 vol. Wormsloe, Privately printed, 1931.

Directory of American agencies concerned with the study of international affairs [edited by Ruth Savord] . . . New York, Council on Foreign Relations, Inc., 1931.

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A bibliography of British municipal history, including gilds and parliamentary representation. By Charles Gross . . . Cambridge, Harvard University Press, 1915.

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Incunabula in the Huntington Library, compiled by Herman Ralph Mead . . . San Marino, 1937.

Henry E. Huntington Library and Art Gallery.
Catalogue of British paintings in the Henry E. Huntington Library . . . by C. H. Collins Baker with an introduction by Sir Charles Holmes. San Marino, 1936.

Johnson, Francis R.
Astronomical thought in renaissance England; a study of the English scientific writings from 1500 to 1645 . . . By Francis R. Johnson. Baltimore, Johns Hopkins Press, 1937. (Henry E. Huntington Library and Art Gallery publication.)

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Slavic Europe; a selected bibliography in the western European languages, comprising history, languages and literatures, by Robert Joseph Kerner. Cambridge, Harvard University Press, 1918.

Ketcham, E. H.
Preliminary select bibliography of international law . . . [1937]. (Mimeographed.)

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Foreign affairs bibliography; a selected and annotated list of books on international relations, 1919–1932 [by] William L. Langer . . . [and] Hamilton

Fish Armstrong . . . New York, London, Harper and Brothers for Council on Foreign Relations, Inc., [c1933].

McKerrow, Ronald Brunlees.
An introduction to bibliography for literary students, by Ronald B. McKerrow. Oxford, At the Clarendon Press, 1928.

Massie, Joseph.
Bibliography of the collection of books and tracts on commerce, currency, and poor law (1557–1763); formed by Joseph Massie . . . transcribed from Lansdowne manuscript MXLIX with . . . introduction by William A. Shaw. London, Published by George Harding's Bookshop, Ltd., 1937.

Monroe, Walter Scott, compiler.
Bibliographies and summaries in education to July 1935; a catalog of more than 4000 annotated bibliographies and summaries listed under author and subject in one alphabet [by] Walter S. Monroe . . . and Louis Shores . . . New York, The H. W. Wilson Company, 1936.

Mumey, Nolie.
A study of rare books with special reference to colophons, press devices and title pages of interest to the bibliophile and the student of literature, by Nolie Mumey . . . Denver, The Clason Publishing Company, 1930.

Munro, William Bennett.
A bibliography of municipal government in the United States, by William Bennett Munro . . . 2nd edition. Cambridge, Harvard University Press, 1915.

Myers, Denys Peter, editor.
Manual of collections of treaties and of collections relating to treaties, by Denys Peter Myers . . . Cambridge, Harvard University Press, 1922.

Newberry Library.
A check list of manuscripts in the Edward E. Ayer collection, compiled by Ruth Lapham Butler. Chicago, 1937.

Oregon. State Planning Board.
Bibliography of the geology and mineral resources of Oregon with digests and index to July 1, 1936. Portland, Conger, 1936. (Lithoprinted.)

Philadelphia. Free Library.
Oriental manuscripts of the John Frederick Lewis collection in the Free Library of Philadelphia; a descriptive catalogue, by Muhammed Ahmed Simsar. Philadelphia, 1937.

Philadelphia. Special Libraries Council of Philadelphia and Vicinity.
Library directory, 1937 . . . 5th edition. Philadelphia, 1937.

Thomason, George.
Catalogue of the pamphlets, books, newspapers, and manuscripts relating to the Civil War, the Commonwealth, and Restoration, collected by George Thomason, 1640–1661. 2 vol. [Edited by G. K. Fortescue.] London [British Museum], Printed by order of the Trustees, 1908.

U. S. Library of Congress. Division of Manuscripts.
The Harkness collection in the Library of Congress. Documents from early Peru, the Pizarros and the Almagros, 1531–1578. Washington, U. S. Government Printing Office, 1936.

U. S. Works Progress Administration. Historical Records Survey.
Checklist of Philadelphia newspapers available in Philadelphia, including files held by the principal libraries, and by newspaper publishers or their representatives; 2nd edition, rev. and corrected to February 15, 1937. Philadelphia, 1937. (Mimeographed.)

Wagner, Henry Raup.
The Spanish Southwest, 1542–1794; an annotated bibliography . . . 2 vol. Albuquerque, Quivira Society, 1937. (Quivira Society. Publications, No. 7.)

Winfield, Percy Henry.
The chief sources of English legal history, by Percy H. Winfield . . . Cambridge, Harvard University Press, 1925.

Frankliniana

Crane, Verner W.
Benjamin Franklin and the Stamp Act. [Reprint from Colonial Society of Massachusetts. Publications, Vol. 32, 1936.]

Crane, Verner W.
Three fables by Benjamin Franklin. [Reprinted from the New England Quarterly, Vol. 9, no. 3, 1936.]

Faÿ, Bernard.
Benjamin Franklin . . . [French edition]. 3 vol. in 2. Paris, Calmann-Lévy, 1929–31.

Faÿ, Bernard.
The two Franklins: fathers of American democracy. Boston, Little, Brown, 1933.

Franklin, Benjamin.
The art of procuring pleasant dreams . . . Detroit, Blue Ox Press, 1937.

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Benjamin Franklin's own story; his Autobiography continued from 1759 to his death in 1790 with a biographical sketch drawn from his writings by Nathan G. Goodman. Philadelphia, University of Pennsylvania Press, 1937.

Franklin, Benjamin.
The ingenious Dr. Franklin; selected scientific letters of Benjamin Franklin, edited by Nathan G. Goodman. Philadelphia, University of Pennsylvania Press, 1931.

Franklin, Benjamin.
The morals of chess. [New York, Tri-Arts Press.]

Franklin, Benjamin.
The Writings of Benjamin Franklin, collected and edited with a life and introduction by Albert Henry Smyth. 10 vol. [Large Octavo edition.] New York, Macmillan Company, 1905–1907.

Franklin, Benjamin.
"My dear girl," the correspondence of Benjamin Franklin with Polly Stevenson, Georgiana and Catherine Shipley, by James Madison Stifler. New York, Doran [c1927].

Franklin, Benjamin.
Benjamin Franklin, representative selections, with introduction, bibliography and notes by Frank Luther Mott and Chester E. Jorgenson. New York, American Book Company [c1936].

Gray, Austin K.
Benjamin Franklin's library (printed, 1936, as "The first American library"). A short account of the Library Company of Philadelphia 1731–1931 . . . New York, Macmillan Company [c1937].

Scientific Pamphlets.
Three volumes of scientific pamphlets from the library of Benjamin Franklin. The table of contents and the notations are in the handwriting of Franklin. (A note upon these volumes will be found below, p. 105.)

American Philosophical Society Library.
A Catalogue of manuscript and printed documents chiefly Americana selected from the archives and manuscript collections of the American Philosophical Society . . . and placed upon exhibition in the Library of the Society, December 28–31, 1937, on the occasion of the annual meeting of the American Historical Association and Societies gathering concurrently. Philadelphia, American Philosophical So-

ciety, 1937. (A note upon this will be found below, p. 103.)

Approximately 100 volumes have been purchased very advantageously from the Harvard University Press. While these books are largely in the field of Social Science, other classes, such as the pure sciences, are represented.

Acquisition of Serials.

During 1937 the Library has received 1773 serial publications, of which 320 have been acquired by gift, 1153 by exchange, and 300 by purchase. The last are credited to the various funds as stated above. Ninety new serials have been added during the year. Among them are the following:

By Purchase

Ägyptologische Forschungen, hrsg. von Alexander Scharff . . . Heft 1 +. Glückstadt, Augustin, 1936 +.

Annuaire de la Société des Nations . . . préparé sous la direction de Georges Ottlik, 1937 +. Genève, 1937 +.

Archives d'histoire du droit oriental, publiée sous la direction de Jacques Pirenne . . . Tome 1 +. Bruxelles, Nouvelle Société d'Éditions . . . 1937 +.

Athar-E Iran; annales du Service Archéologique de l'Iran. Tome 1 +. Paris, Geuthner, 1936 +.

Farm chemurgic journal. Published by the National Farm Chemurgic Council. Vol. 1 +. Dearborn . . . 1937 +.

Folk; the journal of the International Association for Folklore and Ethnology. Vol. 1 +. Leipzig, Hirzel, 1937 +.

The Franco-American review . . . published for the Friends of the Franco-American Review, Inc. Vol. 1 +. New Haven, Yale University Press, 1936 +.

Handbuch der Geophysik, hrsg. von . . . B. Gutenberg. Band 1 +. Berlin, Verlag von Gebrüder Borntraeger, 1931 +.

Ibero-amerikanisches Archiv; Zeitschrift des Ibero-amerikanischen Forschungs-Instituts der Universität Bonn, hrsg. von Otto Quelle. Jahrgang 1 +. Berlin . . . Dümmlers, 1924 +.

International review for social history, edited by the International Institute for Social History. Vol. 1 +. Leiden, E. J. Brill, 1936 +.

The League; the exponent of the principles of free trade, and the organ of the National Anti-Corn-Law League. Vol. 1, no. 1–52. London, 1843–1844.

Leipziger ägyptologische Studien, hrsg. von Walther Wolf . . . Heft 1 +. Glückstadt, Augustin, 1935 +.

Studia et documenta ad iura orientis antiqui pertinentia. Vol. 1 +. Leiden, E. J. Brill, 1936 +.

U. S. National Archives.

Federal register . . . Vol. 2, no. 230 +. [Washington, U. S. Government Printing Office, 1937 +.]

By Exchange

Frontiers; a magazine of natural history, published by the Academy of Natural Sciences of Philadelphia. Vol. 1, no. 3 +. Philadelphia, 1937 +.

Henry E. Huntington Library and Art Gallery.

Huntington library quarterly. Vol. 1 +. San Marino, 1937 +.

Società Italiana per il Progresso delle Scienze.

Scienza e tecnica; supplemento agli "Atti della Società Italiana per il Progresso delle Scienze." Vol. 1 +. Roma, 1937 +.

Southwest Museum, Los Angeles.

Papers. No. 1 +. Los Angeles, 1928 +.

University of California.

Anthropological records. Vol. 1 +. Berkeley, University of California Press, 1937 +.

University of Chicago. Oriental Institute.
Bulletin. No. 1 +. [Chicago], 1937 +.
University of Michigan. School of Forestry and Conservation.
Circular. No. 1 +. Ann Arbor, 1937 +.
Vereeniging Koloniaal Instituut, Amsterdam.
Bulletin of the Colonial Institute of Amsterdam . . . Vol. 1 +. Amsterdam, 1937 +.
William and Mary college quarterly; historical magazine . . . Series 2, Vol. 16 +. Williamsburg, Va., William and Mary College, 1936 +.

By Gift

Revue d'histoire de la philosophie et d'histoire générale de la civilisation . . . Publiée par la Faculté des Lettres de l'Université de Lille . . . N. S. Fasc. 17 +. Lille, 1937 +.
University of Pennsylvania. Library.
Library chronicle. Vol. 1 +. [Philadelphia], 1933 +. (Issued four times a year by and for the Friends of the Library of the University of Pennsylvania.)

Files Completed.

By the acquisition of the parts indicated below, the following files have been completed:

Bibliographical Society of America. Chicago. Bulletin. Vol. 1, nos. 1–3.
Foreign affairs; an American quarterly review. New York. Vol. 1–4.
Harvard University. Peabody Museum of American Archaeology and Ethnology. Cambridge. Harvard African studies. Vol. 10.

Binding, Cataloguing, etc.

During 1937, 1318 books have been bound, over 2132 volumes accessioned, of which 991 were serial publications. There have been catalogued 699 books in 940 volumes, 197

pamphlets, 6 maps, 4 manuscripts, 18 autographs, 9 broadsides, 8 bookplates, 9 medals and coins, 3 photostats, 2 photographs. Of serials analyzed, 1443 titles have been brought out; 8381 cards have been added to the catalogue, of which 2430 were typewritten and 5951 were Library of Congress cards to which changes and additions were made to adapt them to our catalogue.

Progress has been made in the work on the Bache Collection of Franklin Papers, acquired by this Society in March 1936. Preliminary work on 700 of the 1100 items in the calendaring of this collection has been finished.

During the year the Library staff has made headway in the work of sorting and arranging on shelves, the large number of uncatalogued and duplicate books which have been in storage for many years.

Work on the revision of the exchange list has progressed as follows:

1. Printed return postcards have been sent to all the exchanges, asking for the correct form of the name and address.

2. Letters have been written to those exchanges which have failed to send their publications to us, asking if they wish the exchange relations to cease. These letters have brought quick response from many institutions. In nearly every instance they wish to be retained on the exchange list and many are sending to us back numbers of their publications.

3. Letters have been sent to university and public libraries, and to large and important societies and institutions, asking if they wish to have their respective libraries made depositories for our publications, should this Society adopt such a plan. The answers to these letters have been almost unanimous in desiring such an arrangement.

A good start in the listing of the Thomson Papers has been made. All of the material has been arranged in chronological order and 850 letters have been calendared.

Of this rich collection of scientific papers, the American Philosophical Society has received the following items:

- 1500 letters to Elihu Thomson, 1870–1937. (This includes the notification of his membership in the American Philosophical Society, 1876.)
- 200 letters from Elihu Thomson, 1878–1936.
- 300 letters—miscellaneous correspondence.
- 5 volumes of manuscript comments (Thomson's hand) on his patents, 1875–1930.
- 304 original papers, many in three forms—manuscript, typed copy, and printed copy (or photostat).
- Original drawings used to illustrate his patents.
- Reprints of articles (not Thomson's); world war pamphlets.

The General Electric Company has promised to deposit with the Society, at a later date, thirty or more volumes of the Thomson letter books (letter press copies) containing correspondence relative to his work with the General Electric, as well as one or two of his early models of inventions.

Care and Repair of Books and Manuscripts.

The work on the restoration of manuscripts and rare books has been going on steadily. In addition to the work on the Bache Collection, which is now about half completed, two maps have been restored and cases made for them; Penn's "Charter of Privileges" has been cleaned, repaired, flattened and reframed; 75 seals have been restored; 350 cloth joints have been inserted in rare books to give greater support where the joints were weak; 150 leather-bound books have been oiled; and many scattered letters from the archives have been restored.

Among those who have consulted the manuscripts or for whom transcripts or microfilms have been made are the following:

Randolph G. Adams, Ann Arbor, Michigan.
Manuscript Catalogue of the Library, 1799.
Letters from Thomas Jefferson and Others.
Letters Announcing Donations to the Library.
Daniel J. Ahearn, New York, New York.
Samuel Breck. Recollections . . . of deceased members of the American Philosophical Society.
Miss Mary E. Bendelari, Silver Springs, Maryland.
Franklin Papers.
Miss Jane G. Bolton, Upper Darby, Pennsylvania.
Burd-Shippen Papers.
Mrs. M. V. Brewington, Berwyn, Pennsylvania.
Shippen Waste Book.
Ralph D. Brown, University of Minnesota, Minneapolis, Minnesota.
Muhlenberg Journals.
Meteorological Observations by Rittenhouse.
Meteorological Journal by James Madison.
Frances Childs, Philadelphia, Pennsylvania.
Peter S. DuPonceau. Common Place Book.
Gilbert Chinard, Princeton, New Jersey.
Franklin Papers.
Verner W. Crane, University of Michigan, Ann Arbor, Michigan.
Franklin Papers.
Guy F. Hershberger, Goshen, Indiana.
Penn Letters.
Logan Papers.
Franklin Papers.
A. K. King, Chapel Hill, North Carolina.
Franklin Papers.
Burton Alva Konkle, Swarthmore, Pennsylvania.
Declaration of Independence.
Lincoln Lorenz, New Rochelle, New York.
Franklin Papers.
Lawrence J. Morris, Philadelphia, Pennsylvania.
Manuscript Archives of the Wistar Association.
J. Bennett Nolan, Reading, Pennsylvania.
Franklin Papers.
R. C. Randall, Fenn College, Cleveland, Ohio.
Greene Correspondence; Manuscript Communications to the A. P. S.
Mrs. L. D. Redway, Ossining, New York.
Franklin Papers.
H. G. Richards, New Jersey State Museum, Trenton, New Jersey.
Indian Vocabularies.

C. W. Smith, University of Washington, Seattle, Washington.
Documents relating to the Wyoming Controversy.
Carl Van Doran, New York, New York.
Franklin Papers.
P. W. Wallace, Annville, Pennsylvania.
Horsfield Papers.

Records for 1937 show an encouraging increase in the number of books borrowed; in the number of persons using the Library; and in the number of requests for information through correspondence.

Exhibits of the Books and Manuscripts from the Library.

American Association for the Advancement of Science, Affiliated and Associated Societies, January 2, 1937.

A group of political and diplomatic papers selected from the Bache Collection of the Franklin Papers.

Jefferson's manuscript draught of the Declaration of Independence.

A facsimile copy of the Olive Branch Petition.

Commemoration of the One Hundred and Fiftieth Anniversary of the Consecration as Bishop of the Rev. William White, February 4, 1937.

Copies of various sermons written by Bishop White.

Copy of the discourse delivered at the funeral of Bishop White by the Right Rev. Henry U. Onderdonk.

Jayne Memorial Lecture, Delivered by Dr. Harlow Shapley, Director of Harvard College Observatory, February 9, 1937.

Early astronomical works.

Joint Meeting with Representatives of Foundations, Societies, Universities and Institutions Administering Funds in Aid of Research, February 19–20, 1937.

Material, manuscript and printed, pertaining to Jean Hyacinth de Magellan who bequeathed 200 guineas to the Society in 1786, the income of which was to be used for an annual premium.

Material, manuscript and printed, pertaining to François André Michaux, who bequeathed about $10,000 to the Society, the income of which was to be used for the promotion of agriculture, botany and forestry.

The Award of the John Scott Medal, March 5, 1937.

Seven Franklin imprints.

Exhibition, April 3–21, 1937.

Americana and Frankliniana, presented to the Library by William Smith Mason, a member of the American Philosophical Society.

The Annual General Meeting of the Society, April 22–24, 1937.

Franklin, Benjamin. La belle et la mauvaise jambe. (Passy imprint)

Material, manuscript and printed, pertaining to André Michaux and his son, François André Michaux.

Selections from the Bache Collection of Franklin Papers: Letters from Benjamin Mecom; Jane Mecom; Elizabeth Franklin; Mary Hewson; "Caty" Greene; Grace Williams; William Bache; Elizabeth Bache; Jonathan Williams; Elizabeth Partridge; Samuel Franklin; Jane Collas; Richard Bache; Sally Franklin Bache; Sally Franklin; William Franklin; Benjamin Franklin; Deborah Franklin; Abiah Franklin.

Exhibition in Celebration of the Constitutional Convention, May–September, 1937.

Adams, John. Defence of the constitutions of government of the United States. 1787–88.

Carroll, Daniel. Letter from Daniel Carroll to

Benjamin Franklin, dated Annapolis, December 2, 1787. (Manuscript)

Citizen of America [Noah Webster, Jr.]. Examination into . . . the Federal Constitution . . . 1787.

The Federalist . . . [written by Alexander Hamilton and others]. Vol. 1, 1788.

[Jay, John.] An address to the people of the state of New York, on the subject of the Constitution, agreed upon at Philadelphia, the 17th of September, 1787. [1788.]

Livingston, William. Letter from William Livingston to Benjamin Franklin, dated Elizabeth Town, January 9, 1788. [New Jersey ratifies the Federal Constitution]. (Manuscript)

[Nicholson, John.] A view of the proposed Constitution of the United States . . . 1787.

U. S. Constitutional Convention. Constitution of the United States with letter of the Convention, 1787.

Autumn General Meeting of the Society, November 26–27, 1937.

Material relative to the United States Exploring Expedition to the South Seas, commanded by Charles Wilkes, consisting chiefly of correspondence between Mahlon Dickerson, Secretary of the Navy and Peter S. DuPonceau, President of the American Philosophical Society, 1836. (Manuscript)

Maps and Palmer's log, as illustrative of the paper given by Col. Lawrence Martin, Chief of the Division of Maps and Incumbent Chair of Geography, Library of Congress.

On the Occasion of the Annual Meeting of the American Historical Association and the Societies gathering concurrently, December 27–31, 1937.

Exhibition of manuscript and printed documents, chiefly Americana, selected from the archives and manuscript collections of the American Philosophical Society. (For specific items the reader is referred to the *Catalogue of Manuscript and Printed Documents Chiefly Americana Selected from the Archives and Manuscript Collections of The American Philosophical Society Held at Philadelphia for Promoting Useful Knowledge, and placed upon exhibition in the Library of the Society, December 28–31, 1937, on the occasion of the Annual Meeting of the American Historical Association and the Societies gathering concurrently. Philadelphia, American Philosophical Society, 1937.*)

Staff of the Library.

The Library staff comprises Miss Laura E. Hanson, *Librarian*, Mrs. Gertrude D. Hess, Mrs. Ruth A. Duncan, and Miss Elizabeth S. Dunlop. Dr. Alban W. Hoopes is engaged as the Chairman's assistant, and Mrs. Carolyn Rugh for special work in the restoration of the manuscripts, etc.

Laura E. Hanson, *Librarian.*

II. Report of the Chairman of the Committee on the Library

The Library Committee: Personnel, Meetings and Policy.

Regular meetings of the Committee were held on March 17, May 19, October 20, and December 15, 1937. Of these four meetings the last two were convened at two o'clock instead of half after three as formerly. The time thus added has permitted greater opportunity for discussion and has contributed to the more efficient dispatch of business.

The membership of the Committee consists of St. George L. Sioussat, *Chairman*, George A. Barton, Rhys

Carpenter, Waldo G. Leland, William E. Lingelbach, Horace C. Richards, Harlow Shapley, Rodney H. True and Roland S. Morris, *President;* Edwin G. Conklin, *Executive Officer,* sits with the Committee. Dr. George A. Barton expressed a wish to resign from the Committee on account of his intended absence from Philadelphia, but yielded to the unanimous request of the Committee and consented to serve. Though absent, he has given valuable counsel.

The general policy of the Committee as outlined in last year's REPORT has remained unchanged.

In the course of its routine business the Committee has recommended the acquisition of additional space for the Library, an addition to the staff, a change in the stipend of one assistant, and the carrying into the budget of the succeeding year of the accumulated income of the Balch, Michaux, and Phillips funds, as well as that of the "books and binding" appropriation. The Committee has also approved the removal of various portraits from the Library rooms to the Society's Building. It has raised the question of the need of greater provision for fireproof vaults, in view of the fact that the present vaults, so called, are becoming greatly congested. The work of revising the exchange list has made progress. Action has been taken to request various persons to represent the Library at the meetings of several associations.

At the request of the Committee one of its members, Professor Rhys Carpenter, made a special study of the status of the Library and of its needs in the field of Archaeology. Another valuable part of the Library's possessions has to do with the history, archaeology and linguistics of Mexico: our acquisitions in this field go back for more than a hundred years, to the days when Joel R. Poinsett was the first American minister to that country. In relation to our Mexican books and manuscripts certain important questions have been presented to the Committee, and the Committee has sought and received the expert advice of Dr.

Arthur P. Whitaker, Professor of Latin-American History at the University of Pennsylvania.

The Union Catalogue.

The Union Library Catalogue of the Philadelphia Metropolitan Area, to which the American Philosophical Society has contributed generously, is now actively functioning. To the staff of the Library it is proving to be of increasing value. This is demonstrated particularly whenever the desirability of purchasing printed works comes up. Instead of a painful search through the catalogues of three or four of the main libraries in the city, a few minutes consultation of the Union Catalogue determines whether a copy of the book in question is to be found in this region, and if so, in which library or libraries one may consult it. It is greatly to be hoped that in a similar way some method may be discovered for the exchange among libraries of the accessions and purchase lists of books recently published or about to be published. If this can be carried out it will result in a great economy for all libraries.

The Papers of Elihu Thomson.

Among the outstanding events of this year has been the presentation to the Society of the personal papers of the late Elihu Thomson, D.Sc., LL.D. Dr. Thomson (March 29, 1853–March 13, 1937), Vice-President from 1928 to 1934, was at the time of his death the senior member of the Society. Born in England, he acquired his education in Philadelphia at the Central High School, in whose faculty he later became professor of Chemistry and Mathematics. His distinguished attainments in the field of Science, especially that of Applied Electricity, won him international fame; and his long life spanned much of that period in which electrical invention, to which he himself in great part contributed, accomplished its greatest service to hu-

manity. In his later years his work was closely identified with that of the General Electric Company.

Through the interested assistance of President Roland S. Morris, Mrs. Thomson and Dr. Thomson's sons have graciously presented to the Library of the Society the large body of Dr. Thomson's papers, which afford material not only for a better knowledge of the great scientist and his inventions but also for the history of the development of knowledge in this field. These papers have been supplemented by papers from the files of the General Electric Company through the courtesy of Mr. Owen D. Young and the executive officers of the Company. It is hardly too much to draw a parallel between the length and depth of Dr. Thomson's life-work and its results in our own time, and those of Benjamin Franklin's activity in the earlier, eighteenth century, stages of the study of electricity.

The Thomson Papers are still in process of arrangement, and therefore at the present are not available for general use. A suggestion as to the extent and character of the collection has been given in the report by the Librarian above.

The Bache Collection.

To the progress made in the repair, photographing and calendaring of the manuscripts in the Bache Collection of Franklin Papers, the Librarian has referred in her part of this REPORT. The Chairman of the Library Committee has continued his work preparatory to a descriptive account of these papers. He has sought material in the Harvard College Library, the Library of Yale University, the New York Public Library, and the Library of Congress. He has received much assistance in the investigation from Mr. Franklin Bache, Mr. George Simpson Eddy, and Mr. J. Bennett Nolan.

In three visits to the Harvard College Library the Chairman has gone over the correspondence and diaries of Jared Sparks, the historian, sometime President of Har-

vard. In addition to his other services to American history, Mr. Sparks edited the writings both of George Washington and of Benjamin Franklin. Throughout a long life of scholarly activity he came often to Philadelphia and to the Hall of the American Philosophical Society, and was ultimately elected to be a member of the Society. Benjamin Franklin in his last will among other legacies bequeathed to his grandson, William Temple Franklin, his vast body of papers. When Temple Franklin departed for Europe after the death of his grandfather he left behind in Philadelphia, perhaps unintentionally, a large part of these papers. This part came into the hands of George Fox, the friend and advisor of Temple Franklin, who, in his will left the ownership thereof to Mr. Fox. It was Jared Sparks who rediscovered and first used this material, and, in 1840, partly through the suggestion of John Vaughan and more particularly through the good offices of Mr. Sparks, the American Philosophical Society received from Mr. Fox's heirs the gift of the main collection of the Franklin Papers. It has been the Chairman's endeavor to retrace the history of the activity of Mr. Sparks. Very helpful in this task has been the kind permission given by the Harvard College Library to secure microfilm copies of much of the Sparks correspondence and journals mentioned above. Nearly a thousand such "frames" are now in the possession of the Society, and, as they are gradually read and copied, these throw much light on the history of the Society and on that of the Franklin Papers. All this is a necessary preliminary to the account of the Bache Collection which is in course of preparation and in which it will be attempted properly to relate this last acquisition of the Society to the other great bodies of Franklin manuscripts.

The Microfilm Equipment.

It is a source of satisfaction to be able to report that, after long delay, the Library is now equipped with a mod-

ern microfilming apparatus. In July 1937 was delivered a Graflex Photorecord Camera made by the Folmer Graflex Corporation, Rochester, New York, and also one Enlarg-or-Printer, together with an extension top, made by the same firm. Later were acquired one S. V. E. Picturol Projector, Model CC, manufactured by the Society for Visual Education, Inc., Chicago, Illinois, and one Da-Lite Screen, made by the Da-Lite Screen Company, Chicago, Illinois. The camera makes microfilms on a thirty-five mm. film and is operated, together with an electric lighting system, by a pneumatic process worked with a foot pedal. The films used are maintained to be non-inflammable and non-explosive and of great durability. With the additional equipment the microfilm photograph may be thrown upon a screen and enlarged to be read in white-on-black, or an enlarged positive can be made for permanent preservation.

The management of this part of the activities of the Library has been in the hands of Dr. A. W. Hoopes. He has received, besides instruction from the demonstrator of the Folmer Graflex Company, efficient cooperation, assistance and advice from the staffs of the Historical Society of Pennsylvania, the Union Catalogue, and the University of Pennsylvania Library.

While most of the developing and printing was at first put in the hands of commercial firms, it became manifest that time and energy could be saved if the Library were provided with a dark room. Experimentation showed that the old building was not suitable for such equipment; but recently, with the cooperation of the authorities of the Drexel Building, a dark room, fully equipped, has been established at moderate expense in one of the rooms of the Library suite in the Drexel Building. This will soon be in operation.

Although the work is still in an experimental stage, some orders from the outside have been filled. But the best use of the camera has been and will continue to be within the Library itself. Already it has been found ad-

visable to photograph some of the papers in the Bache collection before these have been washed or repaired. One important letter that was loaned to the Society has been copied and enlarged. Copies will be made of similar material in connection with the Elihu Thomson Papers. The projector and screen are being used for reading the microfilm photographs made for the Library by the Harvard College Library, to which reference was made above.

In installing this equipment the Library is participating in a movement of wide extent, which has received its inspiration in part from the experimentation in Washington of various government agencies, notably the Library of Congress, the National Archives, and the Department of Agriculture. In Philadelphia, partly through the fact that the microfilming process was largely used in connection with the Union Catalogue and also because of the pioneering work carried on at the Historical Society of Pennsylvania, a local group has been formed of those interested in the possibilities of microphotography.

On September 29, 1937, there was held in the Franklin Institute a meeting of this group. In the course of this, Dr. Hoopes and Mr. Philip Sadtler briefly explained the history of microphotography and proceeded to an actual demonstration of the entire process. On the stage several microfilms of documents were made, then developed, and the finished product run through the projector. Some of the microfilm photographs were enlarged and the enlargements developed and printed and shown to the audience. It is hoped that this and similar meetings will do much to popularize microphotography.

The Library Committee wishes to point out that in addition to the use of this equipment for the purposes of the Library itself, it may be advantageously employed in the interest of any member who desires microfilm copies of any of the materials, whether in manuscript or printed form, in the Library. Anyone, for example, who wishes a copy of an article in a rare American or European journal may

have made, at small expense, a microfilm which he may keep permanently, instead of having a bulky volume sent by inter-library loan with the risk of loss.

The Archives of the Society.

Interrupted many times, the work of separating, arranging and filing the archival papers of the Society, of which a description will be found in the last REPORT, has been resumed and steadfastly continued. A goal set partway, at the year 1825, has been practically attained; and progress is being made for the later period. This investigation has resulted in the discovery of the need of much repair. Letters and reports of high value have been found to be so bound and folded as to imperil the existence of the documents. The work of repair and preservation against future damage is very slow but must be continued. One further consequence of this investigation has been the discovery of many papers, mixed in with the archives, which properly belong to the manuscript collections of the Society. These gradually are being transferred.

Exhibitions.

In the Librarian's part of this report mention has been made of various exhibitions which the Library has held from time to time. The Chairman will comment a little more fully upon the most ambitious attempt of this sort, that set up in the latter part of December.

The American Historical Association, together with several learned societies gathering concurrently, held its annual meeting in Philadelphia December 29–31, 1937. The American Philosophical Society acted as host to the visiting societies for an entire afternoon. By permission of his Honor, the Mayor, a session for addresses was held in Independence and Congress Halls, after which the visitors were entertained at tea in the Society's Building. It was the design of the Library Committee to present to the distinguished visitors a truly representative exhibit illustrative of the wealth of the Americana in the Society's Li-

brary. To this end considerable preparation was necessary. Happily the management of the Drexel Building found it possible to allow the Library Committee to make temporary use of the additional rooms to which reference has been made in the Librarian's report. Part of the funds appropriated by the Society and the Council for the Sesquicentennial Celebration of the Constitution was allocated to the Library's exhibit. Arrangements were made for a special guard over the Society's books and manuscripts during the time when these were upon display. With the most helpful spirit of cooperation Mr. Franklin H. Price, Librarian of the Free Library of Philadelphia, loaned to our Society eight double exhibition cases of a modern type. Similar offers of assistance were made by Dr. Fiske Kimball of the Pennsylvania Museum of Art and by Mr. Julian P. Boyd of the Historical Society of Pennsylvania; but these it was not necessary to accept. To all these the Chairman begs to express the Committee's sincere thanks. He feels no less bound to record an expression of very real appreciation of the devoted labor of the staff of the Library, both in the selection of the materials for exhibit, the preparation of the catalogue, and the constant attention to the numerous visitors who took part of their busy days to see and enjoy the manuscripts and books displayed.

Some Notes on the Library's Americana.

The Chairman thinks it may be of interest to the members to record the following illustrations of matters taken up in the routine of the Library during the past year, which go to prove the value of our Americana.

1. Mr. George Simpson Eddy of New York was kind enough to point out that in a recent catalogue the price set for the volume, *A Narrative of the Aerial Voyages of Doctor Jeffries with Mons. Blanchard*, London, 1786, was five thousand dollars. This copy was enhanced in value, no doubt, by reason of the fact that it was once in the library of George Wash-

ington. But it is interesting to note that another copy of this work, in which is inlaid a letter from Dr. Jeffries presenting the volume to Benjamin Franklin, is the property of our Society. It was purchased for the Society at the Dufief sale in Philadelphia in March 1803, for the sum of *one dollar*. This may afford a lesson as to the increasing value of old books.

2. Upon Mr. Eddy's advice the Society bought three volumes upon scientific subjects which were once in the personal possession of Dr. Franklin and constituted part of his library. They contain manuscript tables of contents in the Doctor's own hand.
3. Very fortunately there were discovered among the uncatalogued medical books of the Society four similar volumes, in this case made up of pamphlets upon medicine, which likewise belonged to Franklin's own library and have tables of contents written by him or by his secretary, William Temple Franklin. This discovery would seem to justify the Committee in its belief that the Library should be highly conservative in disposing of its old medical volumes.
4. Among our duplicate volumes there was found a copy of the first volume of the Society's *Transactions* upon the title page of which Dr. Franklin in his own hand had written the following sentence, "Proposed and Set on foot, 1744 by B. F.—dormant some years: resumed in 1768—united to a new one 1769."
5. From the Franklin papers in the Library of Congress the Library has secured a photostatic copy of a very rare printed document. This is a letter drafted by Franklin's grandson, William Temple Franklin, supporting his application in 1789 for a diplomatic appointment under President Washington.
6. Reminding us of the relative poverty of the Society in the early years is a letter, acquired by purchase, in which is found an indication, entirely supported

by the Minutes of the Society, that in December 1845 there was danger of a sale of the books in the Library by the Sheriff to satisfy an unpaid obligation of the Society. Happily, by voluntary contribution a sufficient sum was raised and the Library was saved.

St. George L. Sioussat, *Chairman.*

4. REPORT OF THE COMMITTEE ON PUBLICATIONS

The Laws of the Society provide "that there shall be a *Committee on Publications*, consisting of the President, ex-officio, and of not fewer than six other members, representative of the four Classes, who shall serve for three years, and who shall be nominated by the President and elected by the Council" (Chap. V, Art. 8). While election to the Committee is for a three-year term there is no provision against the re-election or appointment of persons to fill out the terms of those who resign or cease to be members. The members of the Committee for 1937 and the dates of their first appointment under the old Laws, or election under the new, are as follows: Henry H. Donaldson,† *Chairman*, 1932; Cyrus Adler, 1932; Frank Aydelotte, 1936; Edwin G. Conklin, 1932; John A. Miller, 1925; Oswald Veblen, 1936; James T. Young, 1933, Roland S. Morris, *President*, and Arthur W. Goodspeed, *Editor*.

The Committee held five meetings during the year, namely, on February 12, April 9, June 11, October 4, December 14, and a special meeting on May 26, and accepted for publication in the

Proceedings	31 papers
Transactions	1 monograph
Memoirs	1 monograph

During the year the following papers were published:

Transactions:

Volume xxviii, Pt. 2—William B. Scott and Glenn L. Jepsen. The Mammalian Fauna of the White River Oligocene. *Rodentia* by Albert E. Wood. 115 pp. 11 pls. 69 figs.

Volume xxx. W. D. Matthew. Paleocene Faunas of the San Juan Basin, New Mexico. 510 pp. 65 pls.

Proceedings:

Volume 76, No. 6. February, 1937.

Charles E. Allen and Elizabeth Mackay. The Offspring of a Triploid Sporophyte. pp. 781–790.

† Deceased January 23, 1938.

Edward L. Thorndike. Trains of Thought. pp. 417–438.
Edward L. Thorndike. Trains of Thought as Symptoms of Interests and Attitudes: An Exploratory Investigation. pp. 439–445.

No. 4. April, 1937.

W. M. Stanley. Some Biochemical Investigations on the Crystalline Tobacco-Mosaic Virus Proteins. pp. 447–454. 1 pl.
Ralph W. G. Wyckoff. The Ultracentrifugal Study of Virus Proteins. pp. 455–462. 3 pls.
Stuart Mudd, E. J. Czarnetzky, Horace Pettit and David Lackman. Labile Bacterial Antigens and Methods for Their Preparation and Preservation. pp. 463–466.
Yale Kneeland, Jr. Filterable Viruses in Upper Respiratory Infection. pp. 467–471.
George Packer Berry. The Transformation of the Virus of Rabbit Fibroma (Shope) Into That of Infectious Myxomatosis (Sanarelli). pp. 473–476.
Ralph E. Cleland. Species Relationships in *Onagra*. pp. 477–542. 2 pls.
M. B. Emeneau. The Songs of the Todas. pp. 543–560.
Joint Meeting of the American Philosophical Society with Representatives of Foundations, Societies, Universities, and Institutions Administering Funds in Aid of Research. pp. 561–620.
Edwin G. Conklin. Report of the Committee on Research, April, 1936, to April, 1937. pp. 621–629.

Volume 78, No. 1. October, 1937.

E. C. Case. The Brain and Skull of a Paleoniscid Fish from the Pennsylvanian of Western Missouri. pp. 1–10. 2 pls.
Robley D. Evans. Quantum-Counter Amplifiers for Gamma Ray Detection, and Applications to Studies in Radium Poisoning. pp. 11–21.
F. K. Sparrow, Jr. Some Chytridiaceous Inhabitants of Submerged Insect Exuviæ. pp. 23–60. 4 pls.
C. B. Davenport. Postnatal Growth of the External Nose. pp. 61–77.
Aleš Hrdlička. Human Typogeny. pp. 79–95. 5 pls.
William Trelease. A Mexican Puzzle (*Yucca Howard-Smithii*). pp. 97–99. 3 pls.
Francis G. Benedict. Race: A Factor in Human Metabolism. pp. 101–110.
E. D. Merrill. On the Significance of Certain Oriental Plant Names in Relation to Introduced Species. pp. 111–146.

Alan Mozley. A Biological Study of the Sub-Arctic Mollusca. pp. 147–189. 2 pls.

E. P. Adams. The Distribution of Electricity on Two Cylinders. pp. 191–243.

No. 2. December, 1937.

E. P. Adams. Electrostatic Problems Connected with Thick Cylindrical Shells. pp. 245–270.

E. P. Adams. The Resistance of Cylindrical Conductors at High Frequencies. pp. 271–285.

Harrison S. Morris. Illusions. pp. 287–290.

Glenn L. Jepsen. A paleocene Rodent, *Paramys atavus*. pp. 291–301. 1 pl.

Leo George Hertlein. A Note on Some Species of Marine Mollusks Occurring in Both Polynesia and the Western Americas. pp. 303–312. 1 pl.

Rodney H. True. François André Michaux, the Botanist and Explorer. pp. 313–327.

Vladimir J. Fewkes. Neolithic Sites in the Yugoslavian Portion of the Lower Danubian Valley. pp. 329–402. 8 pls.

Ernest Glen Wever and Charles W. Bray. A Comparative Study of the Electrical Responses of the Ear. pp. 407–410.

Harlan True Stetson. Correlation of Frequencies of Seismic Disturbances with the Hour Angle of the Moon. pp. 411–424.

INDEX, Proceedings, Volumes 51–75. 71 pp. December, 1937.

MEMOIRS:

Volume VI. Daniel S. Davidson. Snowshoes. 207 pp. 67 figs. March, 1937.

Volume VII. Frank G. Speck. Oklahoma Delaware Ceremonies, Feasts and Dances. 161 pp. 4 pls. 5 figs. March, 1937.

Volume VIII. Santiago Ramón y Cajal. Recollections of My Life. Translated by E. Horne Craigie. (In 2 pts.) 638 pp. 21 pls. 80 figs. April, 1937.

LIST OF MEMBERS, 54 pp. November, 1937.

At the General Meeting of the Society on April 24 representatives of each Class of Members met separately to consider the publication needs of each Class. Later on the same day the more or less divergent conclusions of these groups were reported to the Society in executive session and a Special Committee of Inquiry on the Publications of the Society was appointed to consider the proposals of the different Classes and to formulate a general policy on

publication to be presented to the Society. This Special Committee consisted of the Chairmen of the four Class meetings, namely, W. F. G. Swann, C. B. Davenport, St. George L. Sioussat, Frank Aydelotte, the Chairman of the Standing Committee on Publications, Henry H. Donaldson, and the Executive Vice-president, Edwin G. Conklin. This Special Committee met on October 13 and November 10 and approved the following recommendation:

The Society should publish hereafter a Year Book for each calendar year as soon as possible after the close of the year. This should contain, among other items, the Charter and Laws, lists of Officers and Committees, the President's annual report, important acts of the Society and Council, reports of all standing Committees, catalogue of prizes, premiums and lectureships, lists of all members together with those elected and those deceased during the year, and obituaries of deceased members. In the reports of the standing Committees should be included under "Meetings" the programs of all stated, special and occasional meetings; under "Hall" all improvements and alterations in the property; under "Library" news of accessions, special collections and policy for the future; under "Publications" the output of the year, editorial supervision, distribution, etc.; under "Research" the grants made together with results of previous grants in the form of brief abstracts and bibliographies; under "Finance" a list of all funds and their investments together with bequests and gifts of the year, income and expenditures of the year, and an historic list of the principal benefactors of the Society. Such a Year Book will bring together in one place reports, notices, accounts of the present state of the Society and its activities which have heretofore been published in separate pamphlets or have been scattered through the Proceedings; the latter can then be devoted exclusively to scholarly work. This was unanimously approved by the Committee on Publication on No-

vember 26 and by the Society at its Executive Session on November 27.

The Special Committee also discussed the following proposals, without reaching unanimous agreement or making specific recommendations:

1. Greater editorial supervision should be provided by the appointment of an editor or editors for each Class, with such secretarial assistance as this editorial work requires.
2. The TRANSACTIONS and MEMOIRS should be continued substantially as at present for monographs and extensive contributions, each number to be issued separately and distributed selectively to appropriate institutions and individuals.
3. If the PROCEEDINGS is to be continued as at present for contributions from all fields and for symposia and summaries of a general nature it is felt by some members of the Committee that another series for highly specialized or technical articles should be established first in Class I and later in the other Classes, if this should be desired.

HENRY H. DONALDSON,† *Chairman*

† Deceased January 23, 1938.

5. REPORT OF THE COMMITTEE ON RESEARCH

Previous reports of this Committee have appeared in the PROCEEDINGS, Vol. 76, No. 3, pp. 379–389, and Vol. 77, No. 4, pp. 621–629, covering the period from the General Meeting in April 1933 to that of April 1937. With the establishment of the YEAR BOOK the reports of this and of other committees will hereafter cover the calendar year from January 1 to December 31 of each year. This report, therefore, runs from January 1 to December 31, 1937.

The Laws (Chap. V, Art. 4) specify that the Committee on Research shall consist of the President, *ex officio*, and of not fewer than six other members, representative of the four classes, who shall serve for three years and who shall be nominated by the President and elected by the Council. In practice it has been found desirable to have more than six elected members in order to obtain wider representation of subjects. While regular election to the Committee is for a term of three years several persons so elected have found it necessary to resign and others have been appointed to fill out their terms. There is no provision in the Laws forbidding re-election and when a member has proved his efficiency he has sometimes been continued.

The Committee at present consists of the following persons: Edwin G. Conklin, *Chairman,* William F. Albright, Arthur F. Buddington, Alfred V. Kidder, John A. Miller, Alfred N. Richards, W. F. G. Swann, Hugh S. Taylor and Roland S. Morris, *President.*

The Committee meets on alternate months from October to June. During the year 1937 there have been five scheduled meetings, namely on February 12, April 9, June 4, October 8 and December 10. All applications and supporting letters are manifolded and sent to the members of the Committee ten days in advance of the meeting; in many cases members consult by correspondence or in person with ap-

plicants, or with persons conversant with the applicants or their projects. This work requires considerable time and labor and it has been done faithfully and without compensation.

In the five meetings of the year 122 applications have been considered for a total sum of $305,467.07 and 74 grants were made of a total sum of $76,245.00 as follows:

1937, February 12

Grant No. 127—James A. G. Rehn, Academy of Natural Sciences of Philadelphia, for distributional investigation of the Orthoptera occurring in certain areas of New Mexico, Arizona, Nevada and California 500

Grant No. 128—Alexander Weinstein, Columbia University, for a mathematical study of multiple-strand crossing-over and coincidence in the chromosomes of Drosophila 1,500

Grant No. 129—F. B. Isely, Trinity University, Texas, for the study of the ecology of Orthopterous insects 600

Grant No. 130—Hertha Sponer, Duke University, for investigation of absorption spectra of polyatomic molecules, especially in the photographic infra-red 800

Grant No. 131—Karl F. Herzfeld, Catholic University of America, for theoretical investigation of the absorption spectra of organic compounds 1,200

Grant No. 132—William Bell Dinsmoor, Columbia University, for a detailed study of the history, design, decoration and construction of the architectural monuments of ancient Greece in the age of Pericles 1,500

Grant No. 133—Anna R. Whiting, University of Pennsylvania, for a study of genetically different eye and body colors in mosaic males of Habrobracon juglandis (Ashmead) 500

Grant No. 134—Ralph E. Cleland, Goucher College, for the continuation of a joint study of the cyto-genetics and phylogeny of Œnothera (Onagra), the evening primrose (fourth grant) 1,500

Grant No. 135—Rudolf Höber, University of Pennsylvania, for equipment needed in the study of characteristic effects of organic ions on the secretory power of the isolated perfused liver (second grant) 300

Grant No. 136—Albert T. Volwiler, Ohio University, for the preparation for publication of the correspondence between President Benjamin Harrison and James G. Blaine, his Secretary of State. 1,000

Grant No. 137—Enos E. Witmer, University of Pennsylvania, for continuation of the tabulation and study of the energy levels of the asymmetrical rotator (second grant) 500

1937, April 9.

Grant No. 138—Alexander Goetz, California Institute of Technology, for assistance in connection with the investigation of the nature

of phase-transitions of small particles of simple substances down to colloidal sizes with special regard to the size dependence of such transitions 1,000

Grant No. 139—Gerhard Herzberg, University of Saskatchewan, for special apparatus for the investigation of the solar spectrum in the photographic infra-red 1,300

Grant No. 140—E. J. Workman and R. E. Holzer, University of New Mexico, for the correlation of electrical measurements on thunderstorms with simultaneous photographic measurements for the purpose of analyzing the mechanism of propagation of a lightning flash and studying the electrical structure of thunderstorms 750

Grant No. 141—P. W. Selwood, Northwestern University, for a comprehensive development of magneto-chemistry including the determination of equilibrium constants and activation energies of organic free radical association reactions, continued work on the magnetic properties of rare earth compounds, study of odd-electron molecules, study of the magnetic characteristics of adsorbed gases and their possible relation to contact catalysis ... 500

Grant No. 142—Lester William Strock, University of Oslo, for the study of the geochemical distribution of the chemical elements by means of quantitative spectrum analysis 600

Grant No. 143—John H. Davis, Jr., Southwestern College, Tennessee, for the study of land building as influenced by mangrove vegetation in south Florida and adjacent waters; the geologic role of mangroves 350

Grant No. 144—Albert Tyler, California Institute of Technology, for investigation of the action of various metabolic stimulants and depressants on the rate of respiration and development of eggs of marine animals (second grant) 300

Grant No. 145—William R. Amberson, University of Tennessee, for the study of the behavior of the mammalian body when its normal blood colloids are replaced by gum acacia; the determination of the inter-relationships between the various colloids in the blood stream during the period of recovery from "total plasmapheresis" (second grant) 250

Grant No. 146—Alfred Chanutin, University of Virginia, for the study of renal insufficiency as produced by partial nephrectomy. 1,000

Grant No. 147—Judson Daland, President Philadelphia Institute for Medical Research, for the continuation of studies, through succeeding generations, of the role of the thymus in the rate of growth and development of the young (third grant) 2,000

Grant No. 148—Rudolf Höber, University of Pennsylvania, for investigation on the isolated surviving liver, which organic substances are appropriate to promote, and which to diminish the normally existing secretory power of the liver with respect to the bile-pigments and other dye-stuffs (third grant) 1,200

Grant No. 149—Frederick Edward Brasch, Library of Congress, for the study of (1) the history and progress of scientific thought

in the American colonies, 1636–1783, (2) the rationalizing influence of the Royal Society and Sir Isaac Newton, (3) centering in the lives of John Winthrop (1714–79) and David Rittenhouse (1732–96) 600

Grant No. 150—W. Norman Brown, University of Pennsylvania, for archaeological excavation at the prehistoric (3d millennium B.C.) site, Chanhu-daro, Nawabshah District, Sind, India 3,000

Grant No. 151—The University Museum, University of Pennsylvania, for the seventh field season of the Museum's excavations at Piedras Negras, Guatamala 3,000

Grant No. 152—Alfred J. Swan, Swarthmore College, for the permanent preservation of wedding rite and folk-songs in the ancient Russian district of "Pechory" now in Esthonia 250

1937, June 4.

Grant No. 153—D. H. Wenrich, University of Pennsylvania, for continuation of the study of nuclear and other variations in the parasitic amoebae of man (third grant) 500

Grant No. 154—Horace G. Richards, New Jersey State Museum, for the collection and study of the land mollusks of the Island of Roatan, Honduras, with special attention to the bearing of this fauna on problems of paleogeography 200

Grant No. 155—Edward Girden, Brooklyn College, for the study of the relationship between bone-conduction and air-borne waves in the auditory acuity of dogs, and the effect of cortical extirpation upon these functions 350

Grant No. 156—T. M. N. Lewis, University of Tennessee, for archaeological field research in Tennessee 1,000

Grant No. 157—Edward Horne Craigie, University of Toronto, for the study of vascularity in the brains of amphibians and reptiles .. 225

Grant No. 158—George Kreezer, The Training School at Vineland, New Jersey, for the determination of the properties of the human electro-encephalogram at different levels of intelligence and for different types of mental deficiency 500

Grant No. 159—Marie Channing Linthicum, Salem College, West Virginia, for investigation of the history of the costuming of allegorical, symbolic and type characters on the English stage 400

Grant No. 160—Elsa Guerdrum Allen, Cornell University, for the study of the history of American ornithology before Audubon (second grant) 400

Grant No. 161—V. M. Slipher, Lowell Observatory, for completing the systematic search of the wide ecliptic belt of the sky for more distant planetary members of the solar system (second grant) 2,000

Grant No. 162—Arthur E. Ruark, University of North Carolina, for cloud chamber studies of positron-electron pairs 1,250

Grant No. 163—Edward Sapir, Yale University, to obtain supplementary text material in Navaho 300

Grant No. 164—Gabriel Bonno, University of California, for the study of the intellectual relations between Great Britain and France from 1715 to 1735 750

Grant No. 165—James A. Geary, Catholic University of America, for a field study of the phonology and inflexions of Algonkin and related Algonquian dialects in Quebec and Ontario 400

Grant No. 166—Edward B. Logan, University of Pennsylvania, for the study of the Direct Primary System in Pennsylvania 1,000

Grant No. 167—Norman John Berrill, McGill University, for the study of the histology of growth in post-embryonic development, with special reference to the origin of new types of tissue, tissue repair, and regeneration 1,100

Grant No. 168—Moravian Seminary and College for Women, Bethlehem, Pennsylvania, for research in Moravian music manuscripts located at Bethlehem, Pa., leading to a complete and authoritative catalogue of the material and an historical monograph summarizing the findings of the study 2,000

Grant No. 169—Carl C. Lindegren, University of Southern California, for the study of the mechanism of crossing-over in the regions distal to the spindle-fiber-attachment in the chromosomes of Neurospora crassa 500

Grant No. 170—Hellmut deTerra, Academy of Natural Sciences of Philadelphia, for an archaeological survey in Upper Burma 2,500

Grant No. 171—Henry L. Savage, Princeton University, for the investigation of the background of the Middle English poem *Sir Gawain and the Green Knight* 400

Grant No. 172—Winona Welch, DePauw University, for the completion of a monographic study of the Fontinalaceae of the world 800

1937, October 8.

Grant No. 173—Davenport Hooker, University of Pittsburgh, for functional and morphological studies of human prenatal development (second grant) 2,500

Grant No. 174—Edward W. Berry, Johns Hopkins University, for the completion of papers on Upper Cretaceous and Paleocene floras from Patagonia and from two horizons on the Island of Trinidad, B. W. I. 100

Grant No. 175—Millar Burrows, Yale University, for preliminary excavations at Tell el-Kheliefeh, a small mound in southern Transjordan, just outside Aqabah 900

Grant No. 176—Elmer D. Merrill, Harvard University, for a taxonomic and phytogeographic consideration of the Bornean species of Eugenia 750

Grant No. 177—Union Library Catalogue of the Philadelphia Metropolitan Area for the years 1938, 1939 and 1940. $2,000 each year (continued grant) 2,000

Grant No. 178—Tracy M. Sonneborn, Johns Hopkins University, for the study of sex, sex inheritance and sex determination in ciliate protozoa 720

Grant No. 179—Rudolf Höber, University of Pennsylvania, for investigations concerning intestinal absorption in mammals, influence of organic substances upon the resting potential of muscles and nerves and upon contractility of muscles, secretion of the isolated liver (fourth grant) 2,000

Grant No. 180—F. J. M. Sichel, University of Vermont, for the study of the excitation properties of the contractile mechanism in skeletal muscle 600

Grant No. 181—Mary Butler, University Museum, University of Pennsylvania, for the study of Maya archaeological material, chiefly pottery, from the Chamá district of the highlands of Guatemala 1,800

Grant No. 182—Carl Bachman and D. Wright Wilson, University of Pennsylvania, for a cooperative study of sex hormones: (a) Purification, chemical, and biological study of pregnancy prolan; (b) Study of the quantitative metabolism of œstrogenic hormones and pregnandiol in normal and pathologic pregnancy. 2,400

Grant No. 183—Fred E. D'Amour, University of Denver, for the determination of the time of ovulation in normal women by analysis of the urine for gonadotropic hormone 1,000

Grant No. 184—F. K. Richtmyer, Cornell University, for the study of double ionization of inner electron shells of atoms 1,800

Grant No. 185—Eliot R. Clark, University of Pennsylvania, for the study of living cells and tissues in the living mammal with aid of artificially installed transparent windows and chambers 2,500

Grant No. 186—Ruth B. Howland, New York University, for the continuation of the study of reciprocal transfers of imaginal discs between Drosophila larvae (third grant) 250

1937, December 10.

Grant No. 187—Samuel O. Mast, Johns Hopkins University, for the study of the structure, function and origin of cytoplasmic constituents, with special reference to the granules, vacuoles and crystals in the cytoplasms of amoeba and their bearing on the transformation of energy in amoeboid movement 2,000

Grant No. 188—Frank Morton Carpenter, Harvard University, for the study of the types of carboniferous insects from the Commentary shales contained in the Natural History Museum at Paris and in the Museum at Lille 300

Grant No. 189—William H. Hobbs, University of Michigan, for the study of the history of exploration within the American sector of the Antarctic 300

Grant No. 190—William B. Redmond, Emory University, Georgia, for the investigation of the correlation of the virulence of strains of malaria with the relative cross immunity produced in canaries 400

Grant No. 191—Allan C. G. Mitchell, New York University, for a study of the gamma rays from artificially radioactive sources—Measurement of their energy and determination of the emitter of the gamma ray (second grant) 1,000

Grant No. 192—Paul R. Leberman, University of Pennsylvania Hospital, for the study of the pathology of the human renal papilla. (a) Study of the gross pathology; (b) Study of the microscopic pathology; (c) Correlation of (a) and (b) with the clinical diagnosis of the patient before death 500

Grant No. 193—Daniel S. Davidson, University of Pennsylvania, for an investigation of native tribes and archaeological remains in

Western Australia with reference to continental, historical and ethnological problems ($3,000 a year for two years) 6,000

Grant No. 194—Edward Franklin Castetter, University of New Mexico, for a comparative study of primitive cultivated plants among the Indians of the American Southwest 1,000

Grant No. 195—Francis Harper, American Committee for International Wild Life Protection, for a detailed survey of the extinct and vanishing mammals of the world since the classical period (preliminary grant) 250

Grant No. 196—Tenney L. Davis, Massachusetts Institute of Technology, for the study of Chinese alchemy—particularly to increase our knowledge of ancient Chinese alchemy and of its relations to European alchemy 500

Grant No. 197—J. Rud Nielsen, University of Oklahoma, for the study of Raman spectra of simple compounds in different states of aggregation 500

Grant No. 198—Frank G. Dunnington, Rutgers University, for continuation of a precision determination of the ratio of Planck's constant to the charge on the electron (*i.e.*, of h/e) (third grant) 500

Grant No. 199—Curtis L. Newcombe, University of Maryland, for a physical, chemical and biological investigation of the layer of low oxygen content in the deeper waters of the Chesapeake Bay in the Solomons Island region 800

Grant No. 200—John T. Buchholz, University of Illinois, for the study of the effects of physiological treatment of plants and cut flowers on pollen-tube growth in interspecific pollinations between certain species of Datura 300

The distribution of these grants to various subjects is shown in the following table:

		Grants	Amount
Class I	Astronomy	2	$ 3,300
	Physics	9	8,550
	Chemistry	2	1,000
	Geochemistry	1	600
	Meteorology	1	750
Class II	Paleontology	3	600
	Geography	1	300
	Zoology	10	8,070
	Anatomy	2	5,000
	Botany	5	4,350
	Genetics	2	750
	Ecology	2	1,150
	Anthropology	1	6,000
	Psychology	2	850
	Physiology	10	11,050
	Pathology	1	500
	Neurology	1	225

(*continued*)

		Grants	Amount
Class III	Political Science	1	1,000
	History of Science	2	1,000
	American History	1	1,000
Class IV	Archaeology	7	13,700
	Languages	2	700
	Literature	2	1,150
	Costume and Drama	1	400
	Music	2	2,250
General	Union Library Catalogue of the Philadelphia Metropolitan Area for support during 1938, 1939 and 1940—($2,000 each year)	1	2,000
	Total	74	$76,245

The budget for 1937 assigned $50,000 for the support of research during the calendar year. At the time of the General Meeting in April it was evident that this sum would not be sufficient to meet the many important applications which were being made for aid in promoting research and on April 23 it was voted by the Society to recommend to the Committee on Finance that the research budget for the year be increased by the sum of $25,000 if this should be found possible and desirable. Accordingly the Committee on Finance at its meeting on May 4 approved that action. There was also an unexpended balance from the research appropriation for 1936 of $500.05 making a total sum of $75,500.05 (plus $4,019.03 in refunds) available for research for the year 1937. Of this sum $76,245.00 has been awarded in 74 grants during 1937 and two grants amounting to $3,500.00 were awarded in 1936 to be taken out of the appropriation for 1937, leaving a deficit of $225.92 to be taken out of the research budget for 1938.

The rules of the Committee specify that semi-annual reports of progress shall be made by recipients of grants. These are usually brief and are intended to keep the Committee informed. With the establishment of the Year Book it is proposed to publish a brief abstract and bibliography of work which has been supported by grants from

the Penrose Fund. On October 27, 1937, the following circular letter was sent to all recipients of grants:

The American Philosophical Society held at Philadelphia for Promoting Useful Knowledge is engaged in supporting research work in many fields through the distribution of grants-in-aid. These grants are in no sense gifts or charities but rather investments in men and projects, this being the only way in which an institution can engage in research.

It is important that recipients of grants should give credit to the Society in the publications of work which has been supported in whole or in part by such grants, and this is best done in the case of journal articles by a line or footnote following the title, such as "With the support of a grant from the Penrose Fund of the American Philosophical Society." In the case of books or monographs such acknowledgment could be made on the reverse of the title page or in a preface.

The American Philosophical Society will publish in its Year Book, to be issued hereafter at the close of each calendar year, a list of grants made during the year and a bibliography of publications which have resulted from grants. As no such bibliography has been issued hitherto the Year Book for 1937 will list under each grantee's name a brief abstract of work so far accomplished together with a list of all publications which have resulted from grants from the Penrose Fund since the beginning of such support in 1933. The Society also desires to keep in its records at least two reprints of every article or monograph that has resulted from such support.

You are, therefore, requested to send to the Society before January 1, 1938, for publication in its Year Book a brief abstract of the work which you have accomplished, together with the titles, place of publication, volume, inclusive pages and date of any and all articles which have resulted from your grant, and also two copies or reprints of each publication.

Some of these results have been published in our Proceedings but most have appeared in technical journals. Abstracts and lists of publications which will indicate the character and extent of the research work supported by the Society are appended to this report.

Edwin G. Conklin, *Chairman*

REPORTS OF PROGRESS TOGETHER WITH BIBLIOGRAPHIES OF WORK SUPPORTED BY GRANTS FROM THE PENROSE FUND

Thomas C. Poulter, Byrd Antarctic Expedition II

Grant No. 1 (1933). To make echo sounding equipments available for measuring depth of polar ice cap and discovering nature of its basic support.

Geophysical methods were employed in determining what was beneath the surface of the snow. A total of more than 500 soundings were made at about 135 stations. Two sets of seismic equipment were used for this purpose, one a Geophysical Research Corporation seismograph operated by Charles G. Morgan, and the other a Seismograph Service Corporation seismograph operated by Thomas C. Poulter.

1. Geophysical Research Corporation seismograph.

a. Morgan assisted by members of the Plateau Tractor Party occupied between 15 and 20 stations from latitude 78° and 82° S., and longitude 149° and 164° W. Refraction profiles gave velocities from 1,080 ft./sec. for freshly fallen light snow. Most of the stations were on the 4,000 foot plateau of Marie Byrd Land, and in some cases snow and ice depths of more than 2,000 feet were recorded.

2. Seismograph Service Corporation seismograph.

a. Poulter assisted by Black, Fleming, Moody or sometimes Ronne or Eilefsen, traveling on skiis and hauling the seismic equipment by dog team, occupied a series of 85 stations covering a radius of about 10 miles from Little America. A few stations were occupied as far as 20 miles from Little America. The velocity of sound in the barrier ice as measured over refraction profiles of more than a mile

was found to be 12,050 ft./sec., and 4,790 ft./sec. for the sea water below the ice.

b. The equipment was then mounted in the Condor plane and Poulter with Black or Fleming as assistant operator, and with June and McCormick as pilots, Rawson as navigator, Petersen as radio operator, and Pelter as aerial photographer, occupied eleven stations. One was near Little America, seven were on a radius of about 25 miles from Little America, one at Discovery Inlet, one at Advance Base, and one at the 75-mile-depot on the southern trail.

c. Poulter, Black, and Moody mounted the equipment on sleds and traveling on skiis and with dog teams occupied a line of 17 stations extending from Floyd Bennett Bay on the west side of the Bay of Whales parallel to the edge of the Barrier, past Lindberg Inlet to Discovery Inlet.

3. Of the total 135 seismic stations occupied, about 25 of them were on comparatively thin ice on which there was very little snow, about 20 were on high snow and ice grounded above or below sea level, and the remainder on thick snow and ice floating on water. All grounded stations are south and east of Little America, and perhaps three fourths of them are resting on rock which is above sea level. The stations vary in altitude from sea level to about 4,000 feet above. The thickness of the floating ice varies from 15 feet for Bay ice frozen in one winter to ice 1,500 feet thick, and the depth of the water under the ice varies from nothing to more than 2,000 feet.

The following articles are in the process of preparation on the Geophysical work:

Morgan, C. G. Longitudinal and Transverse Wave Velocities in Shelf and Continental Ice in the Antarctic.

Poulter, Thomas C. (with Black, R. B.). Geophysical Investigations in the Antarctic.

—— (with Westby, G. H.). Reverberations Obtained in Connection with the Geophysical Investigations of the Byrd Antarctic Expedition II.

—— (with Wade, F. Alton). Glacialogy.

Horace Elmer Wood, 2nd, Dana College, Newark, N. J.

Grant No. 2 (1933). Research and publications on the anatomy, stratigraphic distribution and phylogeny of the rhinoceroses and related groups of perissodactyls.

Wood, Horace E., 1936 (with Seton, H., and Hares, C. J.). New Data on the Eocene of the Wind River Basin, Wyoming. Proc. Geol. Soc. Amer. 1935: 394–395.

—— 1936. Evolution of the Elasmotheres. Proc. Geol. Soc. Amer. 1935: 399.

—— 1936. Amynodont Rhinoceroses. Proc. Geol. Soc. Amer. 1935: 400.

—— 1936. New Rhinoceroses from Mongolia. Proc. Geol. Soc. Amer. 1935: 400.

—— 1937. A New, Lower Oligocene, Amynodont Rhinoceros Jour. Mammology, 18: 93–94.

—— 1938. Causal Factors in Shortening Tooth Series with Age. Jour. Dental Res. (In press.)

William B. Scott, Princeton University

Grants No. 4 (1934) and No. 45 (1935). To prepare a monograph on the fossil mammals of the White River formation in Dakota and Nebraska.

Scott, William B. (with Jepsen, G. L.). The Mammalian Fauna of the White River Oligocene. Trans. Amer. Philos Soc. 28:
Pt. I (1936), Insectivora and Carnivora. 1–153.
Pt. II (1937), Rodentia (by Wood, Albert E.). 155–269.

James T. Young, University of Pennsylvania

Grant No. 5 (1934). Survey of local rural government in Pennsylvania.

The Survey covered the county, the first and second class township, the borough and the small (third class) city.

As to each unit, special attention was paid both in the examination of legal provisions and in field work to the following items: (1) Internal organization. (2) Personnel. (3) Fiscal problems. (4) Special functions of outstanding importance. (5) Relation of units to the State and to each other. (6) Constitutional aspects.

As to (1) Internal organization—contrary to the conclusions reached by inquiries in some other States, the evidence secured in Pennsylvania did not support any

recommendations for the abolition of certain types of units and the transfer of their functions to the central State government. The evidence obtained in the field led rather to the conclusion that existing types of units might better be retained and strengthened, with numerous consolidations where special conditions so warranted.

The reduction of elective and increase of appointive offices within each unit was clearly indicated as desirable under conditions revealed by the field inquiry.

Likewise an organization upon a functional basis rather than upon the present haphazard and disconnected foundation was indicated.

A large number of independent disconnected offices was revealed with an apparent need for regrouping to establish responsibility.

As to (2) Personnel—the data gathered showed clearly a need for training, supervision and modern recruitment methods.

Under (3) Fiscal Problems—the material covered assessment, tax levy, collection, budgeting, debt policy and administration, accounting and auditing.

Under each of these items, essential features of the present system were developed in some detail, together with such indications of need for different methods as were given by the evidence collected.

As to (4) Special Functions—attention was given particularly to elections, administration of local justice, welfare and local highways.

In (5) Relations to State and Other Units—the data bore particularly upon absence of effective central supervision and lack of adequate cooperation.

As to (6)—Constitutional Questions—the Survey concludes with an examination of those parts of the State constitution which prevent satisfactory solution of the problems and difficulties laid bare by the evidence collected. Some indication was given of the type of constitutional changes required to meet these problems.

Report of the Pennsylvania Local Government Survey—
The County. H. F. Alderfer.
The Second Class Township. Edward W. Carter.
The First Class Township. Philip B. Willauer.
The Borough. Bradford W. West.
The Third Class City. Blake E. Nicholson.
Trans. Amer Philos. Soc. 28: 1–483, 1935.

Alfred C. Lane, Tufts College, Massachusetts

Grant No. 7 (1934). Cooperative research in physics and chemistry on the relations of the various radioactive elements in rocks and the lead produced therefrom.

The money was entirely expended in supporting the work of Dr. W. D. Urry and was supplemented by a similar grant from the Geological Society of America. That helium had accumulated as a product of atomic disintegration had been known. It has been supposed that helium, being a gas, escaped so that its accumulation could not be used as a measure of geologic age, but work by Paneth and Urry on meteorites, and Holmes and associates on traps had indicated that helium could be determined in such small quantities, and with such accuracy, that it could be used to determine age, if both the uranium and thorium were also accurately determined. The refinement of the methods especially the separation and determination of thorium was more particularly the field of the American Philosophical Society's grant, and the application to particular rocks that of the Geological Society, but a sharp line can not be drawn.

Urry, W. D. 1930. Determination of the Thorium Content of Rocks. Jour. Chem. Phys. 4: 34–40.
—— 1930. Determination of the Radium Content of Rocks. Jour. Chem. Phys. 4: 40–48.

Modern Language Association of America

Grant No. 8 (1934). Editing of two plays (Richard II and Henry IV, Part 2) by Professors Black and Shaaber for the Variorum Edition of Shakespeare.

Grants No. 46 (1935) and No. 109 (1936). Continuation of the Variorum Edition of Shakespeare.

Brooke, C. F. Tucker. 1936. Report of Progress. Miscellanea Amer. Philos. Soc. 1: 2, 41–42.

The grants made by the American Philosophical Society from the Penrose Fund to the Modern Language Association have been used to furnish textual materials, scholarly assistance, and time to the editors of the following volumes in the New Variorum Shakespeare series:

Henry the Fourth, Part I, edited by SAMUEL B. HEMINGWAY, Professor of English, Yale University. Philadelphia, 1937. xii + 554 pp.

The Poems, edited by HYDER E. ROLLINS, Professor of English, Harvard University. (In press.)

Henry the Fourth, Part II, edited by MATTHIAS A. SHAABER, Assistant Professor of English, University of Pennsylvania. Scheduled for publication in December 1938.

Henry V, edited by EDWIN E. WILLOUGHBY, Chief Bibliographer, Folger Shakespeare Library, Washington, D. C. Scheduled for publication in December 1939.

Richard II, edited by MATTHEW W. BLACK, Associate Professor of English, University of Pennsylvania. Scheduled for publication in 1939.

Troilus and Cressida, edited by HAROLD N. HILLEBRAND, Professor of English, University of Illinois. Scheduled for publication in December 1940.

The Comedy of Errors, edited by THOMAS W. BALDWIN, Professor of English, University of Illinois. Scheduled for publication in December 1940.

W. F. G. SWANN, Bartol Research Foundation of the Franklin Institute

Grant No. 9 (1934). Investigations in nuclear physics.

SWANN, W. F. G., 1935. Report of Progress. Miscellanea Amer. Philos. Soc. **1**: 1, 21–47.

—— 1935 (with MONTGOMERY, C. G. and D. D.). The Enhancement of Cosmic-Ray Nuclear Bursts by the Presence of Subsidiary Material. Phys. Rev. **47**: 512–513.

Represents one of the first investigations to show that showers generated in one piece of material can produce showers in another piece of material. The conclusions of this investigation have since been substantiated by many other investigators.

—— 1935 (with COWIE, D. B.). The Effect of Primary Cosmic-Ray Energy upon Burst Production. Phys. Rev. **48**: 649–652.

Perhaps the first experimental investigation to show what is now recognized—that shower production increases with energy.

MONTGOMERY, C. G., 1935 (with MONTGOMERY, D. D.). The Variation with Altitude of the Production of Bursts of Cosmic-Ray Ionization. Phys. Rev. **47**: 429–434.

Showed that cosmic-ray showers increased with altitude much more rapidly than did the cosmic-ray intensity, and formed a basis for a subsequent theory of cosmic-rays developed by W. F. G. Swann.

—— 1935 (with MONTGOMERY, D. D.). On the Showers of Rays which Produce Bursts of Cosmic-Ray Ionization. Phys. Rev. 48: 786–789.

Shows that there is continuity between small showers comprising a few rays and larger showers, usually termed "atomic bursts."

RUMBAUGH, L. H., 1936. Report of Progress. Miscellanea Amer. Philos. Soc. 1: 2, 50–51.

—— 1936 (with HAFSTAD, L. K.). Disintegration Experiments on the Separated Isotopes of Lithium. Phys. Rev. 50: 681–689.

The second paper gives the results of bombarding Li^6 and Li^7 (collected in an investigation, described in the first paper), with protons and deuterons. Two groups of protons are emitted by Li^6 under deuteron bombardment of 540 kv. Neutrons are emitted under deuteron bombardment of 300 kv and above. Short period beta-ray activity was observed under deuteron bombardment of Li^7. Gamma-rays are emitted by Li^7 under proton bombardment in the neighborhood of 450 and 1000 kv, with no observable gamma-rays or neutrons emitted from Li^6 at these energies.

—— 1936 (with LOCHER, G. L.). Neutrons and Other Heavy Particles in Cosmic Radiation in the Stratosphere. Phys. Rev. 49: 855.

Describes those experiments made with photographic plates in the National Geographic U. S. Army Air Corps stratosphere flight, by which it was demonstrated that alpha particles are practically absent at high altitudes, but neutrons are present in appreciable numbers.

LOCHER, G. L., 1936. Wilson Cloud Machines for Portable Use. Rev. Sci. Instr. 7: 471–478.

Describes details of construction of cloud expansion apparatus for portable use, and in particular, an apparatus designed for balloon flights.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA,
M. A. Carriker, Jr.

Grant No. 10 (1934). Collection and study of the distribution and sources of the avifauna of Bolivia.

Grant No. 87 (1936). Study of bird life of southern Bolivia, to determine (1) the northern extension of the so-called "Patagonian" fauna on the eastern side of the Andes (snow line to Chaco), (2) the southern extension of the Amazonian fauna, and (3) the extent and character of the northern winter migration of the "Patagonia" fauna east of the Andes.

CARRIKER, M. A., JR., 1935. Descriptions of New Birds from Bolivia, with Notes on other Little-known Species. Proc. Acad. Nat. Sci. 87: 313–341.

The collection of birds upon which this paper is based was made by the author, in company with his son Melbourne R. Carriker, for the Academy of Natural Sciences of Philadelphia. The expedition arrived in La Paz at the end of June, 1934, and left that city for New York on February 1, 1935. The work was confined to the highlands around La Paz and from the crest of the eastern Cordillera of the Andes downwards into the upper Rio Beni and down that stream as far as Reyes. A considerable portion of the area covered had never been previously explored by any ornithological collector. About 575 species of birds were taken, of which quite a number prove to be new to science.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA,
Henry A. Pilsbry

Grant No. 10 (1934). Collection and field studies of mollusks of northern states of Mexico from Nuevo Leon to Chihuahua.

Grant No. 34 (1934). To collect and make field studies of mollusks of Sonora and Sinaloa, northwestern Mexico, with the object of determining the relations of the Sonoran fauna of our southwest to the Neotropical fauna of Mexico.

The field study of mollusks of northern Mexico aided by grants from the Penrose Fund, occupied two seasons: from June 12 to Oct. 8, 1934, and June 16 to Sept. 20, 1935.

The work was begun at Monterrey, Nuevo Leon, near the northern end of the Sierra Madre Oriental, thence mov-

ing south to the mountain valleys above Galeana, camping at 7800 ft. and working up to 10,000 ft. One of our desiderata, the genus *Humboldtiana*, was found here in several very large species hitherto unknown, but not directly related to United States forms. The high country forms were mainly representatives of tropical genera from the lowlands eastward, here adapted to the "tierra fria," largely species new to science. We did not find characteristic northern genera such as *Pupilla, Vertigo, Vitrina, Cochlicopa* and others which might be expected at that elevation. It appears that cool and humid Pleistocene conditions were not effective so far south.

Proceeding west to Saltillo, where we worked up to 8300 ft., and the Guadalupe Mountains, State of Coahuila, up to about 9000 ft., we found a nearly complete change in species of mollusks, the genera largely the same. At the isolated mountain knot "Concepcion del Oro" in Zacatecas, mining operations had wiped out the forest. The few mollusks found at 8500–9700 ft. were mostly endemic.

Continuing southward we collected at Catorce, an old mining center. In the State of San Luis Potosi a humid country fauna of great interest was found in the Alvarez mountains at about 7500–8600 ft., and a dry country fauna around San Pedro.

On the western border of the Mexican plateau we collected around Durango, finding *Humboldtiana* related to those of Texas; then about 140 kilom. west in the Sierra Madre up to about 9300 ft. at Metates, beyond El Salto. A trip was made down the western slope to 5000 ft., where subtropical forms occurred.

Further north collecting was done around Chihuahua and west to LaJunta and the Sierra Gazachic at about 9000 ft. Here was found the southern known limit for several molluscan genera of Arizona and New Mexico, not before known from Mexico.

The early weeks of the 1935 expedition were spent in the northern end of the Sierra Madre, around Casas Grandes,

Colonia Juarez and southward. The genera of mollusks here are all such as occur in Arizona and New Mexico, but largely different species.

In July we entered Sonora by way of Nogales, going south through Hermosillo and Guaymas, through the state of Sinaloa as far as Tepic, Nayarit. Most of the work was done at low elevations, but with some trips eastward up to 6500 ft. Some Arizona species were traced to about the lower boundary of Sonora; very few extended far beyond that.

Collections were made at 246 localities, in all about 1150 lots, and about 18,000 specimens.

A part of the material has been determined, dissected and described, and is now ready for publication, but it is planned to hold this matter until the whole can be completed and published as a unit.

Academy of Natural Sciences of Philadelphia, Francis W. Pennell

Grant No. 10 (1934). Collection and field studies of plants in Northern Mexico.

Grant No. 35 (1934). Collection and field studies of plants, especially of the family Scrophulariaceae, in Sonora and Sinaloa, northwestern Mexico, considering the composition and distribution of the flora, and its relation to that of the southwestern United States and southern Mexico.

Through the interest of the American Philosophical Society I was enabled to accompany Dr. Henry A. Pilsbry of this Academy on two expeditions to northern Mexico. On the first of these, from June 16 to October 5, 1934, we worked in Nuevo Leon, Coahuila, Zacatecas, San Luis Potosi, Durango and Chihuahua, visiting 81 localities, at which were gathered 2,565 collections of flowering plants and ferns. On the second of these, from July 25 to September 11, 1935, we worked farther west, in Sonora, Sinaloa and Nayarit, visiting 48 localities at which were gathered 840 collections of flowering plants and ferns. The second ex-

pedition was into more difficult country, and the relatively meagre collection of plants contains a higher proportion of unusual or previously unknown species.

Of the 3,405 collections made, 1313 have now been specifically identified, between a third and a half of the total. This has been largely through the kindness of Mr. C. V. Morton of the United States National Museum, who is making a special study of Mexican herbaceous plants, and also of specialists on various groups. My colleague, Mr. Arthur N. Leeds, has identified the ferns and fern-allies (Pteridophyta). Among these miscellaneous plants 36 species have been already indicated as new to science.

My personal interest has been given to the family Scrophulariaceae, of which in 1934 I gathered 353 collections representing about 124 species, and in 1935 80 collections representing about 39 species. Of every species careful field-descriptions were made, so as to recall to me later whatever was apparent in the fresh material. For these, as for all plants collected, records were kept of flower-color, environment, altitude, date, and geographic position. The way has been prepared for the study of these Mexican Scrophulariaceae through the assembling of information concerning the sources of previously described species: by complete cataloguing of the original statements of localities and collectors and by descriptions and photographs of type-specimens both in this country and in Europe. The material of certain genera is now in process of revision.

Academy of Natural Sciences of Philadelphia, James A. G. Rehn

Grant No. 127 (1937). Distributional investigation of the Orthoptera occurring in certain areas of New Mexico, Arizona, Nevada and California.

On July 6, 1937, our party left Philadelphia, using the automobile and freight trailer which served as transport for personnel and equipment until Philadelphia was again reached September 9. Field work was taken up at Raton

Pass, New Mexico, July 13, and actively continued until Boerne, Texas, was reached on September 2 on our return route.

The total number of collecting stations examined was 167, distributed through the states of New Mexico, Arizona, California and southern Nevada, as well as western Texas. The total number of entomological specimens secured was 12,264, a large part of these Orthoptera. The preparation of this material for study is naturally a task requiring months of labor, to which one of the trained preparators of the Entomological Department of the Academy of Natural Sciences of Philadelphia has been assigned for the greater part of her time. Some thousands of the specimens collected have been relaxed and mounted to date. Until the routine, which is always preliminary to critical work on taxonomic entomological material, has been completed, detailed examination and comparative study is not possible.

The more important areas examined from which previous distributional and systematic data were most fragmentary or totally lacking were: the western Navajo and Hopi regions of Arizona, the Datil Mountains of New Mexico, the White Mountain and Tonto area between Springerville and Globe and Globe and Flagstaff, Arizona, that between the Mojave Desert and Owen's Valley, California, the Mono Lake region of California, the open stretches of the upper Salinas Valley in California, the San Gorgonio Pass (in cross section) California, the northern Yuma Desert in Arizona, and the Fort Stockton—Junction area of Texas, from the last of which our information was particularly incomplete. These districts were visited and studied, and extensive observations as well as collections made for critical analysis.

In the course of the investigations a total of ten thousand miles was travelled, slightly over half of this in the general territory under examination. In a number of the areas studied particular attention was given to the extent

and degree of intermingling of different faunal elements and the extent to which mountain or desert barriers are effective. The value of such information on the age, history and movement of faunas, as well as their relative adaptability to conditions departing from the norm of their respective habitats, is becoming increasingly evident.

P. W. Whiting, University of Pennsylvania

Grants No. 11 (1934) and No. 48 (1935). Investigations on genetics and sex determination in the parasitic wasp Habrobracon.

Whiting, P. W., 1935. Selective Fertilization. Jour. Hered. 26: 17–22.
—— 1935. Sex Determination in Bees and Wasps. Jour. Hered. 26: 263–278.
—— 1935. Genic Balance, Sex Determination and Selective Fertilization in Hymenoptera. Proc. Amer. Philos. Soc. 75: 517–520.
—— 1935. Sex Determination in Bees, Wasps and Ants. Miscellanea Amer. Philos. Soc. 1: 1, 16–17.

George M. Reed, Brooklyn Botanic Garden

Grant No. 12 (1934). The influence of the nutrition of the host on development of smuts.

The intimate association between the oat plant and the oat smuts affords problems of fundamental interest. The present investigation is concerned with the question whether profound changes in the growth of the oat could influence the ultimate development of the smut organism. The experiments were carried out with specialized races of both loose (*Ustilago avenae* (Pers.) Jens.) and covered (*U. levis* (K. & S.) Magn.) smuts of oats. Varieties usually giving different types of reactions to these races were inoculated.

Marked changes in the growth of the oat plants were produced by growing them under the influence of artificial illumination and also by the application of various combinations of chemical nutrients. Cultures grown with the full nutrient solution, which included calcium nitrate, potassium phosphate, and potassium chloride, were compared with others in which there was an absence, or excess, of the elements nitrogen, phosphorus, or potassium.

The results indicate clearly that environmental factors during the period of germination of the inoculated seed are of primary importance for the infection of the susceptible variety.

The course of the development of the smut fungus after entrance during the period of germination does not seem to be influenced by the subsequent growth of the host plants. They may grow slowly or rapidly, and at maturity they may have a single short stem, with a small panicle and few spikelets, or they may be tall and well branched with large panicles and many spikelets. However, the final expression of the smut remains unaffected.

Reed, George M., 1936. Report of Progress. Miscellanea Amer. Philos. Soc. 1: 2, 43–46.

J. Lincoln Cartledge, Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor, N. Y. (now at West Virginia University)

Grants No. 13 (1934) and 67 (1935). Investigation of the factors which are responsible for increased mutation rate in aged seeds of Datura.

With the support of grants from the Penrose Fund of the American Philosophical Society, further investigations on the mutation rate in Datura were carried on in 1934 and 1935 in cooperation with Dr. A. F. Blakeslee at the Department of Genetics of the Carnegie Institution. The heat treatments and moisture content determinations of seeds were made at the Boyce Thompson Institute through the cooperation of Dr. William Crocker, Director, and Miss L. V. Barton.

High rates of pollen-abortion mutation had previously been reported from aged seeds of Datura. In Datura seeds that were obtained from soil which had been undisturbed for 22 years the rate of pollen-abortion mutations was not significantly higher than the rate in control plants grown from fresh seeds. Factors other than age were then sought to account for the increased mutation rates. Posi-

tive results in the induction of mutations were obtained by heating seeds of known moisture content. The highest rates of mutation were obtained with fresh seeds of about 5 per cent moisture content, heated at 75° C. for 20 to 40 hours, or at 80° C. for 12 to 24 hours. The more severe treatments killed the seeds, especially those with high moisture content, while moderate treatments increased the seedling production over that of the untreated controls, and both increased the number of plants with abnormal types of branching. In general, the number of pollen-abortion mutations tended to increase with higher temperature, with longer duration of treatment, and with the greater moisture content of the seeds. Delay in the appearance of seedlings after planting of the seeds also varied with these factors.

The effect of aging of pollen grains on the production of pollen-abortion mutations was also tested. Pollen stored at 30° C. in air-dry condition was able to effect some fertilizations after 13 days. Aging from 5 to 13 days induced percentages of mutation as high or higher than those obtained by the various seed treatments. The mutation-inducing effects of aging, temperature and moisture content of the pollen grains are being further investigated.

In these, as in other studies in Datura, pollen-abortion mutation rates have been used as an index to the mutation rate in general. They show parallel, but higher rates than those of visible recessive mutations in every case so far tested. The pollen-abortion mutations are found in the first generation of plants from the various treatments, and thus afford a more convenient as well as a more delicate index to the mutation rate.

Cartledge, J. L., 1935 (with Blakeslee, A. F.). Mutation Rate from Old Datura Seeds. Science **81**: 492–493.

—— 1935 (with Murray, M. J., and Blakeslee, A. F.). Increased Mutation Rate from Aged Datura Pollen. Proc. Nat. Acad. Sci. **21**: 597–600.

—— 1936 (with Barton, L. V., and Blakeslee, A. F.). Heat and Moisture as Factors in the Increased Mutation Rate from Datura Seeds. Proc. Amer. Philos. Soc. **76**: 663–685.

A. V. GROSSE, University of Chicago

Grant No. 14 (1934). Extraction of 1 gram of the radioactive element 91, protactinium, from about 5 tons of raw material and its isolation in the form of pure salts and finally in the metallic state itself.

The grant was used to extract larger quantities of protactinium from radium residues in order to have sufficient material for different investigations. At the present time one half gram of protactinium pentoxide (Pa_2O_5) are available in the form of pure or highly concentrated material. The compounds $K_2P_aF_7$, P_aCl_5 and the metal have been prepared.

GROSSE, A. V., Reports of Progress. Miscellanea Amer. Philos. Soc. 1: 1; 18–19, 1935; 1: 2; 48–49, 1936.
—— 1935 (with AGRUSS, M. S.) Technical Extraction of Protactinium. In Eng. Chem. 27: 422–426.
—— 1935 (with PIERCE, W. C.). The M-Series of Element 91—Protactinium. Phys. Rev. 47: 532–533.

EDWARD L. THORNDIKE, Columbia University

Grant No. 15 (1934). Research in the psychology of animal and human learning.

THORNDIKE, EDWARD L., 1935. Report of Progress. Miscellanea Amer. Philos. Soc. 1: 1, 10.
—— 1937. Trains of Thought. Proc. Amer. Philos. Soc. 77: 417–438.
—— 1937. Trains of Thought as Symptoms of Interests and Attitudes: An Exploratory Investigation. Proc. Amer. Philos. Soc. 77: 439–445.

EDWARD L. BOWLES AND HENRY G. HOUGHTON, JR., Massachusetts Institute of Technology

Grant No. 17 (1934). Research on fog dissipation.

BOWLES, EDWARD L., 1934. Investigation of the Practicability of Dissipating Natural Fog by Means of Hygroscopic Material. Bur. of Aeronautics.
—— 1935 (with HOUGHTON, H. G. Jr.). Report of Progress, Miscellanea, Amer. Philos. Soc. 1: 1, 48–51.

ARTHUR J. DEMPSTER, University of Chicago

Grant No. 18 (1934). A more accurate determination of atomic weights by the methods of mass spectroscopy.

Grant No. 54 (1935). A precise determination of atomic weights by a new method of positive ray analysis, and the study of isotopic structure.

Two research tools of the greatest importance for nuclear physics were successfully developed during the two years 1934 and 1935 with the aid of grants from the Penrose Fund. The one was the construction of the first "double focusing" mass spectrograph for the exact determination of the masses of the atoms, and the other the development of a spark source of ions which made possible the convenient study of all the elements. The masses of the atoms are measured in a so-called "mass spectrograph" by observing the deflection of the charged atoms in magnetic and electric fields. Before 1935, the methods in use made use of divergent bundles of rays which contained ions of slightly different velocities, and brought to a focus for observation either rays of various velocities but not those with divergent directions, or rays of divergent directions but not those with various velocities. The rays which were not brought to the same focus point as the others produced a broadening of the image with a consequent inaccuracy in the mass determination. A method for securing a double or complete focus was proposed by the author, in which the velocity dispersion produced by the magnetic field is exactly neutralized by a previous dispersion in an electric field. This analogue to the achromatic lens was constructed in 1934–35 and proved to give an instrument of much greater precision in mass analysis than any of the previous methods.

At the same time, it was felt desirable to develop a new source of charged atoms. Previously, an electrical discharge in a gaseous compound had been the usual source of ions. It was found that a spark between solid electrodes in a very high vacuum gave rise to many charged atoms and that the method was applicable to all elements. The isotopic structure of the elements rhodium, palladium, iridium, platinum, and gold was determined for the first time. New isotopes were found in many elements which previously had been only partially analyzed; in tungsten one new isotope, in ytterbium two, in erbium two, in dys-

prosium two, in gadolinium two, in neodymium two, in cerium two, in barium three, in tellurium one, and in strontium one new isotope. The doubtful constitution of iron and nickel was cleared up. In uranium, the atomic mass of the important isotope actinouranium, the source of the actinium series, was determined to be 235, thus confirming one of the theories of the origin of actinium.

In the very extensive subject of exact mass comparisons, considerable progress has been made. Thirty-seven new comparisons have been carried out, and from these, the masses of many isotopes have been referred to oxygen as a standard. The comparisons serve to show how the divergence of the mass of the isotope from an integral value varies from element to element throughout the table. This divergence determines the energy content of the nucleus, and interesting conclusions regarding the stability of the nuclei may be drawn. In this field still greater precision than that attained by the present apparatus is desirable in view of the experimental phenomena of nuclear transformations now known, and it is doubtful whether it would not be wiser to endeavor to develop the increased accuracy demanded by modern theories and the progress in nuclear transformations, rather than to continue the measurement of all the isotopic masses with the present precision.

DEMPSTER, ARTHUR J. 1935. New Methods in Mass Spectroscopy. Proc. Amer. Philos. Soc. 75: 755–767.

—— 1936. Ion Sources for Mass Spectroscopy. Rev. Sci. Instr. 7: 46–49.

—— 1936. Further Experiments in the Mass Analysis of the Chemical Elements. Proc. Amer. Philos. Soc. 76: 491–496.

—— 1938. The Atomic Masses of the Heavy Elements. Phys. Rev. 53: 64–75.

JOHN R. MURLIN, University of Rochester

Grant No. 19 (1934). An investigation of heat production of small animals by a new method of direct calorimetry.

Grant No. 69 (1935). Study of the continuous heat production of small mammals, mouse to dog. Amount of food energy required for growth, in its different phases, from birth to ma-

turity. The difference between the food energy utilized and the heat production is the quotum remaining for growth.

The principle upon which this apparatus operates is as follows. In addition to the heat generated within the calorimeter by the experimental animal, heat is supplied in the form of electrical energy, which is easily measured. By means of a device analogous to the self-balancing Wheatstone bridge, the rate of total heat supply is maintained constant by automatic control of the electric heat. The animal heat is then simply the difference between the total (constant) heat supply and the electrical heat supply.

The calorimeter chamber, well insulated thermally, contains an electric heater and a cooling coil which carries a steady stream of water under constant hydraulic pressure. Entering and leaving the chamber the water passes over electrical resistance thermometers, which form the two variable arms of a Wheatstone bridge, of which the galvanometer reflects a beam of light onto a photoelectric cell. The resulting photoelectric current, after amplification, operates a relay of the double-throw type. The latter controls a reversible motor, which moves a worm drive rheostat connected in series with the heater, a direct-current ammeter and a source of direct current. The null point of the galvanometer is so chosen that the reflected light beam falls half on, half off the sensitive surface of the photoelectric cell. If now the heat supply is for any reason (such as a drop in the D.C. line voltage) altered, the change will appear as a decrease or increase in temperature of the outgoing water. The bridge becomes unbalanced, the galvanometer is deflected swinging the light beam further off (say) the photoelectric cell. A decrease or increase in photoelectric current results, the relay is closed right or left and the motor will turn in such a direction as to decrease or increase the series resistance (increase or decrease the heating current). Thus the change plus or minus which started the mechanism will be counteracted and the heat supply brought back to its former value.

Temperature of the chamber wall and heat loss through the wall are automatically recorded. Heat of evaporation is measured by collecting the water from the ventilating current of air (previously dried) as it leaves the chamber. The outgoing air also is sampled continuously, and automatically for measurement of oxygen absorbed and carbon dioxide produced.

With groups of 12 to 16 rats experiments of 3 to 16 hours duration have shown good agreement between heat as calculated and as measured.

BARROWS, W. M., JR., 1936. Report of Progress. Miscellanea Amer. Philos. Soc. **1**: 2, 61.

MURLIN, JOHN R., 1938 (with BARROWS, W. M., JR.). New Automatic Calorimeter for the Continued Measurement of Heat Production over Long Periods of Time. Proc. Amer. Philos. Soc. **78**: 483–512.

HELLMUT DETERRA, Yale University (Now at Academy of Natural Sciences of Philadelphia)

Grant No. 21 (1934). Study of the geological background of early man in Northern India by concerted methods of geology, paleontology, and prehistory, and to carry out an organized search for early hominids and fossil anthropoid apes for the advancement of our knowledge of man's evolution and his earliest cultures.

DETERRA, HELLMUT, 1936. Reports of Progress. Miscellanea Amer. Philos. Soc. **1**: 2, 6–26.

—— 1936 (with DE CHARDIN, P. TEILHARD). Observations on the Upper Siwalik Formation and Later Pleistocene Deposits in India. Proc. Amer. Philos. Soc. **76**: 791–822.

New field studies, carried out last year, lead the authors to a more concise classification of Pleistocene sequences in India. The "Upper Siwaliks" are considered to be of Pleistocene age throughout with the uppermost stage being as young as the second glacial advance in the adjoining Himalaya. The "Boulder Conglomerate" stage witnessed the arrival of Ancient Man whose Paleolithic industries were discovered in NW-India as well as in the fossiliferous Narbadda formation in Central India. The Siwalik his-

tory closes during the Middle Pleistocene and is followed by alternating erosion and deposition of lœssic beds beneath which a younger Paleolithic industry was found. The geological sections described permit of recognizing three to four phases of mountain making since the close of the Pliocene period.

—— 1937. Cenozoic Cycles in Asia and Their Bearing on Human Prehistory. Proc. Amer. Philos. Soc. 77: 289–308.

An attempt is made to apply the cycle theory, as worked out by the investigators of Fossil Man in China, to other regions in Asia, especially India and Java, from where new geologic and archaeologic data have recently been recorded. It was found that on geologic, paleontologic and archaeologic grounds correlations exist between certain Pleistocene stages and distribution of prehistoric cultures. One of these reveals the appearance of Old Paleolithic industries in the Middle Pleistocene, specifically at the close of the second glaciation and during the following interglacial (or interpluvial) interval. Another important stage in the evolution of Man is marked by the occurrence of anthropoids in the Pliocene of India in which group a progressive tendency of specialization is apparent. These facts suggest that the Late Pliocene cycles witnessed the critical phase in the evolution of Man in Asia, as also that Man existed in widely scattered regions as a migrating hunter during the Middle Pleistocene.

Ralph E. Cleland, Goucher College

Grants No. 22 (1934), No. 55 (1935, with Munz, P. A.), No. 85 (1936, with Munz, P. A.) and No. 134 (1937). Joint taxonomic and cytogenetic survey of Oenothera, sub-genus Onagra.

The grants from the Penrose Fund to the author have been in support of a study of the process of organic evolution as it is illustrated in the genus Oenothera, sub-genus Onagra (evening primrose). This particular sub-genus is widely distributed in the western hemisphere, for the most

part in North America, but also to a considerable extent in South America. It has been the despair of taxonomists because of the multiplicity of apparently integrating forms, and the absence of clear-cut specific differences.

One of the chief peculiarities of Onagra is the fact that the chromosomes in most species fail to pair with their homologues in germ cell formation; instead, they become associated end-to-end to form chains. The writer observed some years ago that whenever hybrids are formed by the union of two genetically unrelated genoms or gene complexes, these hybrids will show to a high degree chain formation; on the other hand, when they are formed by the union of two closely related complexes, they will show mostly or wholly pairing chromosomes. Thus there seems to be at hand a tool for the testing of genetic (and hence phylogenetic) relationships, a tool not hitherto found in any other genus of plants or animals.

The primary object of the study supported by the Penrose Fund, therefore, has been to apply this tool to a study of the wild races of Onagra, relating the results of this study to geographical distribution and supplementing it as well with a purely taxonomic study of the genus. To this end, Dr. P. A. Munz, foremost authority on the taxonomy of the Onagraceæ, and the writer have entered upon a program of collaboration. The procedure is as follows: (*a*) Dr. Munz visits systematically the entire range of the genus, collecting data, specimens, seeds and making all necessary field studies. These data, together with the herbarium studies, constitute the basis for a purely taxonomic approach to the problem of relationships. (*b*) Seed is grown in Dr. Munz's garden in Southern California, and the writer's garden at Baltimore. Thus, growth forms under two widely diversified sets of environmental conditions are compared with each other and with the wild forms. Characters induced by the environment can thus be differentiated from characters of genetic importance. (*c*) These races are crossed by the writer to a selected list

of standard races, and later to other forms. The arrangement of chromosomes into chains or pairs in the hybrids is studied, and on the basis of this study, degrees of relationship are tentatively determined.

This determination can be made with some exactness due to the fact that we know why it is that chromosomes pair in some cases and form chains in others. Pairing is due to the association of homologous regions in the chromosomes. If two chromosomes are homologous throughout, they will pair throughout, but if, through a process of segmental interchange, materials become shuffled about, then the union of complexes having unlike arrangements of segments will result in various types of association into chains or pairs. Utilizing this knowledge, it is possible to determine the segmental arrangement of the various complexes. Thus one has the material with which not only to determine present relationships but also, by following the past history of interchange, to see something of the route along which the various complexes have evolved.

With the help of the Penrose Fund, over 125 distinct races have been grown in the garden. A certain number of representative types have been studied in detail and others are being studied. The results of the study to date may be summarized as follows:

(*a*) The races in California are characterized by paired chromosomes, and the hybrids between them have paired chromosomes also. These races are therefore made up of closely related complexes, and the complexes of different races are also closely related. We may therefore speak of the "California type" of complex.

(*b*) In contrast to the California situation, in most parts of the Onagra range we find races, each of which is composed of 2 quite unrelated complexes. Due to the presence of balanced lethals, these breed true, but they are in reality highly heterozygous—perhaps to be regarded as hybrid in origin.

(*c*) Some races growing in New Mexico are transitional, in that they have chains of intermediate size. The chromosomes are neither mostly paired nor mostly in one long chain. Balanced lethals also appear to be lacking. They perhaps represent a transition from the California type of plant with paired chromosomes to the eastern type with large circles.

(*d*) In Colorado and the plains states, races are found with large circles and balanced lethals. While the complexes making any one of these races are not closely related, both of them nevertheless do show a fairly close relationship to the California type, although by differing routes. These races possibly represent a second stage in the evolution away from the California type, if we consider the New Mexico condition as the first stage.

(*e*) In some eastern races, with large circle, one of the complexes is of the California type, having its chromosomal segments arranged in essentially the way found in California forms. The other complex is quite unrelated.

(*f*) Although one can recognize a clear-cut California type of complex, no other recognizable type has appeared. Other complexes are as varied in segmental arrangement as they are numerous.

(*g*) Before this study began, the segmental arrangements of but 5 complexes were known; we have added to this number 18 tentative, but probably correct, formulæ, bringing the total up to 23 (mostly unpublished data).

(*h*) Evolution in Onagra has been accompanied by much shifting about of chromosomal material. It is interesting to note that Dobzhansky has recently found the same to hold for *Drosophila pseudoobscura.*

(*i*) It is obvious that relationships in Onagra cannot be determined from external characters alone. We have observed cases, for instance, where reciprocal hybrids, with *identically the same parents,* were so diverse in appearance that no taxonomist would consider them related. The reason, of course, is that they represented different combinations of the diverse complexes found in the two parents.

The general outlines of the picture thus seem to be visible. In California, a distinct group of closely related forms exists in which the chromosomes behave in conventional fashion. Present indications are that this group is primitive, and perhaps ancestral. Going east, we pass through various transitional conditions, leading to the situation found throughout most of the North American range of the genus, in which complex-heterozygotes with balanced lethals are the rule. It seems bizarre, but is probably a fact, that most Onagras are permanent heterozygotes; neither in genetical make-up, nor perhaps in method of origin, do they correspond to the ordinary definition of a species. Nevertheless, they are self-perpetuating entities, successfully maintaining themselves.

Further work will serve to make the outlines of this general picture clearer, as well as to supply needed details. Many interesting forms have been found and several unusual phenomena discovered which will be analyzed in detail as opportunity affords. We wish to express sincere appreciation of the support received from the Penrose Fund.

Cleland, Ralph E. 1935. Cyto-taxonomic studies on certain Oenotheras from California. Proc. Amer. Philos. Soc. **75**: 339–429.

—— 1935. Chromosome configurations in Oenothera (Grandiflora × Lamarckiana). Amer. Nat. **69**: 466–468.

—— 1936. Some aspects of the cyto-genetics of Oenothera. Bot. Rev. **2**: 316–348.

—— 1937. Species relationships in Onagra. Proc. Amer. Philos. Soc. **77**: 477–542.

[For these papers published in the Proceedings the author received the first award of the John F. Lewis Prize, April 23, 1937.]

F. K. Richtmyer, Cornell University

Grant No. 23 (1934). Determination of the widths, shapes and relative intensities of the lines in the X-ray spectra of the several elements; and the use of these data to compute the distribution of energy in the excited states of atoms.

Richtmyer, F. K., 1935 (with Ramberg, E.). Reports of Progress. Miscellanea Amer. Philos. Soc. **1**: 1, 5–6.

K. Lark-Horovitz, Purdue University

Grant No. 25 (1934). Intensity of electron scattering by means of homeo-polar compounds.

Lark-Horovitz, K., 1936 (with Yearian, H. J., and Howe, J. D.). Intensity Distribution in Electron Diffraction Patterns. Proc. Amer. Philos. Soc. 76: 766–770.

A universal camera has been constructed for the production of electron diffraction patterns of single crystals, powders, liquids and vapors. It is possible in this camera to take diffraction patterns from a surface orientated at the incoming beam in different directions, as well as diffraction patterns produced by penetration of the material. Investigations can be carried out from liquid air temperature up to 400° and the changes in structure can be recorded, without changing the vacuum, by an automatic mechanism allowing the succession of 49 exposures with an exposure time which can be pre-selected and automatically provided.

The material was used mostly in the form of thin films which have been prepared with a new method which allows the production of unsupported films only a few atoms thick. Using this method it has been possible to find the origin of "extra rings" in electron diffraction patterns as due to surface layers.

Electron diffraction patterns have been obtained with voltages ranging from 80 kv. down to 15 kv. The results show that the behavior at high voltages is entirely different from that at low voltages.

Atom factor determinations for copper in pure copper and in cuprous oxide, for zinc, cadmium, gold, silver and palladium have shown that the wave mechanical formula

$$F_{el}(\vartheta) = \frac{Z}{2E}\,\frac{1 - F_x}{\sin^2 \vartheta/2} = \frac{1}{\sqrt{E}} \Sigma\, (2l + 1) P_l(\vartheta) \delta_l$$

as given by Mott is fulfilled at the higher voltages. At the lower voltages one would expect that this formula above

should be replaced by the better approximation as given by Massey and Henneberg

$$F_{el}(\vartheta) = \frac{1}{2i\sqrt{E}} \sum_{l} (2l+1) P_l(\cos\vartheta)(e^{2i\eta_l} - 1).$$

The experiments show that while the behavior in general is similar to the one indicated by this formula, the deviations are so great as to indicate an entirely different phenomenon not described by the theory. By using materials of different structures and varying in atomic number by one it was possible to obtain a scattering curve covering more or less completely the whole region of angles investigated (up to 10°). The results indicate that it is necessary to extend the theory in two directions: better approximation of the atomic field, and interaction between lattice and electron wave including the influence of surface or cross lattices.

HARRY SHULTZ VANDIVER, University of Texas

Grant No. 26 (1934). Computation and investigation of the properties of Bernoulli Numbers with special application to Fermat's Last Theorem.

The Bernoulli numbers B_n; where $B_1 = 1/6$, $B_2 = 1/30$, etc., were computed from $n = 93$ to $n = 110$ inclusive by Dr. D. H. Lehmer, the results being obtained as rational fractions and employing methods developed by him. This method was described and the numbers mentioned above tabulated, in a paper written under Dr. Lehmer's name which appeared in the Duke Mathematical Journal in 1935.

The equation

$$x^l + y^l + z^l = 0$$

was proved impossible for l a given prime integer in the range $307 < l < 617$ and x, y and z rational integers, none zero. This was effected by methods developed by the writer and his collaborators, Dr. D. H. Lehmer, Mr. M. E. Tittle and Mr. M. M. Abernathy.

These methods are described in an article appearing in the December 1937 number of the Duke Mathematical Journal.

VANDIVER, H. S., 1936. Report of Progress. Miscellanea Amer. Philos. Soc. 1: 2, 57–59.

FRANK G. DUNNINGTON, California Institute of Technology (Now at Rutgers University)

Grant No. 27 (1934). Precision determination of the specific charge of a free electron by a new deflection method.

Grant No. 66 (1935). Precision determination of the ratio of Planck's constant to the charge on the electron (i.e. of h/e).

The determination of the specific charge of the electron (e/m) was not finished in the fall of 1935 as had been anticipated so that the second grant, which was given for a determination of the ratio of Planck's constant to the charge on the electron (h/e), was used to continue the (e/m) work done under the first grant.

The (e/m) determination required a total of five years for completion, including in this the preliminary work. The two years supported in whole or in part by the American Philosophical Society were probably the most fruitful years of the work. During these two years the construction of the final measuring tube was completed and its assembly made. The magnetic field standard was designed, constructed, and calibrated, as also were the standards for radius and angle measurement. The Helmhotz coils, used for the magnetic deflecting field, were calibrated from the standard. The source of radio frequency and associated power amplifiers were greatly improved and the apparatus for the determination of this frequency was made.

On the completion of this construction period a study was made of the phenomena occurring in the measuring tube and the research continued until the known sources of error were eliminated either by alterations in the apparatus or by the manner of the taking of the observations.

Finally about half of the final observations were made before the expiration of the last grant.

DUNNINGTON, FRANK G., 1937. A Determination of e/m for an Electron by a New Deflection Method. II. Phys. Rev. 52: 475–501.

N. T. BOBROVNIKOFF, Ohio Wesleyan University

Grant No. 28 (1934). Investigations of stellar spectra, mostly in the red and infra-red, with special attention to the band spectra.

In addition to the work represented by the accompanying list of publications, the timely grant from the Penrose Fund allowed the Perkins Observatory to continue its scientific work until a new organization of the observatory under the joint management of Ohio Wesleyan and Ohio State Universities could be effected.

BOBROVNIKOFF, N. T., 1935. Report of Progress. Miscellanea Amer. Philos. Soc. 1: 1, 9.

—— 1935. The Spectrum of Nova Herculis in the Visual Region. Proc. Amer. Philos. Soc. 75: 717–753.

—— 1935. On the Spectrum of Nova Herculis. Proc. Amer. Philos. Soc. 76: 497–521.

—— 1935. The β-System of TiO in Stellar Spectra. Publ. Amer. Astron. Soc. 8: 107.

—— 1935. Metallic Oxides in M-type Spectra. Publ. Amer. Astron. Soc. 8: 209.

PHILADELPHIA INSTITUTE FOR MEDICAL RESEARCH, Judson Daland,† President

Grants No. 29, No. 100 and No. 147. Biological effect of thymus extract (Hanson) in accelerating the rate of growth and development in successive generations.

The investigation was carried out by L. G. Rowntree, Arthur Steinberg, J. H. Clark, N. H. Einhorn, Adolph M. Hanson and N. K. Schaffer.

Thymus extract (Hanson) has been administered continuously to rats through 17 generations. This investigation has covered a period of more than four years and involved a study of more than 10,000 rats. In the thymus-treated rats there has been observed an accruing accelera-

† Deceased August 14, 1937.

tion in the rate of growth and development, reaching its maximum in the 7th to the 10th generation. During the early period of the life of the offspring, the rate of growth and development has been increased from 100 to 300 per cent or more. Thus the young of the thymus-treated strain in the early days of life may be double the normal size, and mature in from one-half to one-fifth of the time normally required. This precocity of growth and development has continued unabated to date, so long as treatment has continued in succeeding generations.

In contrast, in the thymus deficiency, resulting from thymectomy in seven successive generations, there is observed accruing retardation in the rate of growth and development. Thus the offspring in the 5th generation of thymectomized rats at 30 days are 20 per cent below weight and 20 per cent shorter than normal. They cut their teeth at ten to twelve days, instead of at eight days, and open their eyes at seventeen to twenty days, instead of fifteen days. Often they cannot be weaned until twenty-five to thirty days, instead of at twenty days.

This retardation of the young incident to thymectomy in the parents can be overcome readily by injecting thymus extract (Hanson) to parents, or by frequent implantation of homologous, young, whole thymus glands. In fact, either of these forms of substitution or replacement therapy may result in a normal rate of growth, or if it is overemphasized (1 cc. of thymus extract daily, or the implantation of one thymus gland at weekly intervals for twelve weeks) may result in marked acceleration in the rate of growth and development of the offspring through six generations.

This acceleration is evident only so long as the injections or implants are continued, and disappears rapidly following their discontinuance. Likewise, when normal rats are subjected to frequent homologous implants, precocity appears in the offspring. Thus the young of the normal thymus-implanted animals of the fifth generation

are precocious and are approximately equivalent in the rate of growth and development to the thymus-injected animals of the third generation.

Only thymus extract exhibiting iodine-reducing values of more than 15 mg. per cent have proved potent to date. Certain of the iodine-reducing substances, such as glutathione, ascorbic acid and cysteine have been tested by injection through succeeding generations of rats. Each of these individually has produced some effect in the second and third generation in normal animals, similar to that of thymus extract, but of a lesser degree. Glutathione effects both the rate of growth and development of the offspring, while ascorbic acid and cysteine, in the doses used, have effected the rate of development only. A combination of ascorbic acid and glutathione has been particularly effective. These substances, however, are not capable of overcoming the retarding effects of thymectomy, at least not in the doses used to date.

Chemical studies have been directed to the recognition of the growth agents in potent thymus extract. These studies indicate the presence of certain iodine-reducing substances in thymus extract, approximately in the proportions of ascorbic acid (50 to 55 per cent) glutathione (35 to 40 per cent) and cysteine (5 to 10 per cent).

Parallel quantitative experiments utilizing the thymus extract of calves and chemical preparations representing its partial reproduction with iodine-reducing substances, do not yield identical results. The iodine-reducing substances, in amounts larger than have been found in thymus extract can and do exert biological effects which simulate in a certain way the action of thymus extract. However, these substances are quantitatively less effective, they fail to show marked accruing effects through successive generations and they fail to overcome the retardation incident to thymectomy.

From these studies the conclusions seem justifiable that the thymus gland is concerned in some way with the rate of growth and development of the young, and that while

these iodine-reducing substances found in thymus extract evidently are linked in some way to the biological activity of thymus extract, they do not constitute the only active agents concerned. Obviously further investigation is needed before the biological activity of thymus extract can be explained adequately on a chemical basis.

ROWNTREE, L. G., 1935. The Thymus Gland. Glandular Physiology and Therapy. Jour. Amer. Med. Assoc.

—— 1935. Further Studies on the Thymus and Pineal Glands. Proc. Inter-State Post Graduate Medical Assembly of N. A.

—— 1934 (with CLARK, J. H., HANSON, A. M., and STEINBERG, A.). The Biologic Effects of Thymus Extract (Hanson). Jour. Amer. Med. Assoc. **103**: 1425–1430.

—— 1934. The Biological Effects of Thymus Extract (Hanson). Trans. Assoc. Amer. Physicians **49**: 252.

—— 1935. Biologic Effects of Thymus Extract (Hanson). Reprinted with additions from Archives of Internal Med. **56**: 1–29.

—— 1936. Biologic Effects of Pineal Extract (Hanson). Jour. Amer. Med. Assoc. **106**: 370–373.

—— 1936. The Biologic Effects of Pineal Extract (Hanson). Science **83**: 164–165.

—— 1936. The Biological Effect of Pineal Extract (Hanson). Endocrinology **20**: 348–357.

—— 1935 (with CLARK, J. H., STEINBERG, A., HANSON, A. M., EINHORN, N. H., and SHANNON, W. A.). Further Studies on the Thymus and Pineal Glands. Annals of Internal Med. **9**: No. 4.

—— 1936 (with CLARK, J. H., STEINBERG, A., EINHORN, N. H., and HANSON, A. M.). Further Studies on the Thymus and Pineal Glands. Penna. Med. Jour.

—— 1936. The Rôle of the Thymus Gland in Growth and Development. Trans. Assoc. Amer. Physicians, **51**: 148.

—— 1936. The Rôle of the Thymus and Pineal Glands in Growth and Development. N. Y. State Jour. Med. **36**: No. 18.

—— 1936–37 (with EINHORN, N. H.). The Biologic Effects of Thymectomy. Endocrinology **20**: 342–347; **21**: 659–669.

—— 1936. Biological Effects of Homologous Thymus Implants in Successive Generations of Rats. Science **84**: 23.

—— 1936. The Biological Effects of Thymectomy in Successive Generations of Rats. Science **83**: 443–445.

—— 1936 (with CLARK, J. H., and STEINBERG, A.). Differential Cell Counts of the Pituitary in the Thymus Treated Strain of Rats. Proc. Soc. Exp. Biol. and Med. **35**: 239–242.

FRANK C. JORDAN, Allegheny Observatory

Grants No. 30 (1934) and No. 83 (1935). Measurement of plates and computations for the determination of stellar parallaxes.

The mean number of plates used in these determinations is 30.2. The mean number of comparison stars is

4.3; the mean magnitude 11.16. The mean probable error of the parallax is ″.0057. The mean probable error weight unity is ″.0232 and of annual μ in right ascension is ″.0017.

Thirty-two stars have been measured and computed and are awaiting publication. The total number of plates measured and reduced during the twenty months of research was 2458.

JORDAN, FRANK C., 1935 (with CRISSMAN, BERTHA G.). Report of Progress. Miscellanea Amer. Philos. Soc. **1**: 1, 7.

CRISSMAN, BERTHA G., 1935. Report of Progress. Miscellanea Amer. Philos. Soc. **1**: 1, 7.

—— 1936. Photographic Determinations of the Parallaxes of Fifty Stars with the Thaw Refractor. Astron. Jour. **45**: 175–176.

C. E. MENDENHALL † and G. BREIT, University of Wisconsin

Grant No. 31 (1934). Experiments on nuclear disintegration and scattering with protons and deuterons accelerated by about 300 k.v.

An apparatus was constructed for the acceleration of protons and deuterons to energies of 250 kilovolts and quantitative experiments on the disintegration of Li with protons were made. The yields obtained are greater than those reported by the Cavendish Laboratory but are in good agreement with experiments made by Herb, Parkinson and Kerst in Madison in the range from 100 to 400 kilovolts by means of a Van der Graaf machine. The apparatus constructed with the aid of the grant gives lower voltages but is suitable for high currents.

Source of Voltage. The accelerating potential is produced by a rectifier voltage doubler set. The rectifier tubes are home made and are used on the pumps. In good condition 350 k.v. is developed but without further improvement 250 or 300 k.v. is the present maximum reliably producible voltage.

Proton Gun. A proton gun source of the type developed by Tuve, Dahl and Van Atta is used. Total ion currents of over 200 microamperes are usable. The fraction

† Deceased August 18, 1935.

of protons is about 25 per cent; not all of the current was used in the work on Li. It proved practical to use 10 microamperes of magnetically analyzed proton current in the experiments. The proton spot can easily be made smaller than 1 mm.

Accelerating Tube. This is a four section tube about 40 inches long and 12 inches in diameter. At times good performance at 300 k.v. and higher was obtained. Often 225 or 250 k.v. is the practical maximum. Experiments on tube design were made and an improved tube is under construction.

Improvements. The apparatus has been improved during the last two years. A voltage quadrupler has been found to be preferable to a voltage doubler and improvements in the accelerating tube have been made. A paper describing the outfit in its present form has appeared in the Review of Scientific Instruments. A manuscript of a paper on the results obtained on the excitation function of the lithium alpha-particles due to proton bombardment is being prepared and will soon be submitted to the Physical Review.

Personnel: Dr. N. P. Heydenburg, Dr. C. T. Zahn, Mr. L. D. P. King.

MENDENHALL, C. E., 1935 (with BREIT, G.). Report of Progress. Miscellanea Amer. Philos. Soc. **1**: 1, 11.

HEYDENBURG, N. P., 1936 (with ZAHN, C. T., and KING, L. D. P.). Alpha-Particle Yield from Lithium under Proton Bombardment. Phys. Rev. **48**: 100–101.

HAWORTH, L. J., 1937 (with KING, L. D. P., ZAHN, C. T., and HEYDENBURG, N. P.). Apparatus for Low Voltage Nuclear Research. Rev. Sci. Instr. **8**: 486–493.

ALEXANDER PETRUNKEVITCH, Yale University

Grant No. 32 (1934). The peculiar physiology of digestion and digestive enzymes in spiders.

PETRUNKEVITCH, ALEXANDER, 1935. Report of Progress. Miscellanea Amer. Philos. Soc. **1**: 1, 12–13.

CHARLES E. ALLEN, University of Wisconsin

Grant No. 33 (1934). Determination of the chromosome complements of heteroploid clones of Sphaerocarpos.

The grant allotted to me in 1934 made it possible to secure the services as research assistant of Miss Elizabeth Mackay. During the year from February 1, 1935, to February 1, 1936, she made a study of the progeny of triploid sporophytes of *Sphærocarpos Donnellii*. The germination of the spores produced by such sporophytes yielded a considerable family of gametophytes, the majority of which grew feebly and died while still small. These poorly viable plants included a few, coming from spore dyads, which were presumably triploid. Others may have been aneuploid. Seven survived long enough to be studied cytologically; all of these were diploid, with 14 autosomes. In addition to the autosomes, one plant, a male, had two Y chromosomes; the other six, all female, possessed each one X chromosome. These results, together with previous ones, show that gametophytes of this species with the following chromosome complements are viable: *Female,* $A + X$, $2A + X$, $2A + 2X$; *Intersexual,* $2A + X + Y$; *Male,* $A + Y$, $2A + 2Y$.

ALLEN, C. E., 1935. Report of Progress. Miscellanea Amer. Philos. Soc. **1**: 1, 8.

—— 1936 (with MACKAY, ELIZABETH). The Offspring of a Triploid Sporophyte. Proc. Amer. Philos. Soc. **76**: 781–790.

UNIVERSITY MUSEUM, UNIVERSITY OF PENNSYLVANIA,
Edgar B. Howard

Grant No. 36 (1935). Investigation of the problem of man's antiquity in America with particular reference to a study of possible routes of migrations from Asia.

There is one subject of recurring interest which neither political nor economic unrest seems to disturb, which put into the form of a question is: When did man first arrive in America and how did he get here?

The American Philosophical Society has been interested in the answer to these questions from many points of view, almost since its beginnings, as discussions in the Proceedings will show. It is, therefore, consistent that a grant was made in 1935 to follow up this line of thought in view of recent discoveries which established an antiquity of man in North America at least contemporaneous with an extinct fauna. This grant took the author to Russia, and though the results were largely negative so far as proof was concerned that our earliest known and highly specialized spearpoints had counterparts in Siberia, the inspiration derived from these studies has led to more intensive field work and an increasingly clearer picture of the problem as a whole.

Howard, Edgar B., 1936. Report of Progress. Miscellanea Amer. Philos. Soc. 1: 2, 27–30.

—— 1936. Early Man in America. Proc. Amer. Philos. Soc. 76: 327–333.

—— 1936. Early Man in America with Particular Reference to the Southwestern United States. Amer. Naturalist, 70: 313–323.

—— 1936. The Antiquity of Man in America. Sci. Monthly, 43: 367–371.

—— 1936. Studies of Early Man. Carnegie Inst. Wash. Year Book, 35: 323.

—— 1937. The Emergence of a General Folsom Pattern. Twenty-fifth Anniversary Studies: Phila. Anth. Soc. Univ. of Pa. Press, 111–115.

University Museum, University of Pennsylvania, J. Alden Mason

Grant No. 36 (1935). Archaeological expedition to Northern Mexico, 1935–1936.

The expedition personnel consisted of J. Alden Mason of the University Museum, University of Pennsylvania, and Robert H. Merrill of Grand Rapids, Michigan. For the first few weeks they were joined by Richard A. A. Martin of Boston. The primary purpose, to which the major part of the time and funds was devoted, was a search in northern Mexico for very early man, possibly on the Folsom Horizon. Practically all the research was conducted in the state of Durango. Actual field-work in this and adjacent states continued from January 11 until April 29, but official negotiations, the division of the collections with the Mexican

government, and similar business extended the actual period of the expedition from December 7, 1935, to May 24, 1936.

The principal quest of the expedition was not favored by success; no site of very ancient occupation was found. The two largest lakes in the region, Santiaguillo in Durango and Mayran-Viesca in Coahuila, apparently have no higher and older terraces on which camp-sites of post-glacial period might be sought. No reports of ancient camp-sites were received. About twenty-five caves were examined; excavations were made in some ten of these, and several days' work done in five. In these latter, excavations were carried down until apparent bedrock was reached, though in some cases this rock may have been large sections of fallen roof too massive to be moved. In no instance was the depth over five feet, and the artifacts found in the upper layers betrayed no marked difference from those of recent pre-Cambrian natives.

All surface sites of recent pre-Columbian occupation that were heard of, about fifteen, were investigated, and surface potsherds and other objects were collected. Little excavation was attempted at these sites since the concession granted by the Mexican government did not include such work. Nevertheless the results of this survey were probably the most important of the expedition, since the archeology of this region was almost completely unknown. The extension of the Chalchihuites Culture was traced to probably its northernmost limit at the site of Zape. This site, reported by Guillemin-Tarayre in 1870, was examined for the first time and ascertained to be of less importance than heretofore believed. Zape seems to be the northernmost site of basically Mexican culture. A short distance north of here the ancient cultures show more relationship with the Pueblo region of the American Southwest. No cliff-houses were noted so far south in the high mountains.

Carvings or paintings on rocks, observed in a number of places, were photographed and drawn. They are of

several types, some of which seem to be hitherto unrecorded. The most interesting groups are: some large, apparently non-pictorial, figures, often in rectangular or oval cartouches, found near Zape, and certain smaller pictorial figures painted in white on a black background in the interior of a dark cave near Torreon. It is hoped eventually to prepare a short monograph upon this topic.

Dr. Mason was especially gratified at the opportunity to spend a few days in linguistic research on Northern Tepehuan, a language never before studied, on which he had been anxious to work for several decades. A series of texts was taken which will probably be sufficient to work out the main elements and most of the details of the grammar. This language is very closely related to the Pima and Papago of Arizona, but is in some respects more archaic, preserving the final vowels that are elided in the other languages of this group. A grammar will eventually be prepared on the basis of this material.

Mr. Merrill made surveyed plans of all the sites and caves. About one hundred and fifty photographs were taken. The archaeological objects were equally divided between the Mexican Government and the University Museum, in accord with the concession, and those in the University Museum occupy about 646 catalog numbers.

Mason, J. Alden, 1936. Notes and News, Middle American Area. Amer. Antiquity 2: 55–56; 148–151.

—— 1936. Archaeological Work in Durango During March, 1936. Bull. Univ. of Pa. Mus. 6: 136–137.

—— 1937. Late Archaeological Sites in Durango, Mexico from Chalchihuites to Zape. 25th Anniversary Studies, Phila. Anthrop. Soc. 127–146.

University Museum, University of Pennsylvania,
Frederica de Laguna

Grant No. 37 (1935). Archaeological investigation of the lower Yukon Valley from Tanana to Holy Cross, Alaska.

In the summer of 1935 the University of Pennsylvania Museum sponsored an archaeological and geological exploration of the middle and lower Yukon valley, Alaska,

under the leadership of Dr. Frederica de Laguna. The work was financed by a generous grant from the Penrose Fund of the American Philosophical Society, supplemented by a grant-in-aid from the National Research Council. The other members of the party were Dr. A. J. Eardley, Department of Geology, University of Michigan, Mr. Kenneth Gorton and Mr. Norman Reynolds. The purpose of the expedition was to secure archaeological and geological information pertinent to a study of prehistoric occupation in the region. The expedition did not find any proof of man's existence contemporaneous with the fossil mammoth, horse, etc. The shifting of the river channels have changed the topography of the valley floor to such an extent as to make impractical any search for the camping places of early mammoth-hunters. There is a good chance, however, that indubitable proof of early man's existence may be found by accident.

The geological results of the expedition are being studied by Dr. Eardley and will form the basis for a history of the recent geology of the region. Archaeological sites belonging to the Indian groups at present inhabiting the region were visited and explored. The most significant single find was that of pottery as far up the river as the mouth of the Tanana. A petrographic analysis of the sherds is being prepared by Mr. Donald Horton, of the University of Pennsylvania. The general character of the ware, the shape and decoration of the pots, are so similar to those found in sites in northern Kamchatka that they argue the spread of pottery techniques from Kamchatka to Alaska, a cultural movement which did not involve Eskimo pottery in the Bering Strait region. This suggests that the movement was via the Aleutian Chain, even though no pottery has yet been found there. A study of the distribution of other archaeological types is expected to strengthen the hypothesis of such a movement. The culture of the prehistoric Indians of the lower Yukon is that of an Inland Athabaskan group, greatly affected by Eskimo

borrowings. These Eskimo traits themselves exhibit a blending of northern and southern Alaskan cultural complexes, shaped not only by internal development but by influences from the Canadian Arctic and Northeastern Siberia on the one hand, and from both sides of the north Pacific on the other. The comparative data for the study was obtained during the term of a National Research Council Fellowship in the Biological Sciences granted to Dr. de Laguna.

The expedition also made the first survey of the Khotol River and Kaiyuh Slough system, which enters the Yukon below Kaltag. The map prepared by Dr. Eardley was sent to the U. S. Geological Survey and has been embodied in recent maps of Alaska.

de Laguna, Frederica, 1935. Report of Progress. Miscellanea, Amer. Philos. Soc. 1: 2, 31–40.
—— 1935. Expedition to the Yukon. Bull. Univ. of Pa. Mus. 5: 50–57.
—— 1936. An Archaeological Reconnaissance of the Middle and Lower Yukon Valley, Alaska. Amer. Antiquity, 2: 6–12.
—— 1936. Indian Dance Masks from the Lower Yukon. Amer. Anthrop. 38: 569–585.
—— Notes on the Archaeology of the Middle and Lower Yukon Valley, Alaska. (In preparation.)

University Museum, University of Pennsylvania, H. U. Hall

Grant No. 71 (1935). Ethnological study of the Sherbro of Sierra Leone, British West Africa, their customs, their industries and art.

(Abstract of paper read at General Meeting, November 27, 1937)

The Expedition to Sierra Leone, British West Africa, of the University Museum, sponsored also by the American Philosophical Society, returned to Philadelphia at the end of last July, having spent seven months with the Sherbro of southwestern Sierra Leone for the purpose of studying their customs and making material collections to illustrate their industries and art.

The Sherbro, whose name for themselves is Bolom, have been little investigated from an ethnological point of view.

They depend for their livelihood on agriculture of a primitive kind and, being largely coast-dwellers, on fishing. The principal crops for home consumption are cassava and rice. Smoked fish and palm oil are exported to other parts of Sierra Leone; palm kernels and kola nuts are sold to traders for export to Europe and the United States. The crude palm oil made at home is a favorite condiment and also a generally used cosmetic. The yearly "brushing" or clearing and burning over of the farms is men's work. After this the tending of the farms is mainly the work of women.

The Sherbro of the Protectorate are ruled by their own Chiefs, elected from among the senior members of one or more "ruling houses" or clans in a given Chiefdom. They are assisted in the government of the Chiefdom by a council of elders, who are supposed to influence and to some extent control the Chief in his administrative and judicial activities, which are supervised by British Commissioners. This British system of "indirect rule" obtains throughout the Protectorate, as distinct from the region about Freetown which is governed as a Crown Colony.

Before British authority was made effective in the southern part of Sierra Leone, the real power behind, indeed above, the Chiefs was the Society known as Poro (Sherbro, Paw). On the whole, apart from certain abuses of power, Poro was an efficient instrument for the maintenance of law and order. It is still a power in the land. Membership is universal among Sherbro men. Not to be a Poro man is, in the Sherbro phrase, not to be a man at all.

The counterpart of the Poro, for Sherbro women, is the Bondo Society. It is the champion of women's rights and privileges. Novices are instructed in these and in the duties of womanhood during a period of seclusion in the Bondo Bush, or grove, similar to that undergone by Poro initiants in their Bush. Poro and Bondo rigidly exclude women and men respectively, from their groves. No woman is allowed so much as to see a Poro novice while Poro is "in the Bush."

At the beginning and at the end of a session of Poro, which lasts for three or four months, and is held every few years for the initiation and training of new members, the chief Poro official, the head of the local branch of the Society, makes a libation and an offering of food to the spirits of the ancestors for securing the welfare of the group. Similar offerings, followed by feasting and dancing, are made at irregular intervals by the head of a household for that household, by the head of a clan or *ram* for that *ram*, by the Chief or the senior representative of the ruling *ram* for that *ram* specifically and thus indirectly for all the *rams* of the Chiefdom. Such celebrations are the principal manifestation of the religious life of the people.

Marriage within the *ram* is unlawful. Such marriages are, however, nowadays permitted on condition of the sacrifice of a goat to the ancestors of the families concerned. The prohibition is reflected in the terms which are used to denote relationship. Descent in the *ram* is, traditionally, reckoned through the mother, though the tradition is now not always followed.

The Chief and the senior members of the *rams* control the land of a Chiefdom. Land may not be sold but, if effectively and continuously occupied with the permission of the elders, may be passed on by the occupant to his heirs, who are, properly, the children of his sister or of a female cousin who stands to him in the relationship denoted by the same term as that which signifies "sister" in our sense of the word.

HALL, H. U., 1937. The West African Expedition, November 1936–June 1937. Univ. Pa. Mus. Bull. 7: 5–10.

CHARLES P. OLIVIER, University of Pennsylvania

Grant No. 38 (1935). Study of meteor trains, including their heights, durations, drifts, spectra, constitution and other physical characteristics.

(Abstract of paper read at the General Meeting, November 26, 1937.)

With the grant voted by the American Philosophical Society the services of Dr. C. H. Cleminshaw were secured

for the period Sept., 1935, to June, 1936. During this interval his work consisted of examining all publications, in any language, where meteor train data were known or suspected to exist, and, when found, to make out a card giving the fullest particulars as to both meteor and train. He was also able to unearth, while on a visit to Columbia University, the card file, lost for many years, of the late Prof. C. C. Trowbridge, which was the only part of his data not long since turned over to me. Along with this work, Cleminshaw made valuable notes on the general subject and arranged his results in an excellent way. Since he left, I have undertaken the completion of the work. In this I have been aided by several scientists who have in some cases sent me unpublished data. My indebtedness in this is especially great to Prof. I. S. Astapowitsch of the U. S. S. R., a country where most extensive meteor work is being done.

To date, I have data on 693 long-enduring trains, all visible one minute or more except a few of shorter duration where motion was detected. The mere dates of 100 or more are available, without references. However, the former figure will be somewhat larger in the near future when additional publications have been examined. There is good reason to believe that this is already the largest and most nearly complete file on the subject in existence.

As the data have been collected, certain conclusions already stand out as probable, a few of which will be given. It is obvious that the phenomenon of motion in a long-enduring train is a complex one. We have many cases in which a long, cylindrical train contracts to an elliptical ball whose major axis may become one fifth or one tenth of its original length. We too have narrow, straight trains not changing shape much, but becoming wider. Others break up into a succession of irregular lumps. Many become S-shaped, others the shape of the Greek small xi. In fact the variety of forms taken by trains is very large.

The easy and almost certainly logical explanation for certain types of lateral or vertical motion is that they are caused by winds in the upper atmosphere. But the contractions call for other explanations. Also the sharp distinction between daylight (i.e. smoke) trains and night trains can no longer be held to, as I explained in a former paper here in the case of the great fireball of March 24, 1933. Other cases are found to substantiate this at least partly. Nor can we hold to the rather sharp limits assigned by Trowbridge to the stratum where meteor trains persist. The very cause of the long enduring glow needs further study, though we now know that meteors affect the ionization of the atmosphere, which gives one good clue. One of the most baffling problems, however, is to determine why some meteors leave trains, others do not. For instance, in the last good Leonid shower, that of 1931, I saw Leonid meteors of equal magnitude and velocity, a few leaving trains of several minutes duration, but most of which left trains lasting only a second or two. Yet those which did leave and those which did not leave trains were exactly alike to the eye. How is this possible?

Not until all the data are assembled can any study of wind directions be made. At best, due to scanty data, the results will be tentative. Enough exist, however, to prove that velocities up to 300 km/hour are not uncommon, that winds blow in different directions in superimposed strata which are often very thin, and that at times strong vertical components are present.

As further data can only be gathered by the good will and cooperation of all persons interested in science, no matter how casually, this opportunity is taken to urge upon everyone the importance of making full notes on the position and direction of drift of any long-enduring train seen and, what is equally important, reporting it.

OLIVIER, CHARLES P., 1936. Research on Meteor Trains. Proc. Amer. Philos. Soc. **76**: 772–773.

HARLAN T. STETSON, Massachusetts Institute of Technology

Grant No. 40 (1935). Investigation of cosmic-terrestrial relations.

The possibility that periodic tidal stresses in the earth's crust should be reflected in the frequency with which seismic disturbances occur has been investigated by various workers, usually from the point of view of phases of the moon or with a view to correlation of earthquake frequencies with distances of the epicenter from the sublunar point. Results from the former method of treatment have for the most part been conflicting, and the results from the latter method of analysis have been subject to a fortuitous distribution owing to the relatively few occasions when the moon can be near the zenith of the epicenter.

The present investigation, based on some 2,000 major earthquakes, seeks a possible correlation with lunar hour angle alone, which avoids the above-mentioned difficulty. When the seismic disturbances are restricted to major earthquakes recorded over 80° from the epicenter, and confined to the Philippine Island group and the Japanese Archipelago, two maxima are suggested falling approximately 12 hours apart, one corresponding to lunar time 8 hours, and the other to lunar time 20 hours. These occurrences are not far from the time of maximum tidal stress.

More significant are the results of a study of 150 deep-focus earthquakes with origins 100 kilometers or more below the surface. The frequency distribution of these deep-focus earthquakes is compared with a sine curve corresponding to the horizontal tidal force at the epicenters. A least-square solution shows the sum of the squares of the residuals from the most probable sine curve to be ¼ as large as would be the case were there but a chance distribution based on an arithmetic mean of the hourly frequency. Results, therefore, indicate a distinct tendency for major seismic disturbances to follow preferential positions of the moon with maxima occurring near the times when the horizontal component of the tidal force is a maximum.

STETSON, HARLAN T., 1935 (with LOOMIS, A. L.). Further Investigations of an Apparent Lunar Effect in Time Determinations. Monthly Notices, Roy. Astron. Soc. **95**: 5.

—— 1935. Report of Progress. Miscellanea, Amer. Philos. Soc. **1**: 1, 52–58.

—— 1935. The Correlation of Deep-Focus Earthquakes with Lunar Hour Angle and Declination. Science, **82**: 523–524.

—— 1936. Note on the Present Sunspot Cycle. Science, **83**: 205.

—— 1936. On the Effective Group-Velocities of Low Frequency Radio Time-Signals and the Apparent Variability of Velocity with the Region of the Earth Traversed. Terrestrial Magnetism and Atmospheric Electricity, **41**: 287–297.

—— 1936. Second Report of Progress of Research on Cosmic Terrestrial Relations. Proc. Amer. Philos. Soc. **76**: 759–765.

—— 1937. Correlation of Frequencies of Seismic Disturbances with the Hour Angle of the Moon. Proc. Amer. Philos. Soc. **78**: 411–424.

SPROUL OBSERVATORY, Swarthmore College

Grant No. 41 (1935). To determine the magnitude of stars, utilizing the energy received from them in wave-lengths in the red and infra-red parts of the spectrum.

The results of observations made mostly at the Sproul Observatory with a red-sensitive photoelectric photometer are given in this paper. Color observations numbering 1366 were made of 285 Harvard Ko stars. The effective wave-lengths are at 6800 A and 8300 A. Infra-red magnitudes of 281 stars were determined from 1089 comparisons of the effective stellar energy at 8300 A with that of a controlled incandescent lamp. The zero point of this magnitude system was determined from observations of Ao stars in accordance with the precepts of the I. A. U.

Colors from three different sources are combined with three accurate spectral classifications to form mean color excesses. The colors are from the Sproul Observatory, from Berlin-Babelsberg (Becker), and those formed by taking the difference between the infra-red and Hertzsprung's photographic magnitudes.

The color excess of giant K1 to Mo stars is definitely related to the trigonometric absolute magnitude. In the case of the G4 to Ko stars the corresponding correlation is weak. For both spectral groups color excess is related to the Victoria spectroscopic absolute magnitudes.

Photovisual, visual, and photographic magnitudes were predicted from the observed colors and magnitudes. The discussion of the predicted magnitudes indicates that the color of these stars is mostly independent of the spectral region used in measuring them.

The distribution of the effective stellar energy was directly observed (in terms of the stars) by means of an objective grating placed in front of the 24-inch lens. Spectrophotoelectric intercomparisons of Vega and β Pegasi extending over a range of 6000 A were made on several nights. These stars appear equally bright at 8250 A. The results show that if both stars are black bodies and if β Pegasi has a surface temperature of 3000° K, then that of Vega is near 11,000° K.

Hall, John S., 1936. Photoelectric Photometry at the Sproul Observatory. Astrophysical Jour. 84: 369–408.

Charles A. Kofoid, University of California

Grant No. 43 (1935). A morphological and physiological investigation of the neuromotor system of the ciliate Protozoa in all of the major types of ciliates with a view to defining the structure and function of such system.

1. The neuromotor system of *Anoplophrya lumbrici* (Schrank), simple astomatous ciliate from the intestine of the lumbricoid earthworm *Octolasium cyaneum* (Savigny) consists of 60 longitudinal rows of cilia, 20 on the ventral surface; 30 on the dorsal, and 5 more closely-set ones on each lateral margin. Ciliary rootlets below the basal granules of the ciliary rows connect with 60 primary longitudinal fibrils all of which join the anterior sutural fibril which crosses the anterior end of the ventral surface, and at the relict cytostomal depression passes internally and joins the motorium. From the angles of the motorium two other fibrils enter the endoplasm. A secondary set of 60 more superficial longitudinal fibrils lies between the primary ones and is joined to them by cross commissures. The motorium lies in the region where the ancestral pharynx may have been located.

2. The cilia beat in regular synchronized metachronic waves, propelling the organism with relatively great speed.

3. The anterior sutural fibril and primary longitudinal fibrils are interpreted as functioning in transmission of impulses initiating ciliary movements in the lines of cilia, while the secondary longitudinal fibrils and cross commissures provide for coordination which results in the orderly progression of waves of ciliary action.

4. In an early stage of binary fission the ciliary lines are crowded inward at both lateral margins at the future plane of division; a process of multiplication of the basal granules occurs on both sides of this plane, and an ectoplasmic wall of demarcation appears which later grows inward forming the plane of separation between the two daughters.

5. The neuromotor system of *Anoplophrya* may have arisen from that of the simple stomatous ciliates by degeneration of all of the fibrillar complex of the pharyngeal region except the connection of the motorium with the sutural fibril.

KOFOID, CHARLES A., 1938 (with HAMMOND, DATUS M.). The Neuromotor System of *Anoplophrya lumbrici*, a Degenerate Ciliate, from the Earthworm *Octolasium cyaneum*. Proc. Amer. Philos. Soc. 78: 595–614.

ADMIRAL JOHN D. NARES, Monaco

Grant No. 44 (1935). Preparation of base charts to be used in the new edition of the General Bathymetric Chart of the Oceans.

General information concerning the preparation by the International Hydrographic Bureau of the Third Edition of the General Bathymetric Chart of the Oceans was given in the Report rendered in 1936 and is contained also in Special Publication No. 30, Part A_I (North Atlantic Ocean), Part A_I' (South Atlantic Ocean) and Part B_I (Northern Part of North Atlantic Ocean) published by the International Hydrographic Bureau in May 1935, March 1936 and June 1937 respectively; it is not repeated here.

The actual plotting sheets drawn up by the International Hydrographic Bureau for the insertion of the soundings for the entire Bathymetric Chart number 980, representing a surface of 7,900 square feet; these plotting sheets, the scale of which is ten times greater than that of the published chart, form the basic documents used for keeping the General Bathymetric Chart of the Oceans permanently up to date.

For Sheet A_I, which was published in April 1935, the International Hydrographic Bureau used no less than 75 of these plotting sheets. This Sheet alone, which depicts a particularly frequented area of the North Atlantic Ocean, has necessitated the analysis and recording on the plotting sheets of some 64,300 soundings; 7,800 oceanic soundings were selected for the final publication. The preceding edition (1st May 1912) gave 4,820 and the previous one (1903) 3,280 oceanic soundings.

Sheet A_I', South Atlantic Ocean, published in January 1936, is based on 74 large-scale plotting sheets containing 18,900 soundings, of which 3,100 were selected. The preceding edition (July 1913) gave 1,668 soundings, while the First Edition (1903) showed 996.

Sheet B_I, published in June 1937, was drawn up by the International Hydrographic Bureau on 63 large-scale plotting sheets; this sheet has required the analysis and inscription of 41,000 soundings on the plotting sheets; 7,000 oceanic soundings were selected for the final publication. The preceding edition (1st June 1926) gave 2,780 soundings, while the First Edition (1st July 1903) showed 2,470.

The plotting sheets are on a scale about ten times greater; however, North of Latitude 65° N., the scale adopted for the plotting sheets is only five times that of the chart.

Sheet A_{IV} (Mediterranean Sea and North Indian Ocean) is to be issued on 1st January 1938, and was drawn up in 1937 by the International Hydrographic Bureau on 55 large-scale plotting sheets; having carried out the analy-

sis and inscription of 26,350 soundings on the plotting sheets, 3,700 oceanic soundings were selected for the final publication. The compilation involved the examination of 284 hydrographic charts for this area.

Sheet AIV′ (South Indian Ocean) was taken in hand in June 1937 and is nearing completion.

In the preparation of the Third Edition, the International Hydrographic Bureau has been privileged during 1935, 1936 and 1937 to have the collaboration and assistance of national Hydrographic Offices, of Cable and Steam Navigation Companies, of Oceanographical Institutes throughout the whole world; and financial grants have kindly been made by the National Academy of Sciences, Washington (Marsh Fund), the American Philosophical Society of Philadelphia (U. S. A.), and the International Association of Physical Oceanography, Liverpool (England).

FRANCIS BITTER, Massachusetts Institute of Technology

Grant No. 49 (1935). Installation and operation of a coil to give approximately 150,000 œrsteds continuously and the measurement of magnetic susceptibilities with this coil.

Grant No. 126 (1936). Continuation of experiments on the production of intense magnetic fields, and their effect on matter.

Grants received from the Penrose fund of the American Philosophical Society for the construction and operation of powerful electromagnets have enabled the writer to construct and make preliminary tests on air core coils giving in the neighborhood of 100,000 gauss in a volume of several cubic centimeters. To operate these coils large amounts of power, several thousand kilowatts, were required, and preliminary tests were made possible by the cooperation of the Boston Edison Company. These trials were successful, and an installation to make 1700 kilowatts available in the M. I. T. laboratories is nearing completion. Four magnets are being built, and it is hoped to have experiments under way within a few months. These

experiments are to include the Zeemann effect in strong fields under the direction of Professor G. R. Harrison; low temperature work under the direction of Professor F. G. Keyes; and a study of the magnetic properties of metals and alloys under the direction of the writer.

A history and description of the entire development will be published as soon as the installation is complete and operating satisfactorily.

Bitter, Francis, 1936–1937. The Design of Powerful Electromagnets. Part I. The Use of Iron, 7: 479–481; Part II. The Magnetizing Coil, 7: 482–488; Part III. The Use of Iron, 8: 318–319.

Lankenau Hospital Research Institute, Philadelphia, Stanley P. Reimann, Director

Grant No. 50 (1935). Biological effects of certain pure chemical compounds on proliferation, differentiation and organization of cells, etc.

One of the primary questions for investigation by the Staff of The Lankenau Hospital Research Institute is "what parts are played in growth and development by the naturally-occurring intra-cellular chemical compounds and groupings?" Cellular growth and development are divided for convenience into the processes of proliferation, differentiation and organization with due attention paid to such questions as determination, potency and others. In addition it is attempted to correlate the findings with anabolism, maintenance metabolism, catabolism and similar metabolic considerations. To this end, and as a beginning, the marine hydroid, Obelia Geniculata, was chosen as the test animal.

The obtaining of the necessary normal intra-cellular compounds for test was attended by great difficulties because of the extremely high standard of purity necessary for such experimentation. Therefore the chemical part under the direction of Drs. Gerrit Toennies and T. F. Lavine was undertaken as a research problem with each compound which could not be obtained in sufficient purity from

other sources, and various interesting results have been published on this phase.

The biological experimentation done under the direction of Dr. F. S. Hammett, Scientific Director of the Institute, has yielded, in general, the result that, in truth, each one of those so far tested which include numerous amino acids and several nuclear compounds, has a specific effect on one or the other phases of growth and development. Dr. Hammett has been able to generalize and now states that the pyrrolidone group as present actually or potentially in some of these compounds is a guiding factor in those processes which lead to the differentiation of cells.

The grant so generously given by the American Philosophical Society has made it possible to test several of these compounds and also to help in the general correlation of results on the others. Appended is a short list showing typically the effect of certain of these compounds on the growth processes of Obelia Geniculata.

(*a*) Glycine acts specifically to accelerate regeneration.

(*b*) Alanine has no apparent effect on the growth of the animal other than that which can be attributed to its specific dynamic action.

(*c*) Phenylalanine may, as a potential source of tyrosine, act in some small degree as a forwarder of differentiation.

(*d*) Glutamic acid hastens differentiation and organization.

(*e*) Tryptophane retards catabolism and thus may act as an indirect stimulus to general growth.

(*f*) Histidine may act similarly through its sustaining effect on metabolic expenditure.

(*g*) Uracil favors recurrent growth and retards differentiation, regeneration and metaplasia.

(*h*) d-Arginine has an effect similar to that of Uracil, which suggests the latter as a natural precursor of the former.

(*i*) d-Ribose has no specific effect on any of the developmental growth activities.

(*j*) Allantoin might favor growth in general but it has no specific influence on the increase in cell numbers.

Reimann, Stanley P. Reports of Progress. Miscellanea, Amer. Philos. Soc. 1: 1, 14–15, 1935; 1, 2, 47, 1936

—— 1936 (with Hall, Edith M.). Protective Action of Sulfhydryl against Carcinogenesis Induced with 1, 2, 5, 6-Dibenzanthracene. Archives Path. 22: 55–61.

Hammett, Frederick S., 1936. Comparison of d-Alanine, 1-Phenylalanine, and 1-Tyrosine with Respect to their Participation in Developmental Growth. Protoplasma, 27: 52.

—— 1937. The Role of the Amino Acids in Developmental Growth and its Possible Significance in the Cancer Problem. Amer. Assoc. Adv. Sci. 4: 167.

C. C. Little and W. S. Murray, Jackson Memorial Laboratory, Bar Harbor, Maine

Grant No. 51 (1935). Genetical and cytological studies on spontaneous mammary tumors in mice.

As the result of investigations on the genetics of mammary tumor incidence in mice it has been shown that in virgin females derived from reciprocal crosses there is definite evidence of transmission from mother to offspring of some influence outside of the chromosomes. This is the first evidence of inheritance of this type derived from mammals and has led to further studies which suggest that this influence may be transmitted by or through the milk from mother to nursing young. An entirely new line of investigation has been opened by this work.

Little, C. C., 1935. Report of Progress. Miscellanea, Amer. Philos. Soc. 1: 1, 20.

Murray, W. S., 1935. Report of Progress. Miscellanea, Amer. Philos. Soc. 1: 1, 20.

—— 1936 (with Little, C. C.). Extrachromosomal Influence in Relation to the Incidence of Mammary and Non-mammary Tumors in Mice. Amer. Jour. Cancer 27: 516–518.

Richard M. Badger, California Institute of Technology

Grant No. 52 (1935). Investigation of the spectra of the simpler polyatomic molecules in the photographic infra-red.

The absorption spectra of methyl cyanide and methyl isocyanide have been investigated in the region $\lambda\lambda$8800–

12,600. A number of bands were found in each case but it was not possible to resolve the rotational structure in any of them. However, with the use of other existing data a vibrational analysis of the spectrum of both substances has been made from which conclusions may be drawn regarding the structures of the molecules. It appears quite certain that both cyanide and isocyanide groups are linear and that in the former the carbon nitrogen linkage is quite definitely triple bond in character. In the isocyanide group one of the carbon nitrogen linkages approaches a triple bond rather closely, though it displays a very appreciable amount of double bond character in the vibration in which the group is bent out of the linear configuration.

The vapors of a number of alcohols and of nitric acid have been investigated in the region of the third harmonic of the O–H vibration. In the methyl alcohol band at $\lambda 9500$ the rotational structure can be fairly well resolved and it is possible to estimate the large moment of inertia of the molecule. The band is of a rather complex character due to two facts. In the first place the change in electric moment is not parallel to any of the principal axes of inertia. In the second place there appears to be a near superposition of several bands due to absorption from several excited low lying vibrational levels. From the general character of the spectrum it appears that the hydroxyl hydrogen is not free to rotate with respect to the methyl group, but that it does perform torsional vibrations of rather low frequency.

In the other alcohols it was found that the position and character of the O–H bands depend almost entirely on the type of alcohol and are little influenced by the molecular weight. In the primary alcohols, with the exception of methanol, the third harmonic O–H band has two components with centers at about $\lambda 9510$ and $\lambda 9560$, respectively. The latter is considerably the weaker. The double band leads to the conclusion that the hydroxyl hydrogen has two different positions of equilibrium. In the secondary and

tertiary alcohols the O–H bands are single and are found near λ9560 and λ9600, respectively.

In nitric acid vapor the occurrence of a band near λ9830 makes it fairly certain that this substance contains a hydroxyl group. In several of its characteristics the band appears to be unique among those of moderately heavy molecules which have so far been observed. It is anticipated that rather definite conclusions regarding the structure of the molecule may be drawn when computations which are now in progress have been completed.

Badger, Richard M., 1936. Report of Progress. Miscellanea, Amer. Philos. Soc. 1: 2, 54–56.

—— 1936. Researches in the Photographic Infra-red. Proc. Amer. Philos. Soc. 76: 776–779.

—— 1936. The Absorption Spectrum of Methyl Alcohol Vapor in the Photographic Infra-red. Jour. Chem. Phys. 4: 469–473.

—— 1936. Absorption Spectra of the Vapors of Twelve Alcohols and of Nitric Acid in the Region of the O–H Harmonic Band at λ95,000, Jour. Chem. Phys. 4: 711–715.

—— 1937 (with Bauer, Simon H.). Remarks on the Spectra of Methyl Cyanide and Methyl Isocyanide. Jour. Amer. Chem. Soc. 59: 303–305.

Ernest W. Brown, Yale Observatory

Grant No. 53 (1935). To complete work on the motions of the moon and in particular the motions of the perigee and node, necessary for complete comparison with observation.

Reports read at General Meetings of the American Philosophical Society held on November 28, 1936, and November 26, 1937.

Henry Eyring, Princeton University

Grant No. 56 (1935). Theoretical calculation of the absolute rates of chemical reactions using the methods of quantum mechanics and statistical mechanics.

Seven papers have been published in which one or more of the authors were assisted from this grant. These papers are:

(1) Theoretical Calculations of the Energy of H_3, J. of Chem. Phys., 4, 121–130 (1936), by J. O. Hirschfelder, Henry Eyring and N. Rosen.
(2) Theoretical Calculation of the Energy of H_3^+, J. of Chem. Phys., 4, 130–133 (1936), by J. O. Hirschfelder, Henry Eyring and N. Rosen.
(3) Reactions Involving Hydrogen Molecules and Atoms, J. of Chem. Phys., 4, 170–177 (1936), by J. O. Hirschfelder, Henry Eyring and Bryan Topley.
(4) The Theoretical Treatment of Chemical Reactions Produced by Ionization Processes, Part I. The Ortho-Para Hydrogen Conversion by Alpha-Particles, J. of Chem. Phys., 4, 479–491 (1936), by Henry Eyring, J. O. Hirschfelder and H. S. Taylor.
(5) The Radiochemical Synthesis and Decomposition of Hydrogen Bromide, J. of Chem. Phys., 4, 570–575 (1936), by Henry Eyring, J. O. Hirschfelder and H. S. Taylor.
(6) Absolute Rates of Four Atom Reactions, J. of Chem. Phys., 4, 661–673 (1936), by William Altar and Henry Eyring.
(7) Calculation of the Energy of H_3 and of H_3^+. III. J. of Chem. Phys., 5, 695–703 (1937), by J. Hirschfelder, H. Diamond and H. Eyring.

These seven papers were all designed to go deeper into the theory of absolute reaction rates. (1), (2) and (7) apply rigorous quantum mechanics to the calculation of the potential energy of the activated state in the simplest type reactions which involve hydrogen. The results supply valuable evidence of the approximate correctness of the semi-empirical surfaces usually used in reaction rate theory. This type of calculation is being continued and other papers will be found in the literature. In (3) the semi-empirical potential energy surfaces are then used to calculate the absolute rate of the various isotopic reactions involving light and heavy hydrogen and the results are found to agree satisfactorily with those observed.

Papers (4) and (5) apply the new Theory of Absolute Rates to ionic reactions in the gas phase. No. (6) greatly simplifies current methods of calculating the potential energy of the activated state and for the first time calculates the absolute rate of a four-atom reaction having activated complexes (activated state configurations) possessing only a plane of symmetry.

Eyring, Henry, 1936. Report of Progress. Miscellanea Am. Philos. Soc. 1: 2, 52–53.

WILLIAM D. HARKINS, University of Chicago

Grant No. 57 (1935). Nuclear reactions caused by high velocity projectiles. (1) Quantitative relations shown by Wilson photographs. (2) Study of artificial radioactivity, especially that produced by neutron bombardment. (3) Scattering of neutrons by protons and other nuclei.

After a study of this problem, it was decided that the best use of this fund would be to initiate the building of a large cyclotron,[1] so that the amount of the fund was placed in what is termed "The Cyclotron Fund of the University" and was expended in part payment for the seventy-ton magnet which was constructed. Grants amounting to $17,000 were obtained from other sources and in addition the University has expended about $7,000 for research associates, who have thus far been engaged in the construction of this cyclotron, which is now practically ready to operate.

The cyclotron will be used for work in the synthesis and disintegration of atomic nuclei and in the production of artificially radioactive substances. The first of these artificially radioactive substances to be produced was nitrogen of mass 16, which was discovered in work in this laboratory early in 1933. The work which is to be undertaken will be both physical and biological in its nature.

D. H. WENRICH, University of Pennsylvania

Grant No. 58 (1935). Study of the morphology and life histories of the intestinal protozoa of man.

Grants No. 103 (1936) and No. 153 (1937). Continuation of a study of nuclear variations in the parasitic amoebae of man.

In the present program of study it is hoped: (1) to increase our knowledge of the finer structure of the nuclei in the various stages of the life cycles of these amoebae; (2) to work out the details of nuclear divisions; (3) to

[1] This change in purpose of grant was made without consulting the Committee of Research of the Society.

determine the range of nuclear variations for each species and to detect the extent of overlapping of species characters; (4) to determine as far as possible the causes of such variations as are found; and (5) to determine the effects of different methods of technique. The results to date include the following:

1. Confirmation of the existence of size races in *Endamoeba histolytica* and *E. coli;* and the recognition of size races in *Iodamoeba bütschlii.*

2. Recognition of races or individuals showing nuclear appearances corresponding to those thought by Kofoid and his associates to be characteristic: (*a*) for "Councilmania lafleuri" (in *Endamoeba coli*); (*b*) for "Councilmania dissimilis" (in *E. histolytica*); (*c*) for "Councilmania tenuis" (in *Endolimax nana*); and (*d*) for "Karyamoebina falcata" (in *Endamoeba coli*). Among these conditions is the formation of a crescent or plaque of chromatin against one or more sides of the nucleus. In many of these cases there seems to be demonstrated a mobility of certain chromatic elements of the nucleus without disruption of the fundamental nuclear organization.

3. Recognition of many abnormal nuclear conditions, some associated with prolongation of time outside the host, some with the presence of the parasite, *Sphaerita,* and some of unknown origin.

4. Since nuclear divisions were not found in trophozoites of *E. histolytica* and *E. coli,* these stages were studied in the trophozoites of *E. muris.* In these nuclear divisions the peripheral layer of granules against the nuclear membrane persists, an intradesmose is derived from the endosome, and the chromosomes form out of the periendosomal granules.

5. Nuclear division in *Dientamoeba fragilis* is mitotic; four rod-shaped chromosomes form and split longitudinally; an intradesmose forms out of a laterally placed division center.

6. Many experiments with technique have been made, showing: (*a*) Schaudinn's fluid with a little acetic acid added is probably the best fixing fluid for all these organisms, except *Dientamoeba fragilis;* this species fixes better when 10 to 20 per cent of acetic acid is added to Schaudinn's fluid or when fixed in modified Bouin's fluid containing 10 per cent of acetic acid; (*b*) Schaudinn's fluid with 10 to 20 per cent of acetic acid added causes the endosomes to stain less readily in *Endolimax nana* and in *Iodamoeba bütschlii;* (*c*) after Bouin's fluid the endosomes of *Endamoeba histolytica* and of *E. coli* do not stain well; (*d*) picromercuric fluid causes more protoplasmic extrusions, or "buds," to form on the cysts of *Endamoeba coli* and of *Endolimax nana* than does Schaudinn's fluid; alcoholic Bouin's fluid causes such "buds" on *Iodamoeba* cysts; (*e*) the endosomes of *E. histolytica* and of *E. coli* stain poorly or not at all with Haemalum; (*f*) the Feulgen technique stains very little or nothing in the nuclei of *E. histolytica* and *E. coli;* nothing in the nuclei of *Endolimax nana;* only the periendosomal granules in the nuclei of *Iodamoeba;* but all the nuclear granules of *Dientamoeba.*

WENRICH, D. H., 1937. Studies on *Iodamoeba bütschlii* (Protozoa) with Special Reference to Nuclear Structure. Proc. Amer. Philos. Soc. **76**: 183–205.

J. W. BEAMS and L. B. SNODDY, University of Virginia

Grant No. 60 (1935). (*a*) Acceleration of protons and deuterons to high velocity (several million volts) by a new method developed by the applicants and collaborators. (*b*) To study the effects produced by protons and deuterons with energies above three million volts when they collide with nuclei of other atoms, also their scattering in hydrogen.

Grant No. 99 (1936). Study of the nature of lightning. Photography of lightning discharges and measurement of electrical polarity and electrical moment of the flash. Special study of inter-cloud flashes. Continuation of study of cloud to earth flashes.

This abstract briefly describes an attempt to develop a method of accelerating ions to high energies by what may

be called the "surf board method."[1] In this "surf board" method the ions are accelerated by an electrical field which moves with the same speed as the ions. An investigation of this method is of considerable importance because if a practical apparatus could be worked out, ions with extremely high energies could be obtained without the use of high voltages.

The apparatus consisted of an evacuated long straight glass tube in which were mounted a large number of coaxial cylindrical electrodes properly spaced along the tube. An ion source was placed in one end of the long tube while a thin window projecting into a cloud chamber was placed at the other. The former was to supply the ions for the tube and the latter to measure the number and final energy of the ions. The electrical field which accelerated the ions was applied to the various electrodes in succession and at the proper time to give a maximum acceleration of the ions, by an electrical transmission line. It was soon found that in order to make the method of practical value two developments had to be made. First, it was necessary to work out the proper spacing and shapes of the accelerating electrodes to give the ions maximum acceleration and at the same time keep the ion beam properly focused. Second, an electrical transmission line was required which was free from attenuation and distortion even when considerable energy was required to charge the electrodes. Furthermore, it was not only necessary to apply the potential to successive electrodes in time intervals of from 10^{-7} to 10^{-8} sec., but it was desirable to decrease this time interval progressively down the tube as the ions speeded up. The first of these requirements offered no fundamental difficulties because it could be solved by carefully applying the established rules of electrostatic focusing of ions. However, the second requirement turned out to be very difficult and in the end has resulted in the development of a funda-

[1] Beams and Snoddy, Phys. Review 44, 784 (1933).

mentally new type of transmission line which we have called the gas transmission line.

At the beginning of this work, it was thought advisable to investigate both theoretically and experimentally all of the known types of transmission lines that seemed to hold any promise of solving our problem. To do this, it was necessary to construct an oscillograph which could resolve time intervals of 2×10^{-9} sec. as well as a rotating mirror that could resolve times of this same order. Briefly, these investigations [2] showed that with the proper modifications the known type of transmission line could be used for our purpose, provided ions over a million or so volts were not required. However, if the method was to give ions with energies much in excess of this, a new type of transmission line must be found. Fortunately, it was observed [3] that, if a long glass tube was evacuated to a fraction of a mm mercury pressure, a high impulsive voltage either negative or positive applied to one end, a potential wave traversed the tube from the high voltage end of the tube to the grounded end. If the pressure was adjusted properly, the wave front of the voltage impulse showed no appreciable flattening or attenuation. Furthermore, the velocity of the voltage impulse could be varied from 10^{8} cm/sec to 10^{10} cm/sec by varying the pressure, applied voltage and tube diameter. Clearly, this type of transmission line possessed the characteristics [4] that were needed so a thorough investigation of its properties has been undertaken.

Besides its immediate practical use for the development of the gas transmission line, an investigation of the propagation of potential and luminosity in long discharge tubes should give information on the general problem of the initiation of discharges in gases. While as yet this investigation has not been completed, much new information on the breakdown in gases has been secured.

[2] Snoddy, Trotter, Ham and Beams, Jour. Frank. Inst. **223**, 55 (1937).
[3] Snoddy, Beams and Dietrich, Phys. Rev. **50**, 469 (1936).
[4] Snoddy, Beams, Ham and Trotter, Nature **138**, 167 (1936).

The experiments consisted in measuring the speed of propagation of luminosity in long discharge tubes by the rapidly rotating mirror driven by an air turbine and in measuring the velocity of propagation, wave form, voltage attenuation and energy carried in the wave front, by means of the high speed cathode ray oscillograph. Each of the above quantities has been studied in dry air as a function of pressure and applied impulsive voltage in four long glass tubes with internal diameters of 1.7, 5, 18 and 142 mm respectively. A Marx circuit spark gap arrangement supplied an impulsive potential either positive or negative (approximately 125 kv in most cases) to one end of the long discharge tube, while the other end could be insulated or grounded. In every case it was found that the luminosity and potential waves started at the high voltage (positive or negative) end of the tube and traversed the tube to the grounded end at a velocity between 10^8 and 10^{10} cm/sec depending upon the pressure of the gas, the magnitude and sign of the impulsive potential applied, and size of the discharge tube. The luminous and voltage waves were found to move with approximately the same speed, but no definite experimental observations have as yet been obtained which show whether or not they are coincident. As soon as these initial waves arrived at the grounded end of the tube, a discharge wave starting at the grounded end and moving with about 1/3 the velocity of light returned to the input end. The velocity of this return wave was apparently independent of the tube diameter. There was a slight increase in speed with pressure.

In general, for the initial wave in the low pressure range, the speed increases with increasing pressure. From 0.01 to 0.2 mm the pressure vs. speed curves are steep. Above this range there is a decided flattening. At relatively high pressures the speed decreases and the wave shape is greatly distorted. The speed of the waves for a negatively applied voltage was much greater (a factor of 2 in some cases) than for the case of a positively applied

voltage. No appreciable difference between the speeds in dry air, CO_2 and H_2 was observed in the 5 mm tube. The speed at contrast pressure in dry air was an approximately linear function of the applied voltage (75–180 kv in the 5 mm tube). In general, over considerable ranges, the speeds were found to obey a principle of similarity, i.e., the same speed was observed in two tubes when the pressures were in the inverse ratio of their diameters.

The above experiments show that the initiation of the discharge in a long discharge tube very closely resembles the initiation of the lightning discharge, i.e., the initial luminous wave in the discharge tube can be identified with the well established[5] leader stroke of the lightning flash while the return wave in the discharge tube is very similar to the return stroke of the lightning flash. The phenomenon is also similar to the breakdown in long sparks.[6] Furthermore, the experiments indicate that it is possible to extrapolate from the phenomena obtained with the long discharge tube to those of the lightning flash. Or, in other words, a miniature lightning flash is produced in the laboratory where it can be subjected to a more complete investigation than is possible in the field.

During the summer of 1936, a photographic study of the lightning discharge with moving film cameras was carried on in the vicinity of Albuquerque, New Mexico by E. J. Workman, R. E. Holzer and L. B. Snoddy. The photographic equipment consisted of four cameras with fixed lenses, three of which were provided with films mounted on rotating drums, and one with a fixed film. Two of the rotating drum cameras were mounted so film motion was mutually perpendicular, thus providing vertical and horizontal time axes. Mounting two rotating drum cameras perpendicular to each other is very useful in studying

[5] Schonland and Collins, Proc. Roy. Soc. **A143**, 654 (1934); Schonland, Malan and Collins, Proc. Roy. Soc. **A152**, 595 (1935); McEachron, Elect. J. 31, 251 (1934); Workman, Beams and Snoddy, Physics 7, 375 (1936).

[6] Allibone and Schonald, Nature **134**, 736 (1934); Allibone and Meek, Nature **140**, 804 (1937).

complicated discharges in which stroke directions differ by as much as 90°. The photographic results lend themselves to a simple method of analysis.

The majority of the photographs were cloud-ground flashes, showing leader strokes and repeated strokes similar in all essentials to flashes reported by other investigators. Two air discharges, however, exhibited unusual features, and a third stroke was unlike any previously recorded.

Flash 1 was an air discharge from one cloud base to the second, initiated by a stepped leader (projected velocity 3×10^7 cm/sec) from one cloud to a region below a second cloud. .08 of a second after the leader stroke, a stroke proceeded between the ground and a second cloud which was immediately followed by a fast (4×10^9 cm/sec) discharge over the path blazed by the stepped leader. This delayed return stroke over air discharge path is apparently due to the fact that the cloud-ground stroke which immediately preceded it established a large difference of potential between the two clouds. The normal absence of return stroke in an air discharge between clouds is apparently due to the small difference of potentials which existed between adjacent parts of the same cloud.

Flash 6 was an air discharge between one cloud base and the region below the base of a second cloud. It consisted of 12 repeated strokes over essentially the same path at intervals varying from 1 to 33 milliseconds. The strokes were of the "dart leader" type, with no return strokes. Not all of the strokes were of the same length, and in some only a portion of the path, near the middle or the end, was luminous. The strokes may have been continuous over the entire path, but of intensity so low that they were not recorded photographically, as is apparently the case in some "stepped leader" strokes.

Flash 7, unlike any previous discharge, which has been photographed with moving drum cameras, is a complicated air discharge which occurred at the close of a cold front

type thunderstorm, a hundred microseconds after an intense cloud-ground flash four miles away. The flash, about 1000 feet from the cameras, followed a path which had a maximum height of about 350 feet above the ground. The total projected length of the path was about 0.8 mile. The discharge consisted of at least four apparently unrelated elments. Each element was a moving luminous dart less than 15 feet in length, traveling with variable velocity between 10^7 and 10^8 cm/sec. The most interesting features of the discharge are first, the number of very sharp reversals in the path, and second, the fact that at several points the stroke built up from a single point in the path and moved in opposite directions along the path.

In conclusion, it should be pointed out that many interesting phenomena observed on lightning photographs cannot be explained adequately because of lack of definite knowledge of the electrical field conditions. During 1937, a study in which photographic records will be correlated with extensive electrical measurements will be carried on under a grant of the American Philosophical Society.

Beams, J. W., 1936. Experiments on the Production of High Velocity Ions by Impulse Methods. Proc. Amer. Philos. Soc. 76: 771–772.

Walker Bleakney, Princeton University

Grant No. 61 (1935). Investigation of the isotopic constitution of natural and treated substances with particular emphasis on the study of the relative abundance of isotopes as related to chemistry, geology and biology.

The grant-in-aid from the Penrose Fund of the American Philosophical Society which was made to me in 1935 was used to great advantage in several ways. The principal basis for the request was the help needed in the isotopic analyses of many samples of gas submitted to me by many chemists and physicists scattered throughout the country. This work was of a somewhat routine nature but highly important to the men concerned. With the aid received several hundred samples were analyzed which would

have otherwise remained undone. Although the work, naturally, did not lead to publications under my name, it has helped materially in orientation problems connected with the separation of isotopes.

This grant further permitted the construction of improved apparatus first in the form of a permanent magnet spectrograph and later a large electromagnet. With the former the knowledge of the isotopic constitution of Ba, Sr, In, Ga, Li, Na, Mn, Cb, Pd, Pt, Rh, and Co was greatly extended. The following publications resulted from researches supported at least in part by the grant.

BLEAKNEY, WALKER, 1936 (with SMITH, L. G.). The Ionization Probability of He^{++}. Phys. Rev. **49**: 402.

—— 1936 (with SAMPSON, M. B., and RIDENOUR, L. N.). The Isotopes of Cobalt and Their Radioactivity. Phys. Rev. **50**: 382.

—— 1936 (with SAMPSON, M. B.). A Mass-Spectrograph Study of Ba, Sr, In, Ga, Li and Na. Phys. Rev. **50**: 456–460.

—— 1936 (with SAMPSON, M. B.). The Relative Abundance of the Isotopes in Mn, Cb, Pd, Pt, Ir, Rh and Co. Phys. Rev. **50**: 732–735.

—— 1936. Isotope Analysis with the Mass-Spectrograph. Proc. Amer. Philos. Soc. **76**: 774–776.

—— 1937. The Relative Abundance of Isotopes. Proc. Amer. Philos. Soc. **77**: 395–409.

LUCY B. ABBE, Cornell University (Now at University of Minnesota)

Grant No. 62 (1935). Determination by means of quantitative and qualitative analysis of the histological background for inherited size differences in *Zea mays*. This study is planned to be preliminary to selecting a few characteristic corn dwarf mutants for a developmental study of the plant as a whole and its histology from the embryo and growing point to the mature plant.

A comparison was made of the cells from previously measured internodes and leaves of several dwarf and dwarf-like corn types [1] and their normal sibs, and the following differences noted:

[1] Dwarf types studied were D_1, D_3, $Nana_1$, $Nana_2$, D^P, Wiggan's Dwarf, and Hayes' Dwarf.

1. Cells of dwarf plants were slower in coming to maturity than cells of their normal sibs, the more extreme dwarf types having a slower cell development than larger types.

2. Differences in cell diameter were found to be comparable to differences in internode diameter.

3. Differences in length between comparable dwarf and normal internodes were found to be correlated with differences both in cell length and cell number.

ABBE, LUCY B., 1936. The Histological Background for Dwarfism in Zea Mays. Proc. Amer. Philos. Soc. 76: 743–747.

J. C. JENSEN, Nebraska Wesleyan University

Grant No. 63 (1935). Determination of the relation between evaporation from shallow lakes and ponds and the precipitation from local or "heat" thunderstorms. This will also involve the amount of moisture added to the atmosphere by transpiration from growing vegetation.

Grant No. 107 (1936). Investigation of relation of evaporation from lakes and ponds to rainfall from local thunderstorms.

JENSEN, J. C., 1936. Evaporation and Rainfall Studies in the Northwest Minnesota Lake Region. Proc. Amer. Philos. Soc. 76: 747–759.

—— 1938. Evaporation and Rainfall Studies in the Northwest Minnesota Lake Region. Proc. Amer. Philos. Soc. 78: 651–670.

DONALD F. JONES, Connecticut Agricultural Experiment Station

Grant No. 65 (1935). Study of the genetic and cytological basis for atypical growth.

Paired changes, visible in adjacent areas, have been found to be frequent in maize aleurone and endosperm. They are the result of a shift of known color and texture genes and are similar to previously described paired alterations in pome and citrus fruits, maize pericarp and in bristle and body color characters in Drosophila. These paired changes are not due to a loss of genes but to an unequal mitosis such that genes are removed from one daughter cell and doubled in the other.

In both paired and unpaired somatic changes, linked genes are lost or shifted together or separately. Seeds treated with X-rays shortly after fertilization show a marked increase of inter-chromosomal mosaics in adjacent areas.

The dark part of a paired aleurone color mosaic may revert to normal, to colorless or may become still darker. Some of these secondary changes are paired alterations. Linked genes may shift together or separately in these secondary changes.

Tissues that have lost one or more genes are highly unstable and may show frequent losses of other genes on the same chromosome in subsequent cell generations. Chromosome stability, as measured by the frequency of mosaics varies widely in different families and from one generation to the next in the same family.

Reciprocal gene exchanges occur between non-homologous chromosomes. There may also be an interchange between homologous chromosomes during development, but whether this is somatic crossing over at homologous loci or some form of unequal translocation, remains to be determined.

Changes in cell size and arrangement occur alone or may accompany changes in color and texture. These tissue alterations result in depressions and outgrowths which are sometimes paired. Atypical growth in both plants and animals is considered to be the result of the removal from, or concentration in, certain cells of essential growth-regulating substances brought about by unequal mitosis, with or without visible alteration of the chromosomes. This unequal mitosis may be induced by external agencies or by inherited defects of the mechanism of cell division transmitted in part by the female parent.

In both animals and plants external agencies can do little, if anything, more than what may occur spontaneously in the organism itself. When normal mitosis is interfered with the resulting cells, if viable, may change their usual

activities and regulatory powers. This deviation from normal during development is not dependent upon visible derangement of the mitotic structure since it has been shown for both animals and plants that chromosomes with mutant genes or small deletions may be substituted for normal members in somatic cell division. But the departure from normal growth may become wider in succeeding stages, as more and more essential genes are lost with the increasing irregularity of the mitotic mechanism, until finally the cells die or lose, in varying degrees, their ability to coordinate growth with the other parts of the organism.

JONES, DONALD F., 1936. Report of Progress. Miscellanea, Amer. Philos. Soc. 1: 2, 60.

—— 1936. Atypical Growth. Amer. Nat. **70**: 86–91.

—— 1936. Segregation of Color and Growth-Regulating Genes in Somatic Tissue of Maize. Proc. Nat. Acad. Sci. **22**: 163–166.

—— 1936. Mutation Rate in Somatic Cells of Maize. Proc. Nat. Acad. Sci. **22**: 645–648.

—— 1937. Tumors in Drosophila Melanogaster Resulting from Somatic Segregation. Science, **84**: 135.

—— 1937. Somatic Segregation and Its Relation to Atypical Growth. (Preliminary Report.) Proc. Amer. Philos. Soc. **77**: 411–416. (Full report.) Genetics, **22**: 484–522.

ROBLEY D. EVANS, Massachusetts Institute of Technology

Grant No. 68 (1935). Perfection of a new instrument for detecting radium poisoning before the appearance of clinical symptoms, for the study of the progress of patients under medical treatment for radium poisoning, and for detecting poisonous radioactive contaminants in face creams, tonics, medicinal waters, and patent nostrums.

A portable, rugged amplifier, with a direct reading counting-rate-meter has been developed for the study of feeble gamma rays. The instrument has been simplified so as to permit successful operation for those not specifically trained in experimental physics. Quantities of radium of the order of 5×10^{-8} gm. or more may be determined in a few minutes. Calibrations have been made for determining the amount of radium contained in living victims of radium poisoning.

By means of such measurements, the presence of chronic radium poisoning in humans may be established five years or more before the appearance of any clinical symptoms. The possibility of administering early and more helpful therapy is thereby greatly increased.

EVANS, ROBLEY D., 1936 (with GINGRICH, N. S., and EDGERTON, HAROLD E.). A Direct Reading Counting Rate Meter for Random Pulses. Rev. Sci. Instr. 7: 450–456.

—— 1937. Quantum-Counter Amplifiers for Gamma Ray Detection, and Applications to Studies in Radium Poisoning. Proc. Amer. Philos. Soc. 78: 11–21.

WILLIAM R. AMBERSON, University of Tennessee
(Now at University of Maryland)

Grant No. 70 (1935). Study of the physiological significance of the plasma proteins. The research is directed to the study of the functional meaning of the proteins of the blood plasma.

Grant No. 145 (1937). Study of the behavior of the mammalian body when its normal blood colloids are replaced by gum acacia; the determination of the interrelationships between the various colloids in the blood stream during the period of recovery from "total plasmapheresis."

1. Most of the chloride of the cat's body is diffusible. It may be removed by long perfusion with Ringer-Locke solution made up with the sulfates of sodium, calcium and potassium instead of the chlorides. To this solution are added chloride-free beef cells and gum acacia.

2. By this technic plasma chloride has been reduced to as low as 6 per cent of normal.

3. In certain tissues, such as the red cells, skeletal muscle, the liver and the kidney all of the chloride is diffusible and tissue chloride varies directly with plasma chloride.

4. In other tissues such as stomach, spleen and salivary glands there is evidence for an indiffusible chloride fraction which is not accessible to perfusion, in addition to a diffusible fraction which varies directly with plasma chloride.

5. This retention of chloride is particularly striking in central nervous tissue. Cerebrum, cerebellum and spinal cord all hold their chloride tenaciously, and lose very little even when plasma chloride has been greatly reduced. At the same time, peripheral nerve loses most of its chloride.

6. It is concluded that the theory which holds that chloride is able to penetrate only into extracellular water must not be extended uncritically from muscle to all other tissues. Our data suggest very strongly that in some of the tissues a considerable fraction of chloride is intracellular.

7. Except in the erythrocyte the sulfate ion probably cannot penetrate the living cell membranes. It cannot, therefore, exchange with intracellular chloride, whose presence is thus made manifest in all tissues where it occurs.

AMBERSON, WILLIAM R., 1936 (with STANBURY, J. B., and WARWEG, E.). Total Plasmapheresis. Amer. Jour. Physiol. 117: 230–236.

L. R. CLEVELAND, Harvard University

Grant No. 72 (1935). Study in cytology with particular reference to hypermastigote protozoa.

CLEVELAND, L. R. Longitudinal and Transverse Division in Two Closely Related Flagellates. Biol. Bull. (accepted).

—— Origin and Development of the Achromatic Figure. Biol. Bull. (accepted).

—— Morphology and Mitosis in Teranympha. Archiv für Protistenkunde (accepted).

—— Mitosis in Pyrsonympha. Archiv für Protistenkunde (accepted).

MURRAY B. EMENEAU, Yale University

Grants No. 73 (1935) and No. 125 (1936). Investigation of the Dravidian and Munda languages of India, especially those which, possessing no literatures in written form, have been relatively unexplored in a scientific way.

EMENEAU, M. B., 1937. The Songs of the Todas. Proc. Amer. Philos. Soc. 77: 543–560.

RICHARD M. FIELD, Princeton University

Grant No. 74 (1935, in cooperation with the U. S. Navy and the American Geophysical Union). To determine the submarine structure of the lesser Antiles by geophysical means, including sonic sounding, gravity determinations, and the recently perfected (1935) submarine seismic method.

Report read at General Meeting of the American Philosophical Society held on April 22, 1937. Symposium on "The Geophysical Exploration of the Ocean Bottom" held November 26, 1937.

HORACE G. RICHARDS, New Jersey State Museum

Grant No. 75 (1935). To collect mollusks (especially land) from the Island of Cozumel, off the east coast of the Yucatan peninsula, Mexico. A study of the relationship of this fauna with those of Cuba and the mainland of Mexico and its possible bearing on paleogeography.

The island of Cozumel lies in the Caribbean Sea about sixteen miles off the east coast of the Yucatan Peninsula. In order to study the molluscan fauna of this island and to obtain data on the relationship of this fauna to those of adjacent regions, a visit was paid to the island in April, 1936. Twenty-two species of land and freshwater mollusks were collected, of which four are described as new. With the exception of two or three species of widespread distribution throughout tropical America, and one previously reported only from Arizona, all the Cozumel species are intimately related to Yucatan and Central American forms. None are distinctly Cuban. The study of this fauna does not favor a geologically recent land connection between Cuba and Yucatan, but suggests that those species that do show some West Indian relationship reached Central America in early Tertiary time by a Jamaica-Honduras-Nicaragua land-bridge. If there was no land-bridge between Cuba and Yucatan at any time during the Pleistocene, as appears to be indicated by the mollusks, there may be some

doubt cast on the theories recently advocated of a Pleistocene sinking of sea level of the magnitude of several thousand feet.

RICHARDS, HORACE G., 1937. Land and Freshwater Mollusks from the Island of Cozumel, Mexico, and their Bearing on the Geological History of the Region. Proc. Amer. Philos. Soc. 77: 249–262.

—— 1938. To Cozumel and Back. Frontiers, 2: 88–91.

WOMAN'S MEDICAL COLLEGE OF PENNSYLVANIA, Esther M. Greisheimer

Grant No. 76 (1935, with Fay, M., Hafkesbring, R., Andersch, M., Kenyon, M., MacCalmont, W., Cortell, R., Ingleby, H., and Geiss, M.). Study of the effects of various general and spinal anesthetics on the nervous system, circulatory system, etc. . . . to be followed by the pathological examination of such tissues as the liver, kidney, brain and heart.

The purpose of this study is to compare the results of different types of anesthetics. Ethyl ether and cyclopropane have been studied to date.

The principal differences observed are: under ether, the blood becomes more concentrated, the decrease in potassium is more marked, the acidosis is pronounced, sugar and lactic acid increase markedly, and the increase in hemoglobin, erythrocytes and leukocytes is striking. The inorganic phosphate rises in both types of anesthesia.

Those blood constituents which did not vary consistently in either type of anesthesia include: total base, fatty acid, total and free cholesterol, phospholipid phosphorus, non-protein nitrogen, fibrinogen, albumin, globulin, and chloride.

In addition to the above chemical studies, certain physiological observations were made. The variation in body temperature, heart rate, respiration and blood pressure was strikingly greater under ether than under cyclopropane.

The pathological findings are summarized. After ether, the brain showed evidence of slight edema and chromotolysis. The heart was extremely dilated, with fragmentation and in some of the animals degeneration of the heart muscle

fibers was noted. The liver showed dilatation of the veins with acute degeneration of the liver cells. After cyclopropane, the brain showed some swelling and degeneration of the nerve cells. The heart was dilated, and showed cloudy swelling. The liver showed vacuolization of the liver cells. The lungs showed areas of collapse.

GREISHEIMER, ESTHER, 1937 (with FAY, M., HAFKESBRING, R., ANDERSCH, M., KENYON, M., MACCALMONT, W., SHARPE, M., and CORTELL, R.). The Effects of Anesthesia on Dogs. Ethyl Ether. Amer. Jour. Physiol. 119: 306.

H. A. BETHE and LLOYD P. SMITH, Cornell University

Grant No. 79 (1935). Studies in (1) the absorption of electrons in matter by the combined effect of scattering and energy loss; and (2) multiple scattering of neutrons.

The multiple scattering of electrons is calculated in terms of the well-known cross section for single scattering. The transmission of a collimated beam through a plane parallel plate is treated, neglecting energy loss; the transmitted intensity is found to be inversely proportional to the thickness of the plate for large thicknesses. Under certain conditions (nearly random distribution of velocities) the motion of the electrons can be treated as a diffusion problem and their energy loss taken into consideration; several applications are given. The absorption of fast electrons due to energy loss and scattering is discussed quantitatively. These considerations are applied to the determination of γ-ray energies from the absorption of their secondary electrons and very good agreement with experimental data is obtained.

BETHE, H. A., 1938 (with ROSE, M. D., and SMITH, L. P.). The Multiple Scattering of Electrons, Proc. Amer. Philos. Soc. 78: 573–585.

C. E. MCCLUNG, University of Pennsylvania

Grant No. 81 (1935). Collection of Orthopteran material for cytological study in Cordoba, Tecuman and Mendoza and along the river Uruguay in South America.

This grant was employed to finance a collecting expedition into northern Argentina. It was very economic-

ally accomplished by sending one of our young colleagues who lives in La Plata, who, with native assistants, was able to secure some eight hundred specimens of Orthopteran material. All were new to our collections, and some of them represent new sub-families. From these the testes were removed and preserved cytologically. The dried bodies have been pinned out and classified, a lengthy taxonomic task, and the work of sectioning for cytological study has been partially completed.

The material so secured is only a part of our very large collection of similar specimens from all over the world, and it is used by a large number of investigators and graduate students working on problems of chromosome structure and relationships in closely related groups. It will obviously take much time to fit this material into our very comprehensive general scheme. It will be used with other material for many doctor's theses and in long-time research problems.

CHARLES R. MOREY, Princeton University

Grant No. 86 (1936). Continuation of the excavation of Antioch-on-the-Orontes in Syria.

Since the excavations of 1937 included under the new concession the site of Seleucia, the port of Antioch, the season was divided into two parts, concentrating in the first part on Antioch and Daphne, and in the second part on Seleucia. At Antioch the excavation of the Main Street of the city was continued and developed some important facts of the topography of the city and an incidental discovery of considerable importance, namely a group of marble statuettes of excellent quality found in the stratum of the early first century A.D. In addition a mosaic pavement was found and secured for the Expedition which had for its central motif a personification of ANANEOSIS (Renewal) typified by the bust of a woman holding a wine amphora. At Daphne, the suburb of Antioch, five miles to the southwest, which has been a veritable mine of mosaic

pavements, an additional number were uncovered during the present season. One displays a beautiful figure of Narcissus, and another, a male head with a wreath of leaves, grapes and grain, both dating in the second century A.D. Another pavement was found, executed in the unexpected technique of cement painted in a geometric design giving the aspect of a floor of colored marble.

A large villa dating in the third century A.D. was discovered at Daphne. The excavation of it was initiated during the present season but will be completed next year. The pavements uncovered represent Ganymedes offering a drink to the eagle of Zeus, and an extraordinary spectacle of a table set with a complete meal of seven courses. A pavement of another room of the same villa has a seated figure of Narcissus. The results of this dig were so large that extensive excavations will be carried on in this portion of Daphne in the coming year.

At Seleucia the market gate was completely excavated and the market place itself was dug to the extent which time allowed. A colonnaded passage and a row of shops were uncovered and in them a considerable number of bronze objects were found as well as a statuette of a seated male divinity. Near this area a bath was found which had been covered by the collapse of a stone vault and had never been entered or plundered. The débris contained the torso of a nude male figure in marble.

A survey was conducted of the inner harbor of Seleucia, which is now largely marsh land, and a considerable excavation was made on one of the spurs of Musa Dagh within the city wall on the site of one of the luxurious villas built there. Mosaic pavements of this house were especially fine, including a panel picturing a nimbed Bacchus awakening the sleeping Ariadne, and a number of others with mythological scenes, notably one representing Perseus and Andromeda. In another portion of these spurs of the mountain, the rock cut stairway down the face of the cliff,

described by Polybius, was indentified and cleared. The last find made during the season at Seleucia was a half destroyed mosaic floor which originally had the personifications of four provinces in the center, of which Cilicia was the only one completely preserved. In the four corners of the floor were busts personifying rivers, those preserved being Tigris and Pyramus, the latter one of the finest mosaic figures that has come out of the excavation of Antioch and its vicinity.

Morey, Charles R., 1936. The Excavation of Antioch-on-the-Orontes. Proc. Amer. Philos. Soc. 76: 637–651.
Downey, R. E. G. Seleucid Chronology in Malalas. Amer. Jour. Arch. (to be published)
—— Imperial Building Records in Malalas. Byz. Zeitschr. (to be published).
Stillwell, Richard. Antioch-on-the-Orontes, Volume II.

Rudolf Höber, University of Pennsylvania

Grants No. 88 (1936), 135 (1937) and 148 (1937). Investigations on the isolated surviving liver of the frog, secretory power of the liver with respect to the bile-pigments and other dyestuffs.

Earlier experiments have shown that the frog liver when perfused with Ringer's solution containing natural or artificial pigments is able to secrete these substances in concentrations several hundred times those in the perfusing solutions. This secretory activity of the surviving organ can be stimulated by certain organic substances and inhibited by others. In the group of compounds exhibiting an inhibitory effect have been found those which possess a strong affinity for water, are surface inactive, and produce dehydration and condensation of hydrophilic colloids. Examples of such substances are sugars, polyhydric alcohols, amino acids, and bivalent aliphatic acids and oxyacids. The members of the group promoting secretion are surface active and disclose organophilic and hydrophobic properties on one side of their polar molecules and hydrophilic qualities on the other side. To this group belong the bile acids, higher fatty acids, carbamates and saponin. The same division into groups has been met with in experiments

upon the influence of a fairly large number of organic substances on the dispersity of lecithin sols and in experiments on the production of injury potentials in muscle and nerve. From these results it is concluded that the secretory activity is in some way dependent upon the alteration of the condition of the cell colloids in the direction of either a higher or a lower degree of dispersion.

Höber, Rudolph, 1938 (with Moore, Elinor). Experiments Concerning the Secretory Activity of the Liver. Proc. Amer. Philos. Soc. 78: 587–593.

Samuel Levine, University of Pennsylvania

Grant No. 89 (1936). To develop methods for evaluating the Gibbs phase integral for dense gases, solutions and liquids.

1. Interaction of Two Hydrophobic Colloidal Particles and Stability of Colloidal Sols.—An expression for the electrical forces acting between two hydrophobic colloidal particles is developed by applying the Debye-Hückel theory of electrolytes to the overlapping ionic atmospheres of the two particles. The van der Waals attractive forces are also calculated. The results lead to an explanation for the values of the concentrations of ions of different valencies necessary to coagulate a sol. From the form of the energy curve for the two particles the phenomena of slow coagulation and thixotropy can also be understood. A number of papers on this work will appear shortly in the Transactions of the Faraday Society.

2. Theory of Monatomic Liquids of the Rare-Gas Type.—By considering successive shells of atoms about a given atom in a liquid, an expression for the spacial distribution function for liquids is developed. This leads to expressions for the internal energy and specific heat of the liquid. By applying the virial theorem, an equation of state is also derived. The theory is applied to liquid argon. A paper will appear soon in the Proceedings of the Royal Society of London.

HARRY ROWE MIMNO, Harvard University

Grant No. 91 (1936). Experimental study of the changes in ionization occurring in the upper levels of the earth's atmosphere during the total eclipse of the sun, June 19, 1936. Observations by specially designed radio apparatus.

(Abstract of paper read at General Meeting, November 26, 1937)

A group of engineers and physicists from the Cruft Laboratory of Harvard University conducted radio measurements at Ak-Bulak, Western Turkistan, during the Russian solar eclipse of 1936. They employed three specially constructed transmitting sets in the measurement program, while using a fourth transmitter for communication with the University. Radio measurements made during a solar eclipse are interesting because the sudden and temporary removal of sunlight produces violent electrical changes in the outer layers of the earth's atmosphere. By means of a detailed study of these changes it is possible to investigate the nature of solar radiation and to investigate the behavior of the outer atmosphere. By employing a new and compact method of arranging the data it is possible to present on a single diagram the details obtained from hundreds of field observations made by two independent methods.

A three-dimensional space model has been prepared which represents the equivalent heights of the F_1 and F_2 layers as functions of frequency and of time on the morning of the eclipse. The space model exhibits a considerable amount of detail which can best be studied by means of a contour diagram. Additional diagrams indicate the conditions found in a series of control measurements which were made on days preceding and following the eclipse. The eclipse effect is large in magnitude. The results do not indicate the presence of corpuscular radiation in measurable amount. Ultra-violet radiation appears to be chiefly responsible for the ionization of the F region.

ETHEL BROWNE HARVEY, Princeton University

Grant No. 93 (1936). Study of the development of sea urchin eggs without nuclei.

(Abstract of paper read at General Meeting, November 27, 1937)

Parthenogenetic merogony is a combination of parthenogenesis and merogony. In parthenogenesis, the egg develops without fertilization; therefore the male nucleus is lacking. In merogony, a portion of an egg without the egg nucleus is fertilized; therefore the male nucleus is present but the female nucleus is lacking. Parthenogenetic merogony is the development of an egg without any nucleus at all, either the male or the female. Parts of eggs without the female nucleus are obtained by centrifuging. When sea urchin eggs are centrifuged at about 10,000 $\times$ gravity in a solution of the same density as the eggs (i.e. sea water and sucrose) so that they remain suspended, they become stratified, elongate and then break into two almost equal spheres. The nucleus always goes to the lighter pole so that the heavier halves of the eggs are entirely and always non-nucleate. With further centrifuging, the halves can be broken into quarters, three of which are non-nucleate. By treating these non-nucleate fractions with parthenogenetic agents such as hypertonic sea water, they are activated and start to develop. They throw off normal fertilization membranes, a large monaster forms, then an amphiaster, and the cleavage plane often comes in between the two asters. In *Arbacia punctulata* from Woods Hole, cleavage follows upon cleavage in a fairly orderly fashion, more and more cells being formed, until there is a group of some five hundred cells forming a fairly normal blastula. Some of these activated non-nucleate eggs have lived for four weeks; the normal unfertilized egg with a nucleus lives only a day or two.

Stained sections of the eggs after cleavage show well-formed asters often in pairs but no nuclei and no chromo-

somes. The Feulgen reaction which is specific for chromatin is negative.

In several other species of sea urchin occurring at Naples, non-nucleate halves of eggs can be obtained similarly by centrifuging. The nucleus in all the species always goes to the lighter pole. The granules, however, stratify differently in the different species, so that in some species the non-nucleate halves contain mitochondria and in some species they do not. The non-nucleate halves of all the species can be activated, throw off fertilization membranes and cleave, but the cleavage is not so regular as in *Arbacia punctulata,* though many-celled blastulæ are obtained.

All attempts to raise the non-nucleate eggs to a further stage of development beyond the blastula have so far proved fruitless. Variation of the parthenogenetic agent, isolation of individual eggs, change of temperature, addition of various salts to the medium, and the addition of various kinds of protein material, and of nucleic acid have been tried without success.

There is no doubt that cell division can take place when no nucleus is present and that eggs without nuclei can be activated with the usual parthenogenetic agents. The early stages of development up to the formation of a blastula can occur without nuclei. It now seems probable that for further differentiation nuclear material is necessary. It may very well be that the factors for specific and more detailed characteristics of an organism (such as eye-color) are carried by the genes which are located in the chromosomes or chromatin material of the nucleus; and that the factors for more fundamental and generalized characteristics are carried in the cytoplasm—not in the visible granules but in the matrix or "ground-substance" which in the living egg is optically empty.

Ruth B. Howland, New York University

Grant No. 94 (1936). Experimental studies on the location of the eye-level in egg and early embryo of *Drosophila melanogaster.*

Grant No. 111 (1936). Study of reciprocal transfers of imaginal discs between *Drosophila* larvae.

1. In 1935, Ephrussi and Beadle devised a method for transplantation of embryonal tissue between *Drosophila* larvæ of known genetic constitution, thus opening the way for the critical investigation of numerous problems in developmental mechanics, and closely linking together the two fields of experimental embryology and genetics. Their first investigations * were concerned with homoplastic transplantation of larval eye-disks in *D. melanogaster* and interspecific transplantation of ovaries between *D. melanogaster* and *D. simulans.* The successful outcome of these experiments prompted us to undertake the transplantation of wing-thoracic disks with a view to determining the experimental value of implanted wing and bristle-carrying tissues in determining the mechanisms of gene action.

Accordingly the dorsal mesothoracic disks from four day *D. melanogaster* larvæ were transferred into other larvæ of known ages. The stocks of wing and bristle mutants included: (1) ey^D/ci^D in which the 4th and 5th wing veins do not reach the wing margins, and the wings are held outspread, and (2) H^2 ext. which shows an extreme absence of bristles but retains the trichopores.

Implanted dorsal mesothoracic disks from 4 day donor larvæ develop in hosts of equal age to such a degree that differentiation into scutellum, dorso-lateral thorax and wing regions are easily recognized. Specific bristles can be identified, and the rows of thoracic hairs stand out distinctly. In implants from 2 1/2 or 3 day donors into 2 1/2, 3 or 4 day hosts the scutellum and dorso-lateral thorax are more fully developed than the wing-tissue. H^2 ext. im-

* Ephrussi, B., and Beadle, G. W., 1935*a*, Comptes rendus Acad. Sci. **201**: 98–99 and Ephrussi, B., and Beadle, G. W., 1935*b*, Biol. Bull. **69**: 492–502.

plants develop autonomously, few, if any, bristles appearing on the thoracic portions, the site of missing bristles being marked by trichopores. Venation and marginal wing defects cannot be recognized in implanted tissues. However, the initial findings on bristle-bearing tissues suggests that these regions may serve as reliable and accurate material for experimental interpretation of gene action.

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2. Dorsal mesothoracic disks from mature wild type larvæ of *D. melanogaster* have been implanted in wild type larvæ of the same age. Striking bristle phenotypes identical with those found on the mutants forked and singed have been frequently obtained. In addition to these, there are found simple bent bristles and a variety of forms which do not resemble those characteristic of any known mutant in *D. melanogaster.* Since the implant develops in an inverted position these abnormalities are in all probability due to the compression of the bristles during development. It is evident therefore that compression effects must be considered, especially when studying the developments of bristle-bearing tissues in such mutant hosts as forked and singed.

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3. Interspecific implantations of wild-type and vermilion eye-disks were made within and between four species of *Drosophila.* The stocks used were *D. melanogaster* + and v^2, *D. simulans* + and v, *D. pseudo-obscura* Texas Race A + and y sn v, and *D. virilis* + and v^3 mt^3. The wild type eyes develop autonomously in all cases, the color of the virilis + eye being darker than any of the other three species.

The diffusible v^+ substance postulated by Beadle and Ephrussi * acts upon and modifies to wild type implanted vermilion eye disks of every species except that of *D. virilis* v^3 mt^3. The latter is intermediate with respect to the virilis + implant, but matches the other + implants. This

* Genetics, 1936, 21: 225–247.

not only indicates that each species produces a v^+ substance active within the species, but that this substance acts upon the v disks of any of the other species.

HOWLAND, R. B., 1937 (with GLANCY, E. A.). Le Comportement de + et de v Disques Optiques de la Drosophile Virilis Après Transplantation dans les Limites de l'Espécè. Comptes Rendus **124**: 783–784.

—— La Production de Phénotypes "Forked" et "Singed" Après Auto-implantation de Disques du Type Sauvage dans la Drosophile Melanogaster. Comptes Rendus **124**: 785–786.

—— Interspecific Transplantation of Wild Type and Vermilion Eye Disks in *Drosophila*. D. I. S. Carnegie Inst. Wash., Cold Spring Harbor, N. Y. **7**: 91. Abstract.

—— Development of Larval Wing-thoracic Disks on Implantation in *D. melanogaster*. D. I. S. Carnegie Inst. Wash., Cold Spring Harbor, N. Y. **7**: 89. Abstract.

—— The Effect of Compression on Bristle Growth in Wild Type and Self Implants of *Drosophila melanogaster*. Amer. Nat. **71**: 429–431.

—— Non-autonomous Development of v eye disks in *D. virilis*. Amer. Nat. (accepted).

—— 1937 (with GLANCY, E. A., and SONNENBLICK, B.). Transplantation of Larval Wing-thoracic Disks in *Drosophila melanogaster*. Genetics **22**: 196. Abstract.

—— Interspecific Transplantations of Wild Type and Vermilion Eye Disks in *Drosophila*. Genetics **22**: 197. Abstract.

—— Transplantation of Wing-Thoracic Primordia in *Drosophila melanogaster*. Amer. Nat. **71**: 158–166.

—— Transplantation of Wild-type and Vermilion Eye Disks among Four Species of *Drosophila*. Genetics **22**: 434–442.

OLIVER JUSTIN LEE, Northwestern University

Grant No. 96 (1936). Photography of stars down to the 12th magnitude or fainter with 10½ inch Prismatic Camera. . . . The whole sky from the north pole to declination minus 5° will be recorded on 10″ × 12″ special panchromatic plates giving about 100 square degrees each. This survey will yield a catalogue of all red stars to this limit of magnitude.

Mr. Richard F. Kinnaird, whose work for twelve months (September 1, 1936 to August 31, 1937) was made possible by this grant-in-aid either made or assisted in making 32 field exposures of four hours each: a large number of shorter exposures for the purpose of testing various brands or emulsions of plates and for other purposes: 27 spectrograms of Comet Finsler having exposures ranging from 20 minutes to 1½ hours in length: marked the stars to be

studied on 26 $10'' \times 12''$ field plates, numbered these stars on six plates and identified them on three. In this connection he proposed a faster and easier method of identifying the stars, which we adopted: classified 25,000 stars on 25 plates as to spectral type and class of intrinsic luminosity.

E. A. Culler, University of Illinois

Grant No. 97 (1936). Continuance and extension of work on hearing and conditioning; motor conditioning to sound; measuring electric phenomena of nervous tissue. Work will cover the neural and cortical changes which accompany learning in animals.

Earlier investigators have reported that learning is impossible in the curarized animal. To test this conclusion, the animal is prepared as follows. Both M. semi-tendinosus are exposed; either one contracts strongly when the paw of its hind-limb is shocked. The right muscle is then conditioned until it responds vigorously to sound of bell. Animal is next curarized. Even though the right muscle is still capable of a slight but clear twitch when paw is shocked, the CR (conditioned reaction) just established has utterly vanished. The left muscle is now conditioned under curare to the same bell (shock to left paw), until it twitches every time bell is sounded. Upon recovery from the drug, animal is tested with bell; the normal CR in right muscle now reappears clear and strong, whereas the curare-CR in left muscle betrays no sign of its presence. Upon recurarization bilateral reversal again occurs: the normal CR on right side wholly vanishes while the curare-CR reappears clear and prompt. The facts schematize as follows:

	Semi-tendinosus muscles	
	Right	Left
Normal	CR established	
Curare	CR vanishes	CR established
Normal	CR reappears	CR vanishes
Curare	CR vanishes	CR reappears

These results are of real theoretic interest. We are now able to condition a dog independently on separate levels of the central nervous system to the same stimulus at the same time. It is an experimental form of *dual personality:* the animal has two independent behavior-systems to the same stimulus, one in one state and one in the other. Normal learning proceeds at cortical levels, curare-learning presumably at sub-cortical levels (owing to cortical depression).

The above functional observations have been checked by electric (chronaxic) tests in this way. Under complete general anesthesia, the following entries are made: (*a*) one M. semi-tendinosus is exposed for observation; (*b*) one, or more, of the spinal motor-roots serving this muscle (6th and 7th lumbar, 1st sacral) is exposed; (*c*) the heterolateral cortical area, directly behind cruciate sulcus, which serves this muscle, is exposed. The same muscle can thus be stimulated either from the cortex or from the spinal motor-root. Anesthesia being discontinued, the normal rheobase for both cortex and motor-root is found; the chronaxia is then determined by repeated tests until it is found to be stable and consistent from test to test. Curare is then administered intra venam until all signs of spontaneous breathing cease, the animal being maintained by mechanical ventilation. Chronaxia is then again determined at both cord and cortex by repeated tests until breathing returns. After full recovery from the drug, the second normal measurements are made. Results in most cases are as follows:

	Spinal root	Cortex
Normal state	normal chronaxia	normal chronaxia
Curarized state	shorter than normal	longer than normal
Normal state	normal chronaxia	normal chronaxia

The chronaxic determinations therefore confirm our hypothesis of *cortical depression* under curare; this is all the more significant in that it is accompanied by spinal sen-

sitization. The plane of cleavage dividing the two "personalities" thus appears to pass between cortical and subcortical levels.

Dr. Edward Girden, H. W. Ades, John D. Coakley and P. S. Shurrager collaborated in this investigation.

Albert Tyler, California Institute of Technology

Grant No. 98 (1936). Investigation of the temperature coefficients of the respiration of unfertilized and fertilized eggs.

Temperature coefficients for the rate of oxygen consumption of unfertilized and fertilized eggs of *Urechis caupo, Strongylocentrotus purpuratus, Ciona intestinalis* and *Dendraster excentricus* were determined. The results showed no large differences between the unfertilized and the fertilized eggs. The temperatures of the experiments extended in some cases beyond the range in which normal development is possible. With *Urechis* and with *Strongylocentrotus,* the experiments were run at temperatures between 22° and 5°; with *Ciona,* between 25° and 12°; and with *Dendraster,* 22° and 12° C. In most of the temperature range no significant differences between the coefficients for unfertilized and for fertilized eggs are manifest. At the lower temperatures there are differences that are possibly significant, the unfertilized eggs giving consistently lower values. In all four animals, the unfertilized eggs exhibit a rising rate of respiration with time. The rise is much more rapid in *Strongylocentrotus* and *Dendraster* than in *Urechis* and *Ciona;* it appears to be correlated with the length of fertilizable life of the egg. Methods of determining the temperature coefficients that take into account the general rise and other variations are described. Comparison of the absolute rates of respiration of the unfertilized and fertilized eggs shows in *Dendraster,* as well as *Strongylocentrotus,* the rise in respiration upon fertilization typical of the echinoids; in *Ciona* a less than two-fold rise occurs; in *Urechis,* the rate may rise considerably, re-

main constant or decrease slightly, depending upon the particular batch of eggs employed. In this form the absolute rate of respiration of the unfertilized eggs decreases with increase in the length of time that the animal is kept in captivity. The results are in accord with the view that a change in temperature affects maintenance, growth and differentiation similarly.

TYLER, ALBERT, 1937 (with HUMASON, W. D.). On the Energetics of Differentiation VI. Comparison of the Temperature Coefficients of the Respiratory Rates of Unfertilized and of Fertilized Eggs. Biol. Bull. 73: 261–279.

EVERETT S. WALLIS, Princeton University

Grant No. 101 (1936). Development of methods for the laboratory preparation of oestrus-producing hormones (female sex hormones).

(Abstract of paper read at General Meeting, November 26, 1937)

A. It is well known that whereas the structural formulas of the sterols, cholesterol, ergosterol, and stigmasterol are well established, our knowledge of sitosterol is unsatisfactory. This is due to the fact that this plant sterol obtained from most sources is not a homogeneous substance but is a mixture of sterols which can be separated only with great difficulty. Investigations carried out in this laboratory during the past year have established beyond doubt the structure of β-sitosterol, one of the sterols of this sitosterol complex. Conditions have been found under which it is possible to selectively hydrogenate stigmasterol to yield 22-dihydrostigmasterol. Experiments show that this partially hydrogenated sterol and β-sitosterol are identical. It has also been observed that this plant sterol is the principal constituent of the cottonseed oil phytosterols. It is not contaminated with either α_1, α_2 or γ-sitosterol and therefore cottonseed oil is an excellent source for β-sitosterol.

B. Studies on the laboratory preparation of oestrogenic substances have been made. By a series of reactions based upon the method of Windaus ergosterol has been converted

into epi-neoergosteryl acetate. This acetate on oxidation with chromic acid yields a ketone which is different from oestrone—a fact which is of special interest in the light of certain investigations carried out by Marker et al.

Further studies have been made on transformations of dehydroandrosterone, one of the male sex hormones previously prepared in this laboratory.

Louis F. Fieser, Harvard University

Grant No. 104 (1936). Investigation of the structures of natural products by precision analysis.

After suitable modification of the original apparatus it was found that satisfactory precision in the combustion analysis can be attained with the use of a 0.5-g. sample. Combustions of friedelin established the formula $C_{30}H_{50}O$, while for ursolic acid the formula $C_{30}H_{48}O$ was confirmed. Gossypol was investigated but, owing to the unfavorable physical properties of the compound, without decisive result. (Due to unavoidable circumstances, the investigation had to be discontinued at an early date.)

Arthur H. Compton, University of Chicago

Grant No. 105 (1936). Measurement of the ionization produced by cosmic rays in the stratosphere at different latitudes. Measurements are made with instrument-carrying ballons.

When this grant was awarded in the Spring of 1936, we were actively engaged in the development of instruments and balloon techniques for making measurements of the ionization at high altitudes. Our plan was one originated at Chicago by Mr. J. M. Benade in 1933. It consisted of sending automatic radio reports from the balloon to a receiver on the ground, which would give the ionization readings and the barometer readings at the position of the balloon. Shortly after this method was introduced by Benade, it was applied by other investigators to allied

problems, notably recently by Curtiss, Korff, and their collaborators at Washington.

Using our ionization technique, our instruments were necessarily relatively heavy and the balloon problem, though minor as compared with man-carrying balloons, was much more serious than for the experiments involving lighter instruments. In the Spring of 1936, our Mr. C. D. Keen, assisted by Dr. Doan, made a successful flight from Shreveport, Louisiana, securing a set of rough cosmic ray data. Dr. Doan immediately bent his efforts toward further refinements of the instruments and balloon techniques and made during the summer of 1936 several attempts to secure data with balloons sailing from Lake Geneva, Wisconsin. We were unfortunate at this time in receiving rubber balloons which were unreliable and thus failed to secure usable cosmic ray data.

At the end of the summer, Dr. Doan, who had been in charge of these experiments, was called to another position, and the experiments were interrupted until Dr. W. P. Jesse, who has the work now in charge, could become familiar with the new and difficult technique. The studies during the past season, which have included four balloon flights, have convinced Dr. Jesse and myself that the use of the radio technique with ionization chambers, while technically possible, introduces too many uncertainties for its reliable use. We are accordingly now engaged upon the development of a new technique with which we hope within a few months to start a series of systematically planned flights.

Since this work was undertaken, contemporaneous studies with different technique by Dr. Korff and his collaborators in Peru, Panama, and United States, and by Bowen, Millikan and Neher in India, United States and Canada, have covered a part of the ground which had been laid out for our investigators. At the same time, our own measurements on shipboard on the Pacific Ocean have shown the importance of new cosmic rays studies at high altitudes at

different times of year. It is in this direction that our studies are now turning.

KEEN, C. D., 1937. High Altitude Test of Radio-equipped Cosmic Ray Meter. Jour. Franklin Inst. 223: 355–373.

DOAN, R. L., 1936. Apparatus for Transmitting Cosmic Ray Data from the Stratosphere. Rev. Sci. Instr. 7: 400–406.

ENOS E. WITMER, University of Pennsylvania

Grants No. 106 (1936) and No. 137 (1937). Tabulation and study of the energy levels of the asymmetrical rotator, and the calculation of the magnetic susceptibility of molecular hydrogen by quantum theory, using the wave functions of James and Coolidge. . . .

This work is a calculation of the magnetic susceptibility of molecular hydrogen, using the five and eleven term wave functions of James and Coolidge for the normal state of hydrogen. The magnetic susceptibility of molecular hydrogen is given by the formula

$$\chi_M = -\frac{Le^2}{6\,mc^2}(\overline{r_1^2} + \overline{r_2^2}) + \frac{Le^2}{6\,m^2c^2}\sum_{n'\neq n}\frac{|P(n, n')|^2}{h\nu(n, n')}. \quad (1)$$

Here L is Avogadro's number, r_1 and r_2 are distances of the two electrons from the center of gravity of the molecule, and P is the symbol designating the angular momentum of the electrons. The quantum number n refers to the normal state of the molecule and n' to any excited state.

Our conclusion is that the value of the first term lies between -4.15×10^{-6} and -4.09×10^{-6}. We shall take -4.13×10^{-6} as the probable value of the first term.

In order to evaluate the second term we made use of the approximation of Van Vleck and Frank which replaces the second term in (1) by

$$\frac{Le^2}{6\,m^2c^2}\frac{\overline{P^2(n, n)}}{h\nu_1},$$

where $\nu_1 = 1.23\ N$, N being the Rydberg number. Our conclusion with this value of ν_1 is that the maximum possible value of the second term is $.31 \times 10^{-6}$, the probable mini-

mum is $.25 \times 10^{-6}$, and the best value either $.26 \times 10^{-6}$ or $.27 \times 10^{-6}$. This value of ν_1 is probably too low.

Combining the results for the first and second terms, the greatest possible value of χ_M is -3.78×10^{-6} and the least possible value is -3.90×10^{-6}. The best value is -3.86×10^{-6} or -3.87×10^{-6}. These are the results with $\nu_1 = 1.23N$. If we take $\nu_1 = 2N$, our calculated results are that χ_M lies between -3.90×10^{-6} and -4.00×10^{-6} with -3.96×10^{-6} or -3.97×10^{-6} the best value. The experimental values of χ_M are -3.94×10^{-6} (Wills and Hector) and -4.00×10^{-6} (Soné).

Work on the asymmetrical rotator is now in progress.

Elsa G. Allen, Cornell University

Grants No. 110 (1936) and No. 160 (1937). Study of the history of American ornithology before Audubon.

This project, for which grants have been made by the American Philosophical Society, covers an investigation of ornithological art and observation from the earliest attempts at colonization by the French Huguenots in 1562 to the time of Audubon's publication of his famous elephant folio plates in 1827–1838.

The study is prefaced by a brief review of ancient ornithology and a fuller account of early European workers in this science, especially the Italian naturalist of Bologna, Ulysses Aldrovandus, and the English scientists, John Ray and Sir Francis Willughby, of the 17th century.

It then turns to an account of early bird lore in the western world, and proceeds to an estimate of the contribution of Spanish, French and English travellers to the study of American birds. These early beginnings of the science of ornithology, although often elementary and inaccurate, together with the period of colonial and early national development, are important to an understanding of modern ornithology as developed in America.

Much of this work has been done in England in order to have access to the early drawings and manuscripts on American birds which have not been published, and a particular study of the life and career of the English naturalist, Mark Catesby, who spent several years in America studying American birds and plants, has been made. From a study in England of Catesby's unpublished letters and a search of other biographical and historical sources, it has been possible to throw considerable new light on his hidden biography. Similar work has been done on the more recent orinthologists, Alexander Wilson and John Abbot, both of whom emigrated to America in the early nineteenth century. Many other phases of the subject are set forth in the manuscript of some 500 pages, and numerous early illustrations of biographical, historical or ornithological interest have been assembled.

This work was begun under the auspices of the American Council of Learned Societies in 1934–1935, but during 1935–1936, and 1936–1937 has been furthered largely through grants from the Penrose Fund of the American Philosophical Society.

In addition to the preparation of the book itself, a few separate articles have been prepared, which have been published as follows:

ALLEN, ELSA G., 1936. Some Sixteenth Century Paintings of American Birds. The Auk, 53: 17–21.

—— 1937. New Light on Mark Catesby. The Auk, 54: 349–363.

—— 1938. Jaques Le Moyne, First Zoological Artist in America. The Auk, 55: 106–111.

ALBERT ELMER WOOD, Cape May Court House

Grant No. 112 (1936). Study of variation among the Cricetid rodents of the White River Oligocene.

I have been working for the past year on the problem of individual variation in the White River Cricetidae. As I did not have as much available time as I had anticipated when awarded the grant, the work has been proceeding slowly. At the present time, however, information has

been collected showing the extreme variability in tooth pattern and size among these interesting rodents, the variation being much more marked than has been observed among a single species or series of closely related species of recent rodents. Study has been concentrated on two small collections in which the exact stratigraphic relations of the horizons of the specimens are known, in hopes of establishing an evolutionary sequence in these animals.

Wood, Albert Elmer, 1937. The Mammalian Fauna of the White River Oligocene (by Scott, W. B., and Jepsen, G. L.). Part II, Rodentia. Trans. Amer. Philos. Soc. 28: 155–269.

Thomas Harper Goodspeed, University of California

Grant No. 115 (1936). Field work in Connection with the completion of a monograph of the genus *Nicotiana*, in which cytogenetic, morphological and distributional evidence will be combined to picture the origin and evolution of the species of a representative genus of higher plants.

Collections of little known species of *Nicotiana* were obtained. In Dep'to La Libertad and in Dep'to Cuzco, Peru; in Southwestern Bolivia; Prov. Jujuy and Terr. Misiones, Argentina. Of these *N. thyrsiflora* (n. sp.) is most important in its probable contribution of evidence concerning amphidiploidy as a mode of species origin in *Nicotiana*. Unfortunately its rarity and the difficulties and hazards of collecting in Northwestern Peru have made it as yet impossible to secure seed of *N. thyrsiflora*. Local collectors have been hired to obtain this additional material. Of great interest are the herbarium specimens and seed collections of *N. sylvestris* and *N. otophora* made between Tarija, Bolivia, and Jujuy, Argentina. The former species has only once before been collected in seed. Numerous investigations have been made concerning the relation of *N. sylvestris* to the amphidiploid origin of the tobacco of commerce (*N. tabacum*), in every case employing only garden derivatives of the original seed collection. It will now be possible to compare the cytogenetic condi-

tion of these derivatives with plants directly from the wild state. *N. otophora* has only once been collected and then without seed. This species is allied to the *N. tomentosa* assemblage (collected in Dep'to Cuzco, and elsewhere in Peru) which has particular importance as the other postulated progenitor of *N. tabacum*. Near the Iguazu Falls *N. langsdorffii* was collected as seed. This species is apparently rare, although strains of it are widely grown in botanical gardens as derivatives of the only previous seed collection made many years ago. This new collection will permit cytogenetic comparison of a wild race with those long in cultivation and important studies of a member of a particularly interesting species group in *Nicotiana*.

Further field work is under way or contemplated which should produce collections of still other new or little known species of *Nicotiana* whose investigation as to native distribution and in garden cultures will assist in completion of the contemplated monograph of the genus.

The Union Library Catalogue of the Philadelphia Metropolitan Area

A special grant of $7,500.00 was approved by Council in December, 1935, for expert work in the production of a Union Catalogue of the Libraries in the Philadelphia Metropolitan Area.

Grant No. 116 (1936) of $2,500.00 (an equal amount was appropriated by each of the Committees on Publication and Library making a total of $7,500.00).

The Union Library Catalogue of the Philadelphia Metropolitan Area, on which operations were actually begun in the end of January, 1936, is now far advanced towards completion and is already in daily use. It consists of an alphabetical file of cards, arranged by author or main entry, combining and making available in one place the catalogues of about one hundred and fifty libraries. Very nearly all the important libraries of Philadelphia and the surrounding community are embraced in it, and their combined resources amount to perhaps 5,000,000 volumes or

about half that number of different titles. In the file there is one card for every bibliographically separate title—including reference works, treatises, periodicals, pamphlets, reports, fiction, music, maps, rare books, and other classes of literature—which appears in the catalogue of any of the contributing libraries. In short, it is intended to make the Union Catalogue complete. The file, which is still located in temporary quarters on the top floor of the Historical Society of Pennsylvania, now consists of more than two and three-quarters millions of cards, and expands or contracts somewhat from day to day as new materials are added to it or as cards are withdrawn from it through the combining of identical entries from several libraries on a single card. A comparison of the file with the national Union Catalogues in the Library of Congress, which is being carried on with great mutual advantage, reveals the interesting fact that some 36 per cent of the material in our Philadelphia libraries are not represented in the union catalogue in Washington, notwithstanding the fact that it includes at least parts of the catalogues of some six hundred libraries located in all parts of the country. Tests that have so far been made within the Philadelphia Union Catalogue indicate that, if variations of imprint be treated as separate items, 66 per cent of the items included in the file are to be found in only one of our libraries; if variations of imprint be ignored and only totally different titles be considered, it still appears that almost 40 per cent of the material listed in the Union Catalogue is contained in only a single library.

The compiling of the Union Catalogue has been supported by the combined generosity of the American Philosophical Society, the Carnegie Corporation of New York, the Samuel S. Fels Fund, the Federal Government through the Works Progress Administration, and individual contributors. It is controlled by a non-profit corporation organized under the laws of the state of Pennsylvania, and

its services are offered freely (for the present by mail or by telephone only) to the public. Its daily use by private individuals and by librarians is steadily increasing and it already seems apparent that it has become an indispensable instrument in the intellectual life of our community.

The fullest and most detailed information about the Union Catalogue is contained in the recent mimeographed report entitled "A Brief Account of the Principles and Formative Period of the Union Library Catalogue in Philadelphia" by Paul Vanderbilt. Prospective users of the catalogue should address themselves to Mrs. Ruth W. Linderoth (or telephone Kingsley 0636) at the Union Library Catalogue, Historical Society of Pennsylvania, 1300 Locust Street.

Union Catalogues, a Select Bibliography, compiled by Arthur Berthold, with an introduction by Ernest Cushing Richardson, Philadelphia. Union Library Catalogue, 1936, 70 pp. Annotated throughout by Arthur Berthold.

Union Library Catalogue of the Philadelphia Metropolitan Area, a Statement of Facts. 4 pp. 1937. A circular of information.

Vanderbilt, Paul, 1936. Report on an Experimental Section of the Proposed Union Library Catalogue of the Philadelphia Metropolitan Area. Institut International de Documentation, Communicationes III (The Hague) Fasc. 1. (First issued and widely distributed in mimeographed form in 1935; describes in detail an experiment made with a short section of the alphabet and involving the catalogues of twenty representative Philadelphia Libraries.)

—— 1937. Coordinating Our Libraries. Amer. Scholar 6: 1, 119–.

—— 1937. The Philadelphia Union Catalogue. Library Trends, ed. L. R. Wilson, Chicago: Univ. of Chicago Press.

Berthold, Arthur, 1937. Cataloguers and Linguistry. Lib. Jour. 62: 455–456. A discussion of the importance of a knowledge of languages for cataloguers, with illustrations drawn from work on the Philadelphia Union Library Catalogue.

—— 1938. Cataloguing in the Interest of Documentation. Forthcoming in the Yearbook for 1938 of the Cataloguers' and Classifiers' section of the American Library Association. A forecast of development in catalogues and cataloguing in the near future.

Linderoth, R. W. The Working Union Catalogue. Forthcoming in the Wilson Bulletin.

David, C. W., 1935. The Proposed Union Catalogue of the Philadelphia Area. Univ. of Pa. Lib. Chron. 3: 67–71.

ALLAN C. G. MITCHELL, New York University

Grant No. 117 (1936). Investigation of the scattering of slow neutrons with a view to determining more exactly the ratio of the scattering probability to that of capture.

A neutron source consisting of 211 milligrams radium salt, obtained with the help of a grant from the Penrose Fund, has been used to perform a number of researches in nuclear physics which are set forth in the following publications:

MITCHELL, ALLAN C. G., and VARNAY, R. N., 1937. Neutron Scattering Cross Section as a Function of Energy. Phys. Rev. 52: 283.

Since neutron sources consisting of a mixture of radium and beryllium are known to give widely different neutron yields, depending on the method of preparation, the neutron yield of the present source was compared to that of a neutron source consisting of a mixture of radon and beryllium of known strength. This was accomplished by comparing the activity produced in a silver detector by the neutrons from each source, when the source was contained in a standard paraffin block. The measurements showed that the source was equivalent to a radon-beryllium source of like strength to within 10 per cent.

Previous experiments in the laboratory have shown that neutrons are scattered by atomic nuclei, and the probability of scattering, expressed as a cross sectional area for the process, has been measured for a number of elements. The present experiments were designed to show how the cross section for scattering depends on the velocity of the neutrons. It is well known that the artificial radioactivity produced in various elements by neutron capture depends on the energy of the neutron. Thus, by choosing different elements as detectors one can single out neutron groups of various energies for study. We have measured the scattering cross section for neutrons of the energy range 0.02 to 80 volts for the elements Fe, Ni, and Pb using as detectors Ag, Rh, and CHI_3. The results are shown in the following table.

TABLE

Group	Neutron Energy (volts)	Scattering Cross Section $\times 10^{24}$ cm²		
		Fe	Ni	Pb
C	0.02	9.8	19.2	6.2
D	1.16	10.0	11.9	6.6
A + B	3.5	11.6	13.5	12.3
I	80	10.8	12	13

In addition, the directional distribution of slow neutrons emerging from the top of a paraffin cylinder containing a Ra-Be neutron source was investigated by placing detectors at various distances above the top of the paraffin. The results agreed well with those calculated for a Cosine distribution law.

—— and LANGER, L. M., 1937. Energy of the Gamma Rays of Radio-Indium and Radio-Manganese. Phys. Rev. 52: 137.

The energies of the gamma rays of radio-indium (54 minute period) and radio-manganese (2.5 hour period) have been obtained by allowing the gamma rays to eject Compton electrons from aluminum and measuring the stopping power of aluminum for these electrons. The Compton electrons are allowed to pass through two thin walled counters, arranged to count coincidences, and the aluminum absorbers are placed between the counters. From a curve showing the decrease in the number of coincidences as a function of absorber thickness the energy of the gamma ray can be obtained. The energies of the gamma rays, measured in this way, were found to be for radio-manganese 1.65 M.E.V. and for radio-indium 1.39 M.E.V.

—— 1937. Long Period Activity in Cadmium Irradiated with Neutrons. Phys. Rev. 51: 995.

The element cadmium, which has a large absorption coefficient for slow neutrons was irradiated for a week with neutrons from the radium-beryllium source. At the end of this time a weak activity was found showing two periods

of 52 hours and 5 hours respectively. These periods agree with those found by Cork and Thornton when cadmium is bombarded by 6.3 M.V. deuterons.

WHITAKER, MARTIN D., 1937. Magnetic Scattering of Neutrons. Phys. Rev. 52: 52.

Through the work on the scattering of neutrons which has been carried out in this laboratory during the past three years, it appeared that the magnetic elements showed a higher scattering cross section for neutrons than did the others. This led Bloch to investigate the theory of the scattering of neutrons by magnetic substances. The theory predicts that if neutrons are scattered by magnetized iron there will be a difference in the number scattered depending on whether the neutrons pass parallel or perpendicular to the lines of magnetic force in the iron. Small effects have been observed by workers in other laboratories. Drs. Halpern and Johnson calculated that there should be a difference in the scattering power of certain elements depending on whether they were used in the elementary form or as paramagnetic salts. Dr. Whitaker has made a careful investigation of this problem and has failed to detect any effect.

DAVENPORT HOOKER, University of Pittsburgh

Grant No. 118 (1936). Functional and morphological studies of human prenatal development.

The program of correlated physiological and morphological studies of human prenatal development, in progress in the Department of Anatomy, University of Pittsburgh School of Medicine, under the general direction of Davenport Hooker, has made marked progress under the grant, made in 1936, for the year 1937. Physiological observations have been carried out on 7 abortuses, seen within a very few minutes after delivery, and ranging in menstrual age from 8 1/2 to 18 1/2 weeks. These are nos. 27 to 33 in the series. In each of these, responses to tactile stimu-

lation were studied, and recorded cinematographically. In two, electrocardiographic records were made and, in two others, the response of nerve and muscle to electrical stimulation was observed.

Though the series of observations in this entire study (34) is as yet too small to warrant the drawing of final conclusions from them, the results secured from tactile stimulation are sufficiently uniform to justify a preliminary account. The human fetus first shows responses to tactile stimulation at about 8 weeks of menstrual age. The earliest reaction observed is contralateral and limited to the body musculature, including the neck and limb-girdle muscles. For the next two or three weeks, the response is, in the main, still limited to the body musculature, but involves a larger amount of the body, including the shoulder and pelvic muscles of the extremities. During this period, some specific responses of the upper extremity, including the beginnings of prehension, result from stimulation of the palm. In one case, a foot sole response was secured. The number of observations between 11 1/2 and 13 1/2 weeks is insufficient to establish the exact succession of responses at these ages. However, by 13 1/2 to 14 weeks, the generalized character of the responses has largely disappeared and many of the specific reflexes found in the new born are represented. Beginning shortly after the replacement of general by specific responses, the fetus fails to respond very actively. The cause of this difficulty in eliciting responses is unknown, as yet. It has been reported to exist in other mammalian fetuses.

Fetal electrocardiograms, made on 16 cases, contain all the elements found in those of the adult, but show differences from adult records in rate and latent period.

During the current year, the morphological program has been extended by beginning a photomicrographic record of the sections. Additional sections have been made and mounted, and the general survey studies of the nervous system have been expanded. Doctor A. A. Pearson, at the

time of his visit affiliated with the University of Chicago, has studied the development of the spinal accessory nerve in this series of sectioned human fetal material.

The program has been presented, during 1937, in short reports before the Allegheny County Medical Society, the Interurban Medical Society at its Pittsburgh meeting, the Society for Biological Research of the University of Pittsburgh School of Medicine, and the American Society of Zoologists at its Indianapolis meetings.

PEARSON, A. A., 1938. The Spinal Accessory Nerve in Human Embryos. Jour. Comp. Neur. **68**: 243–266.

LAURENCE IRVING, University of Toronto
(now Swarthmore College)

Grant No. 120 (1936). Study of physiological adjustments of respirations in diving mammals.

When breathing of a beaver ceases, the blood flow through the brain increases while it diminishes in the muscles. Flow changes were studied with a heated nickel wire resistance flow meter. The vascular adjustments occur but less conspicuously in cats, dogs, and rabbits. They are not attributable to changes in arterial or venous blood pressure. After sympathectomy the change fails to occur or is reversed in a sympathectomized muscle, but sympathectomy does not prevent the change in cerebral flow. The vagus, depressor and carotid sinus nerves can be severed without preventing the vascular adjustment.

The vascular change resembles the effect of CO_2, but it occurs more rapidly and more intensely than it has been observed during the artificial inhalation of CO_2. It appears to be significant in the adjustment of all mammals to survive asphyxia and such vascular sensitivity may be particularly suited in diving animals to their ability to survive for long periods without breathing.

IRVING, L., 1937. Differential Vascular Changes During Apnea from Inflation of the Lungs. Amer. Physiol. Soc.

—— 1937. The Effect of Changes in Blood Pressure upon Blood Flow in Denervated Tissues. Canadian Physiol. Soc.

ROBERT K. ENDERS, Swarthmore College

Grant No. 121 (1936). The mammals of the Chiriqui region of Panama with reference to their distribution, affinities, faunal relationships and life histories; to collect material for anatomical and embryological studies.

With the aid of a grant from the American Philosophical Society and support from the Academy of Natural Sciences and Swarthmore College a survey of the mammals of the Chiriqui region of western Panama was carried on from January to September, 1937. Approximately 1500 mammals were taken as well as birds, insects, and plants where these were essential to an understanding of habits or distribution. Embryological material was secured from two primitive marsupial genera, *Marmosa* and *Metachirops* as well as from many other genera. Anatomical material, too, was secured.

No publications have appeared although the collections have been worked upon constantly since our return. Preparation has reached the point where the extent and value of the collections can be judged and work on them begun with the publication of final report in view. Several new species will be described before the final paper on distribution is published.

EARLE RADCLIFFE CALEY, Princeton University

Grant No. 122 (1936). Application of chemistry to archaeology—the restoration and preservation, chemical examination of ancient objects, etc.

Though many prehistoric bronze objects of known provenance and a number of closely dated Roman objects in alloyed copper have been carefully analyzed, very few accurately dated Greek bronze objects have been subjected to careful chemical examination. Yet a knowledge of the composition of Greek bronzes should be of value to archaeologists, to museum curators, and to historians of chemistry

and of technology. The principal object of this investigation was to obtain fundamental data about these ancient copper alloys, particularly in respect to one important class of objects.

Coins offer distinct advantages over most other objects for studies of this sort. In addition to their comparative abundance and availability, they are generally capable of being dated with greater certainty, and their place of origin is usually known quite definitely.

Chemical analyses were made of nearly a hundred Greek coins representative of important localities at different periods. Thirty five of these coins were from Athens and ranged from the earliest to the latest. In general, it was found that the earliest coins of all localities are characterized by a high percentage of tin with little lead. Later coins show a progressive decrease in tin content with time, and this decrease is nearly always paralleled by an increase in the percentage of lead in the alloy. A sudden increase in the lead content of these coinage bronzes occurred about the middle of the second century B.C. or slightly later, depending somewhat on the locality.

The data obtained in this investigation can be applied to the solution of certain difficult problems in archaeology and numismatics. Of general historical interest is the possibility that these systematic changes in the composition of ancient bronze coins are indicative of an increasing scarcity of tin in the ancient world.

HAROLD O. BURDICK, Alfred University

Grant No. 124 (1936). Investigation of the rôle of the tubo-uterine junction to determine if this region acts like a valve which is directly or indirectly controlled by hormones.

Following our experiments of 1936 on the tube-locking of fertilized ova of mice and rabbits by small injections of estrogenic substances, this year we have been checking the effects on egg transport of massive injections (100 r.u.–500

r.u.) of Progynon-B. We were surprised to find an acceleration in the rate of transport through the tube in at least 60 per cent of our mice. Normally, the fertilized ova descend into the uterus after 72 hours in the morula or early blastocyst stage, but we have numerous examples of eggs in the uterus in the 2-celled stage (30–40 hours after the vaginal plug of mating).

We have sufficient data and photographic evidence to show that the uterine environment, under experimental conditions, is detrimental to eggs in the early cleavage stage resulting in their degeneration and dissolution. The presence of dead sperm cells and leucocytes in the uterus up to about 50 hours after the vaginal plug formation makes it very difficult to find the eggs.

Experiments of a similar nature have been carried out with rabbits with similar results, except that eggs disappear more rapidly. These experiments not only add interesting details about the physiology of the fallopian tubes but also raise the question of possible temporary sterilization or prevention of pregnancy in humans by use of estrogenic substances (see also Kurzok—Endocrines in Obstetrics and Gynecology, p. 424).

A new method has been developed for the direct observation of ova within the fallopian tubes of mice and some good photographs have been obtained. We think these are the first pictures to show normal ova under such conditions.

Burdick, H. O., 1937 (with Whitney, Rae). Acceleration of the Rate of Passage of Fertilized Ova through the Fallopian Tubes of Mice by Massive Injections of an Estrogenic Substance. Endocrinology **21**: 637–643.

—— 1938. Fate of Ova Accelerated in Their Rate of Passage Through the Fallopian Tubes of Mice by Massive Injections of an Estrogen. Endocrinology. (In Press.)

—— 1938. Acceleration of the Rate of Passage of Fertilized Ova Through the Fallopian Tubes of Rabbits by Massive Injections of Progynon-B. Endocrinology. (In Press.)

ALEXANDER WEINSTEIN, Columbia University

Grant No. 128 (1937). Mathematical study of multiple-strand crossing over and coincidence in the chromosomes of Drosophila.

The present study considers all arrangements of the chromatids during crossing over that are geometrically possible; works out mathematically the genetic results in each case; and by excluding results inconsistent with experiment, arrives at the actual arrangement, a knowledge of which is a necessary foundation for a study of the mechanics of crossing over.

If there is no crossing over between sister strands; and if the frequencies (F, G, and H respectively) of regressive, progressive, and digressive crossing over are the same for all pairs of adjacent exchanges, and are independent of crossing over elsewhere in the tetrad; then the following relations can be proved.

The chance that two loci between which there are n exchanges in a tetrad will show recombination in an emerging chromatid, is $\frac{1}{2}$ when n is odd, and $\frac{1}{2} - \frac{1}{2}(F - H)^{n/2}$ when n is even.

The chance that a tetrad with n exchanges will give rise to a chromatid of any specified class $= \frac{1}{2}\left(H + \frac{G}{2}\right)^k \times \left(F + \frac{G}{2}\right)^{n-k-1}$; where, in the chromatid, k is the number of times that a crossover region follows a non-crossover region plus the number of times a non-crossover region follows a crossover region.

If a tetrad is a crossover in two nodal regions and at n points between them ($n \neq 0$), the chance that an emerging chromatid is a crossover in both nodal regions $= \frac{1}{4} + \frac{1}{4} \times (F - H)^{n+1}$; the chance that it is a crossover in both nodal regions but not in the intermediate region $= \frac{1}{2}\left(H + \frac{G}{2}\right)^2 \times \left(F + \frac{G}{2}\right)^{n-1}$. If $n = 0$, either chance $= \frac{1}{2}\left(F + \frac{G}{2}\right)$. These relations make it possible to calculate inclusive coincidence and internode frequency (select coincidence).

In attached X's, the chance that a tetrad with n exchanges proximal to a locus will give rise to attached chromatids homozygous at the locus $= W_n = (1 - W_{n-1})G + W_{n-2}(1 - 2G)$.

The experimental results indicate that $F = \frac{G}{2} = H$.

The formulas can be generalized by taking into account the possibilities that recurrence may be variable and may be influenced by crossing over elsewhere in the tetrad, and that exchanges may occur between sister strands. If the ratio ($= 2p$) of homologous-strand exchanges to all exchanges is the same for all regions, then for random and for some types of non-random recurrence, homozygosis in attached X's can not exceed p when $\frac{1}{2} \geqq p \geqq \frac{1}{3}$; can not exceed $\frac{1}{3}$ when $p < \frac{1}{3}$; and in general approaches $\frac{1}{3}$ as n becomes infinite. The observed homozygosis indicates that p exceeds 0.4 and probably $= 0.5$; that is, sister strands cross over rarely if at all.

These conclusions, deduced mathematically from genetic data, are in accord with cytological observations of chromatid twisting.

F. B. Isely, Trinity University, Texas

Grant No. 129 (1937). Study of the ecology of Orthopterous insects.

1. Forty species of the more frequent north central Texas grasshoppers were experimentally studied (1935–37) for their food preferences and for soils chosen for oviposition. Laboratory results and clues were verified as far as possible by further critical field observations. The primary purpose was to attempt an evaluation of the relative importance of the several environmental factors which delimit the local distribution of acridians. Facilities were not at hand to determine pH and soil moisture.

The tests show that north central Texas grasshoppers are chiefly oligophagous and that their species maintenance is dependent on the presence of specific plant species. Plants acceptable as food for one species frequently served as a starvation menu for other species.

Four hundred and nine egg pods deposited by 32 different acridian species in cages were secured. In certain species soil texture is the determining factor in the selections of egg laying sites, in other species soil structure appears to be the controlling factor.

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2. Grasshoppers, whose color patterns appear to the human observer to blend perfectly with their natural backgrounds, were used for these experiments. The predatores, real enemies, were mockingbirds, sparrows, cardinals, turkeys and bantams.

A garden plot 12 × 16 feet was marked off into squares 16 × 16 inches arranged in checkerboard fashion to represent four different types of natural backgrounds: black, white, and red soils; the fourth green, transplanted bermuda. The acridians were picketed on the various squares of the checkerboard plot or for some experiments anesthetized. Usually matched pairs were used in equal numbers i.e., white acridians on white and green squares, black acridians on black, red, or white squares, etc.

The native birds could be easily observed and checked from a screened porch and from the house windows. The domesticated birds permitted experimenters to follow their every movement.

The records of 33 experiments (June 9–July 1, 1937) show that out of 459 acridians placed on non-harmonizing or non-protected backgrounds of the checkerboard plot and subjected to predator depredations that 405 or 88.24 per cent were eaten by the birds, while 54 or 11.76 per cent survived.

On the other hand, of the protectively colored acridians placed on harmonizing backgrounds 276 or 60.11 per cent were missed by the birds, while only 183 or 39.85 per cent of the acridians protected by concealing colors were eaten. All experiments show that concealing coloration protects acridians against bird predators.

KARL F. HERZFELD, Catholic University of America

Grant No. 131 (1937). Theoretical investigation of the absorption spectra of organic compounds.

The grant has been used to pay the salary of Dr. Alfred L. Sklar, so that the work on the theory of the absorption spectra of organic compounds could be continued. Dr. Sklar had calculated the energy levels of benzene and other molecules according to the Heitler-London method in his dissertation.* In the three months the grant has run, he has almost finished the check of his results with the method of molecular orbitals, a check considered necessary by many authorities. He has also almost finished the evaluation of the interaction between 2 p-π electrons, which is needed for the calculation of many organic molecules.

A paper by Sponer, Pöschl-Nordheim and Sklar is ready for publication.

ALBERT T. VOLWILER, Ohio University

Grant No. 136 (1937). Preparation for publication of the correspondence between President Benjamin Harrison and James G. Blaine, his Secretary of State.

Work on this project was begun early in 1937 and is nearing completion. Most of the letters that passed between Harrison and Blaine were located either in the archives of the Department of State, or among the Harrison Papers and the Blaine Papers. These two collections of private papers are now in the Manuscript Division of the Library of Congress. Much of the work, therefore, had to be carried on in Washington. Accurate typed copies or photostats were made of all letters found. Additional material was secured in New York, Indianapolis, and Chicago.

An introduction, explanatory footnotes, and a detailed index are being prepared for the letters. The project has entailed much correspondence in an effort to find additional Harrison–Blaine letters, and to secure data to make clear

*Jour. Chem. Phys. 5: 669, 1937.

and to illuminate the content of these letters. Fortunately, Mr. Louis A. Dent, who served as Blaine's private secretary during the period under consideration, and Mr. Everard F. Tibbott, who was Harrison's private secretary, are still living and in good health; both have been most helpful. Cordial cooperation has been met everywhere; especially noteworthy has been the cooperation by the officials of the Pan American Union and the secretaries of the embassies in Washington. Some requests for information were forwarded by them to their respective foreign offices in Europe or South America.

Alexander Goetz, California Institute of Technology

Grant No. 138 (1937). Investigation of the nature of phase-transitions of small particles of simple substances down to colloidal sizes with special regard to the size dependence of such transitions.

A method of preventing the crystallization of liquids at low temperature has been designed, consisting in the spraying of the liquid, by means of a specially designed high pressure atomizer, into cooled liquid media which do not dissolve or attack the sprayed substance. This method has been applied to the freezing of protozoa, liquid cultures of which were sprayed into supercooled isopentane at the temperature of liquid air ($-185°$ C.). The very perfect heat contact, as well as the greatly decreased probability of the formation of centers of crystallization during the time of cooling (which latter is shortened by this method to a small fraction of a second) result, apparently, in a vitrification of a large fraction of the protozoa sprayed, if types of sufficiently small size (up to 2μ) are chosen.

Although sufficient quantitative work has not been done, the qualitative results so far render it probable that organic cells of the type used do not lose their capacity for life if the crystallization of the cell plasma has been prevented. The results have not yet been published.

GERHARD HERZBERG, University of Saskatchewan

Grant No. 139 (1937). Special apparatus for the investigation of the solar spectrum in the photographic infra-red.

The grant has been awarded for the purchase and mounting of a 20 foot concave grating to be used in the investigation of the photographic infra-red solar spectrum and in various investigations of molecular spectra. The construction of the grating spectrograph is well under way. It is hoped that the apparatus will be ready for work by the coming spring.

E. J. WORKMAN and R. E. HOLZER, University of New Mexico

Grant No. 140 (1937). Correlation of electrical measurements on thunderstorms with simultaneous photographic measurements for the purpose of analyzing the mechanism of propagation of a lightning flash and studying the electrical structure of thunderstorms.

The program undertaken during the summer of 1937 was to make simultaneous photographic and electrical measurements on thunderstorms in the vicinity of Albuquerque, New Mexico, with the expectation of obtaining the information necessary for a much more complete picture of thunderstorm phenomena than had been possible previously. The experimental work was divided into two parts: photographic and electrical. Grants from the American Association for the Advancement of Science and from the American Philosophical Society were made for the purpose of carrying out the entire program. Since the two grants were applied on two phases of the same problem, a complete statement of the work accomplished is being submitted to both organizations.

Photographic Work

The greater part of the first grant was used in the construction of a new multiple lightning camera. The expenditures were made for lenses, standard camera parts, and

a special 6 volt motor to operate the camera in the field. Construction of the camera was started in the first week in January and required all of the available time of one of us and a laboratory assistant until about the first of June. A description of the instrument was given at the Meeting of the American Association for the Advancement of Science in Denver on June 25, 1937.

The remainder of the first grant and a part of the second grant were used for photographic supplies and processing and the expenses of field operation. The camera was mounted in the armored truck which was constructed and used during the summer of 1936. The new camera was successful in every respect. Thirty-five sets of lightning photographs (three to the set) were obtained between July 1, and September 15. This is a particularly good record since many of the storms in this period were difficult to photograph. The cloud level was frequently 8,000 to 10,000 feet and as a result many discharges were within the cloud or high air discharges. In the case of one single storm (on the night of July 21) which was characterized by many cloud-ground discharges 20 sets of excellent photographs were obtained in 18 minutes. The camera is ready for use in the summer of 1938. In a full season, from May 15, to September 15, it is quite possible that 100 or 150 sets of photographs may be obtained, especially since many violent storms occur in the latter part of May and the early part of June. Large numbers of lightning photographs taken under varied conditions are very necessary to a satisfactory study of lightning in a given locality.

The pictures taken have not been analyzed in detail, but they may be described as follows:

42 separate flashes appeared on the 35 sets of photographs.
14 flashes showed stepped leaders.
15 flashes showed dart leaders.
No air discharges showed leader strokes although some indicated a long interval stepping effect.
4 flashes consisted of a single stroke over a single path.
1 flash consisted of a single stroke over a multiple path.
20 flashes consisted of repeated strokes over a single path.
17 flashes consisted of repeated strokes over multiple paths.

Electrical Work

The electrical work was accomplished with the aid of the remaining part of the grant from the American Philosophical Society. During the late spring and early summer, we constructed 12 recording voltmeters of a type similar to those outlined in our application for funds. The instruments were installed in the field for a period of about 6 weeks. The first storm over their location indicated that the maximum fields for which the instruments were constructed and tested (about 10,000 volts per centimeter as indicated by previous estimates and measurements by others) were actually much larger than the electric fields under thunder clouds in this vicinity. Accordingly, all of the electrometer deflecting elements were replaced with more sensitive ones. The next storm seemed to indicate that we were still equipped for fields stronger than actually existed, and a second change was made in the deflecting elements. The last set of elements did give measurable deflections. At this stage we were set up for fields of the order of 1000 volts per centimeter, but we did not have satisfactory storms over the region after this.

The information based on our summer's experience leds us to the following conclusions:

1. The method of approach is feasible for studying several phases of the electrical phenomena associated with thunderstorms. It will yield a new method of measuring the charge passing in a lightning stroke which together with photographic data will make possible current estimates in individual strokes. Secondly, it will give a continuous (although approximate) picture of the changes in charge distribution which no other method developed to date will do.

2. The electrical surface fields under thunder clouds, in the vicinity of Albuquerque at least, are neither as extensive nor as large as the simple theories previously held and the limited measurements made would lead one to believe. This may be in part due to the complex nature of the dis-

tribution of charge in the cloud, and in part to the rôle of space charge in the region between cloud and ground. It is of course possible that in one season, in one locality, one may encounter particularly complicated clouds as the large number of cloud-cloud and cloud-air discharges observed would suggest.

3. The complexity of thunderstorms emphasized by our preliminary work and by a recent publication of Simpson points to the inadequacy of previous theories and the necessity of obtaining much more extensive field data. We are convinced that our method or a similar one is necessary to understand the development of thunderstorms, the charge distribution throughout its history, and perhaps even more important, the effect of space charge shields around objects on the ground. The last point is of first importance as applied to lightning protection.

4. We have done sufficient preliminary work on instruments of this kind to be able to design an instrument which will be satisfactory from the standpoint of a motor drive, electrical insulation, and versatility as regards wide variation in field. Such an instrument has been designed, and the construction of a sample is about to be started in our shop.

P. W. Selwood, Northwestern University

Grant No. 141 (1937). Comprehensive development of magnetochemistry including the determination of equilibrium constants and activation energies of organic free radical association reactions, continued work on the magnetic properties of rare earth compounds, study of odd-electron molecules, study of the magnetic characteristics of adsorbed gases and their possible relation to contact catalysis.

The grant was received in August 1937 and is being spent, over a period of ten months, for technical assistance in magnetochemistry. No publications as a result of this work have as yet appeared but some results are now available and will soon be published. These are, first: in con-

nection with the compound $YbSO_4$ it has been established that the electronic configuration of divalent ytterbium is identical with that of the isoelectronic ion, trivalent lutecium. This work involved measurement of the magnetic susceptibility of $YbSO_4$ over a wide temperature range. Work has also been done on lanthanum oxide. It has been shown that pure lanthanum oxide, freshly ignited, has a marked temperature coefficient to its diamagnetic susceptibility. Efforts are being made to relate this effect to the catalytic effect of the surface, and to the possible existence of surface paramagnetism.

LESTER WILLIAM STROCK, University of Oslo

Grant No. 142 (1937). Study of geochemical distribution of the chemical elements by means of quantitative spectrum analysis.

1. Quantitative Spectrum Analysis Method for Determining Silver in Rocks.

The general method of procedure is as described by the author in "Spectrum Analysis by the Carbon Arc Cathode Layer Method" (Adam Hilger Ltd., London. 1936). Important factors influencing the accuracy, reliability, and sensitivity of this method, when applied for determining silver, were studied in detail, which enabled the best manner of procedure to be found. The rate and time of volatilization from samples of varying chemical composition, and especially in presence of alkalies, large amounts of iron, copper, and carbonaceous matter, were studied. Silver in alkali-rich rocks can be determined to an accuracy of ± 10 per cent in the concentration range 0.001–0.00003 per cent. The intensity ratio of the lines Ag-3280 and Sb-3267.5 (0.5 per cent Sb) as determined from photometrically determined blackening curves of the photographed spectra was related to silver concentration. These data give the standard intensity-concentration calibration curve. A 10 mg. sample is used.

2. Determination of Scandium and Yttrium in Biotite-Pyroxenites.

A series of biotite-pyroxenites supplied by Prof. A. Holmes of Durham University was analyzed spectroscopically for Sc and Yt. The Sc-content was found to vary from 0.001 to 0.01 per cent Sc_2O_3, which is in excellent agreement with previous data of V. M. Goldschmidt and C. Peters.

3. Correlation of Rock Types in a Petrographic Province by a Study of the Geochemical Distribution of Lithium. I. Spectrum Analysis Method.

The method of analysis as employed by the author in "Geochemie des Lithiums" (Nachr. d. Ges. d. Wiss. Göttingen, New Series, **1**, 171–204, 1936) has been altered. The samples to be analyzed are mixed in a ratio 1:1 with a sodium-feldspar containing 20 per cent BaO as a comparison substance. This is further mixed in a ratio 1:1 with NaCl. The intensity ratio of the lines Li-6708 and Ba-6694 is related to lithium concentration. The concentration-intensity curve was obtained from a series of synthetic mixtures. The revised method enables MgO, CaO, and Fe_2O_3 to be determined in the same sample. A 1–2 mg. sample is used for the analysis.

Alfred J. Swan, Swarthmore College

Grant No. 152 (1937). Permanent preservation of wedding rite and folk-songs in the ancient Russian district of "Pechory" now in Esthonia.

The work was successfully completed and records preserved on four twelve inch disks; one set was presented to the American Philosophical Society.

Edward Horne Craigie, University of Toronto

Grant No. 157 (1937). Study of vascularity in the brains of amphibians and reptiles.

Certain earlier workers reported that in tailed amphibians the substance of the central nervous system is vas-

cularized entirely by simple, non-anastomosing capillary loops. A recent student of *Ambystoma tigrinum* stated that in it there is only a simple capillary network.

The present study showed simple, non-anastomosing loops to be the only arrangement of vessels in the brain substance in *Necturus*, *Cryptobranchus*, and *Triturus*, which represent three different suborders. In *Ambystoma maculatum*, *A. jeffersonianum*, and *A. tigrinum* both loops and a network were found, some loops being entirely independent of the net and others associated with its meshes in various ways. Thus the genus *Ambystoma* is intermediate in this respect between the other tailed amphibians studied, which have only loops, and the tailless amphibians, which have only a capillary network. The final report will include some observations upon the vessels of the brain of the frog.

Craigie, E. Horne, 1938. The Blood Vessels of the Brain Substance in Some Amphibians. Proc. Amer. Philos. Soc. 78: 615–649.

George Kreezer, The Training School at Vineland, N. J.

Grant No. 158 (1937). Determination of the properties of the human electro-encephalogram at different levels of intelligence and for different types of mental deficiency.

The purpose of the present investigation has been to determine what correlations there are, if any, between the electro-encephalogram (the record of the electric potentials of the brain) and variations in intelligence level and clinical type among the mentally deficient. Evidence of such correlations would make it possible for knowledge concerning the cortical basis of the electro-encephalogram to be utilized in the formulation of working hypotheses of the cortical factors associated with mental deficiency.

In the investigation of the influence of intelligence level (Binet mental age), it has been necessary to control a number of variables that might influence the electro-encephalogram independently of intelligence level. These have included type of mental deficiency, chronological age, sex, emotional excitability, interelectrode resistance, electrode

location, and subject-conditions during the recording. By the variation of certain of these factors, in the role of parameters, additional data concerning possible factors in the electroencephalogram have been obtained. Records have been secured on a total of over 200 subjects, including about 40 mentally normal subjects and 160 mentally deficient subjects of various types.

The chief results relate to the empirical relations between properties of the occipital alpha rhythm (wave-frequency of about 10 waves per sec.) and mental age, in subjects above 16 years of age, chronologically. In a group of 50 subjects of the mongolian type of mental deficiency, statistically significant correlations were obtained between alpha index (percentage of time occupied by alpha rhythms) and wave-amplitude, and Binet mental age. In a group of 46 subjects of the non-differentiated hereditary type of mental deficiency, a statistically significant influence of mental age on alpha wave-frequency was found, but no significant influence on alpha index or wave-amplitude. In groups of subjects of other special types, those with phenylpyruvic amentia, hydrocephalus, microcephalus, and cretinism, the numbers available in the various groups were not great enough to permit satisfactory determinations of the influence of the mental age variable. There was evidence, however, of a variation in the electro-encephalogram with type of mental deficiency.

The fact that not the same properties of the alpha rhythm are correlated with mental age variations in the mongolian and hereditary types points to the existence of multiple physiological factors in mental age level, and indicates that different ones of these cortical factors are affected in different types of mental deficiency. On the basis of the particular properties of the records found to correlate significantly with mental age level, or to vary with clinical type, tentative theories of the nature of the physiological factors involved may be proposed.

The results outlined thus provide evidence that the electroencephalogram is likely to be of aid in the investigation of the factors in the cerebral cortex presumably associated with mental deficiency. It is desirable, however, that the empirical relations considered be re-investigated with larger groups of subjects, in order to guard against sampling errors; as well as that tests be made of the working hypotheses suggested by the results.

Gabriel Bonno, University of California

Grant No. 164 (1937). Study of the intellectual relations between Great Britain and France from 1715 to 1735.

Progress on the research: (1) Information systematically gathered from the following French periodicals published in Holland: Bibliothèque ancienne et moderne; Journal littéraire de la Haye; Mémoires littéraires de la grande Bretagne; Nouvelles littéraires; Histoire Critique de la République des Lettres; Bibliothèque raisonneé; Bibliothèque Française; Bibliothèque Anglaise; L'Europe savante; Journal Historique de la République des Lettres; Histoire littéraire de l'Europe. Numerous articles refer to English literature, English science and philosophy (especially Newton, Locke, Shaftesbury, Mandeville) and the deist controversy in England.

(2) Early traces of British influences in the memoirs of several provincial academies: Montpelliers, Lyons, Montauban, Rouen and especially Bordeaux, where Newton's ideas are accepted at a time when Descartes still reigns supreme at the Académie des Sciences in Paris.

(3) Reaction of British and French critics of the times to Voltaire's Lettres Philosophiques and his description of British literature, thought and civilization.

Bonno, G., 1937: Lettre inédite d'un correspondant parisien de John Wilkes. Revue de Littérature Comparée.

The following publications will also appear in the Revue de Littérature Comparée:

(1) La traduction française du Spectator et la censure.

(2) Une critique de Leibnitz par Toland.

JAMES A. GEARY, Catholic University of America

Grant No. 165 (1937). Field study of the phonology and inflexions of Algonkin and related Algonquian dialects in Quebec and Ontario.

The project is a study of the phonology and grammar of Algonkin as spoken by the various local bands in Quebec and Ontario, in comparison with the Algonkin presented by Cuoq, *Lexique de la langue algonquine*, Montreal, 1886; Cuoq, *Grammaire de la langue algonquine*, in "Memoirs of the Royal Society of Canada," 1891, Section I, 85 ff., 1892, Section I, 41 ff.; and Lemoine, *Dictionnaire francais-algonquin*, Chicoutimi, 1909.

Senneterre, P. Q., seemed to be a convenient place to begin the survey, as I was informed that Indians usually camped in the vicinity outside of the fall and winter hunting-season, and that communication with Lake Simon and Grand Lake Victoria was most convenient from here. I soon realized that the project was not one that might be accomplished in a few weeks, but that it would be necessary to concentrate on one local dialect until its phonological and grammatical characteristics were clearly enough perceived to provide a basis of comparison for other local dialects, and then visit successively the other places where study was contemplated, and examine whatever variations of dialect might appear.

I was fortunate enough to arrive at Senneterre just as Fr. Léon Carrière, O. M. I., arrived at the Catholic chapel at Lake Simon (more correctly Lake Siamo, so named in Algonkin from the name of a certain species of duck), to which the Indians of the Lake Simon band repaired (by appointment) for a "mission," a week of religious instruction and exhortation, which is impossible during the hunting-season, on which their living depends, to say nothing of the impossibility of getting to church during the severe winter weather. By agreement of the Indians an extra week was added to instruct the children in their prayers and in Christian doctrine. This gave me the opportunity of receiving

instruction in the local dialect during sixteen days at Lake Simon. After that I went (along with Fr. Carrière on his way home to Maniwaki) to Senneterre, where I was hospitably entertained by the pastor, Fr. L. Jourdon.

Nearby, along the River Louvicourt, the Indians had set up their tents, and lived by fishing and hunting (some moose having been killed by the middle of September), awaiting the time when they would go "into the bush" to hunt in earnest. Residing in the rectory with Fr. Jourdon, I had the opportunity of visiting the Indians each day.

These Indians consider Lake Simon to be the center of their territory, and there their chief, Chābowēsi Papatē, resides. There are between 200 and 300 of them, as I am informed by Fr. Carrière, who has made a census of them, on which the government relies, having no "Indian-agent" in this vicinity.

There is another chief at Grand-Lac Victoria, Alex Papatē, who is a nephew of Chābowēsi Papatē, chief at Lake Simon. He was a frequent visitor at Lake Simon, and appeared to speak the same dialect; I got some phrases from him and saw no divergences from the local dialect.

Many of these Indians write their own language and most of them can read it, and make use of prayer- and hymn-books at church. One of my informants, who speaks English, French and Algonkin, I found to be interested in the old traditional stories, and he agreed to get some of them written down for me. As far as I know, little has been done along this line in Algonkin proper, though much has been done for Fox, Kichapoo, Ojibwa, Cree, Menominee, and some other Algonquian languages.

I have assembled a large quantity of notes which will require further study before anything but tentative conclusions can be drawn. But it can be said that the spellings of Cuoq and Lemoine do not represent the Lake Simon pronunciation in some particulars. The most important divergence is the frequent absence of the nasal in the combinations *nd, mb, ng, nj* (*nc*), *ns* (*nz*), for which I often heard

medially *d, b, g, j* (*c*), *s* (*z*), but finally *t, p, k, c, s*. The frequency of the omission of the nasal varied in different speakers: one informant came from Maniwaki (to the south-east) and used the nasal in the proportion of 3:2; another, native in this locality, omitted it in the proportion of 6:1; another, of a more northern origin, but here since boyhood, omitted it in the proportion of 9:1; a fourth, whose family connections are with the north-east, omitted it in the proportion of 11:1.

The correct interpretation of these observations is difficult without further study both at Lake Simon and in other places. However, it seems significant that the nasal combinations are fewer as northern influence upon my informants appears to be greater. That is, the resemblance to Cree, which has not kept the nasal in these combinations, some dialects replacing it with *h*, is naturally greater as one approaches the Cree country to the north. Moreover, place-names to the south and west show the nasal, while to the north and north-east they lack it.

On the other hand, Cuoq's Algonkin appears to be based on the Nipissing dialect, as is suggested by many notes in the dictionary, and as was understood by James Mooney (Bureau of American Ethnology, Bulletin 30, Part I, p. 73); a part of the Nipissing tribe is known to have gone to Lake of Two Mountains, where Father Cuoq labored as missionary, and from there some went later to Maniwaki. Now, the home of the Nipissings, at Lake Nipissing, is close to Ojibwa territory, and the nasal combinations are characteristic of Ojibwa. They have been regarded as characteristic of Algonkin also, but my observations suggest a division of Algonkin into two dialects, one agreeing with Ojibwa in having the nasal combinations, and the other lacking them, in that point agreeing with Fox.

A good example of a discrepancy between Cuoq's Algonkin and the Lake Simon dialect is seen in the word for "dressed hide." Cuoq and Lemoine give *packwegin*, which agrees with Ojibwa; but Cuoq mentions in various places

another form *pakigin*, without any explanation of the difference. At Lake Simon the form is *pa'kīgin*, while I was told that at Lake Abitibi they say *packwegin*, and at Maniwaki, *pa'kēgin* (which is good Cree, cf. Lacombe *pakkegin*, Bloomfield *pahkākinwah;* derived from traders from Cree territory, no doubt). Just how such variations are to be judged is not easy to say. In having *hk* for Ojibwa and Algonkin *ck*, the Lake Simon dialect resembles Cree (and Menominee); in the *ī* for *ē* it goes against Cree (and agrees with what Menominee would show if the word were found in that language).

That we have to do with a mixed dialect is quite possible. The Lake Simon band hunt as far north as Waswanipee (in Cree territory), and some Tête-de-Boule Indians from the north-east have settled among them and married here. Apparently their children speak as do all the others. Also some Cree from the north have setled here. Further study and observation is required, and this I plan to continue next summer.

SUMMARY

The serial numbers of grants made in successive years, and those for which no reports have been furnished for publication in the YEAR BOOK for 1937 may be summarized as follows:

Year	Grant Nos.	Reports lacking in this YEAR BOOK
1933–34	1–35	on Nos. 3, 16, 24
1935	36–83	" " 47, 59, 64, 77, 78, 82
1936	84–126	" " 84, 92, 95, 102, 108, 113, 114, 119, 123
1937	127–200	21 Reports in this volume

There has not been sufficient time for reports from these latest grants but these and some of the earlier ones will probably be represented in future numbers of the YEAR BOOK.

6. REPORT OF THE COMMITTEE ON FINANCE

According to the Laws of the Society, the Committee on Finance consists of the President and Treasurer, ex-officio, and not fewer than five other members who shall be nominated by the President and elected by the Society at the General Meeting in April.

During the year 1937 the Committee on Finance consisted of William P. Gest, *Chairman*, Marshall S. Morgan, Thomas S. Gates, John Story Jenks, Charles J. Rhoads, J. Henry Scattergood, Roland S. Morris, *President*. Edwin G. Conklin, *Executive Officer*, and Morris Duane, *Legal Consultant*, sat with the Committee. The Treasurer, Fidelity-Philadelphia Trust Company, is represented by its President, Marshall S. Morgan. The members of the Committee met regularly once a month from October to June inclusive with occasional special meetings and during the summer meetings were held from time to time as questions arose that required the attention of the Committee. In addition to supervision of the investments by the Committee they have the benefit of the advice of one of the leading investment houses in Philadelphia as well as the assistance of the Treasurer, Fidelity-Philadelphia Trust Company.

In conjunction with the Committee on Building Fund the Committee on Finance arranged with Mr. Eldridge Reeves Johnson for the transfer of his contribution from the Building Fund to a new fund for the general purposes of the Society, to be known as the Eldridge Reeves Johnson Fund. As shown elsewhere this fund amounted to $500,000 par value, in cash and good securities.

The Committee continued to give detailed attention to the settlement of the estate of Walter Wood. There have been numerous problems in connection with uncompleted tax matters and collateral interests of Mr. Wood which are progressing satisfactorily and to date it is apparent that at

least $80,000 will be received in cash, in addition to real estate and other assets heretofore received.

During the year Dr. Judson Daland died and left his residuary estate to the Society. It is hoped that this will amount to over $200,000 after the estate is settled. There have been numerous questions involved, viz.: settlement of claims, investments, etc., which have received the attention of the Committee in connection with this estate.

The reports as made by the Treasurer and approved by the auditors, Wilson, Linvill and Parry, are herewith submitted.

William P. Gest, *Chairman*

PURPOSES OF TRUST FUNDS AND SPECIAL FUNDS

There are twenty-three trust funds in the keeping of the Society. Only three of these are unrestricted in the uses to which their income may be applied "for promoting useful knowledge;" three specify a primary purpose, after which any balance may be used for general purposes; seventeen are restricted to specific uses, twelve of these being for the purchase of books for the Library. These funds and the manner and purpose of their establishment are listed alphabetically as follows:

Balch International Law Fund

Founded by Thomas Willing Balch, Esq., of Philadelphia, October 13, 1911, with an initial gift of securities valued at about $700, increased by later gifts to about $1,600, as a memorial to his father for his part in bringing about the submission of the Alabama Claims to the Geneva Tribunal. A part of the income to be used for the purchase of books relating to the law of nations and such other uses, when thought advisable, as may promote the study of that science; a part, not less than one-half, to be added annually to the principal.

Boyé Library Fund

Bequest of $1,879.21 by Professor Martin Boyé, of Coopersburg, Pa., who died March 5, 1909. Income to be

expended in the purchase of books, preferably on chemistry and geology.

BRUSH ENDOWMENT FUND

Gift of $10,000 by Charles Francis Brush, LL.D., of Cleveland, Ohio, November 24, 1914. Income to be used for the general purposes of the Society.

BUILDING FUND

Created by deed of trust dated June 4, 1900, Girard Trust Company, depositary and trustee. All money or property which shall be designated or devoted by any donor, testator or other person, for the acquisition of land or buildings for the Society's use, shall be forthwith paid over, conveyed, or delivered by the Society to the said depositary, for the acquisition of land and the construction and furnishing of buildings for the use and occupation of the Society. The present value is $590,543.30.

CARLIER LIBRARY FUND

Bequest of $5,000 by Auguste Carlier, of Paris, who died March 16, 1890. The income, less 10 per cent to be added to the principal, to be expended for the purchase of books for the Library.

CARNEGIE LIBRARY FUND

Gift of $100,000 by the Carnegie Corporation in 1931. The income to be used for the maintenance of the Library.

DALAND FUND

Bequest of the residuary estate of Dr. Judson Daland, of Philadelphia, who died August 14, 1937, approximately $200,000. The income only to be used by the Society for research in clinical medicine.

ENTERTAINMENT FUND

Contributions of approximately $4,250, by various donors since 1906. The income to be used to defray the cost of entertainment.

Franklin Library Fund

Established by the Library Committee in May, 1911, from funds derived from the proceeds of the sale in that year of duplicates, formerly the property of Benjamin Franklin, approximately $3,400. The income to be used for the purchase of books.

Jefferson Library Fund

Established by the Library Committee on January 20, 1905, from the proceeds of royalties from the publication of manuscripts acquired by the Society through President Thomas Jefferson, approximately $1,700. Income to be used for the purchase of books.

Johnson Fund

Established in 1937 when Mr. Eldridge Reeves Johnson transferred his gift of $500,000 from the Building and Endowment Fund to the Endowment Fund of the Society.

Lewis Fund

Gift of $10,000 made by Mrs. John F. Lewis in 1935 in memory of her husband; the income to be used each year as an award to the American citizen who shall announce at any general or special meeting of the Society, and publish among its papers, some truth which the Council of the Society shall deem worthy of the award. In any year income not so awarded to be added to principal.

Magellanic Fund

Gift of 200 guineas by John Hyacinth de Magellan, of London, in 1786, for a gold medal to be annually awarded under prescribed terms, to the author of the best discovery or most useful invention relating to navigation, astronomy, or natural philosophy (mere natural history only excepted). Any surplus of interest remaining to be used for such purposes as may be authorized under the Society's Charter and Laws. The unexpended annual income, less 10 per cent, which is to be added to the principal, may be used for the purchase of books relating to those departments of science in which the premium is annually offered.

Michaux Fund

Bequest of 92,600 francs by François André Michaux, who died at Paris, October 23, 1855, for the extension and progress of agriculture, and more especially of sylviculture, in the United States. Income, less 10 per cent reserved for reinvestment, to be used for the purchase of books on forestry, etc., in accordance with the terms of the bequest.

Norris Library Fund

Established by the Library Committee in May, 1911, from the proceeds of the sale in that year of duplicate pamphlets, presented to the Society in 1815 by Joseph Parker Norris, Esq., of Philadelphia, approximately $2,100. Income to be used for the purchase of books.

Phillips Library Fund

Bequest of his residuary estate, approximately $3,410 (December 1895) by Henry Phillips, Jr., Esq., of Philadelphia, who died June 6, 1895, to which were later added two bequests to him, confirmed and audited October 5, 1903, of $7,547.54 from the estate of his aunt, Emily Phillips, and of $41,464.26, being an interest in the residuary estate of his uncle, Henry M. Phillips. Income to be used for the purchase of books on archaeology and philology.

Phillips Prize Essay Fund

The gift of Miss Emily Phillips, of Philadelphia, in memory of her brother Henry M. Phillips, on October 5, 1888, of $5,000. Income to be used in the awarding of a prize for the best essay of real merit on the science and philosophy of jurisprudence.

Penrose Fund

Bequest of one-half of the residuary estate of Dr. Richard A. F. Penrose, Jr., of Philadelphia, who died July 31, 1931, approximately $3,900,000; this gift to be considered an endowment fund, the income of which only to be used and the capital to be properly invested.

PROUD LIBRARY FUND

Established by the Library Committee in May, 1911, from the proceeds of the sale in that year of duplicate pamphlets presented in 1812 by Robert Proud, Esq., of Philadelphia, $2,500. Income to be used for the purchase of books.

PUBLICATION FUND

Contributions of approximately $25,400 by various donors since 1914, the income to be used toward defraying the expenses of the publications of the Society.

SEYBERT LIBRARY FUND

Bequest of $2,000 by Henry Seybert, Esq., of Philadelphia, who died March 3, 1883. Income to be expended for the purchase of books.

TILGHMAN LIBRARY FUND

Bequest of $200 by Chief Justice William Tilghman, of Philadelphia, who died April 30, 1827. Income to be expended for the purchase of books.

WOOD MEMORIAL FUND

Bequest of the residuary estate of Walter Wood, of Philadelphia, who died April 20, 1934, approximately $150,000, in memory of his uncle, George B. Wood, his cousin, Horatio G. Wood, and his two brothers, Richard and Stuart Wood, all of whom were members of the American Philosophical Society; to be used by the Society first for the construction of a building that shall be adequate for the needs of the Society and if there be any surplus, then the same to be applied to such useful purpose or purposes as the Counsel (sic) and Officers of said Society may determine.

Estimated Annual Income

General Fund	$ 22,832.50
Admission Fees Fund	227.00
Brush Endowment Fund	508.00
Carnegie Library Fund	3,500.00
Entertainment Fund	180.00
Eldridge Reeves Johnson Fund	14,642.50
Penrose Endowment Fund	141,217.98
Publication Fund	1,005.50
Sales of Publications	1,500.00
Income Applicable to Budget	$185,613.48
Fourteen (14) Trust Funds for Special Purposes	8,754.95
Total Estimated Annual Income	$194,368.43

Funds for Special Purposes

Thomas Balch Fund	$ 189.10
Martin Boyé Fund	128.50
Auguste Carlier Fund	553.50
Benjamin Franklin Fund	388.50
Thomas Jefferson Fund	141.50
John F. Lewis Fund	400.00
Magellanic Fund	218.50
Michaux Fund	1,941.00
Joseph Parker Norris Fund	181.00
Henry Phillips, Jr., Fund	3,686.10
Henry M. Phillips Prize Essay Fund	472.75
Robert Proud Library Fund	221.00
Henry Seybert Fund	157.50
William Tilghman Fund	76.00
	$8,754.95

BUDGET FOR 1938

Executive Office	$ 9,600.00	
Secretaries' Expense	3,000.00	
Telephone Expense	500.00	
Insurance	900.00	
Committee on Publications:		
Publication Expenses	25,000.00	
Committee on Library:		
Books and Binding	9,900.00	
Librarians' Salaries	10,750.00	
Rental for Housing of Library	8,700.00	
Curator's Expense	200.00	
Treasurer's Expense and Compensation	6,750.00	
Hall Fund	5,000.00	
Research Fund	50,000.00	
Research Expense	1,000.00	
Meetings Fund	6,000.00	
Miscellaneous	10,000.00	$147,300.00
Funds for Special Purposes		8,754.95
		$156,054.95

Balances carried forward from 1937 in cash to pay appropriations made under the 1937 Budget	
Books and Binding	$ 1,186.20
Publication Expenses	12,071.37
Research Fund	34,132.38
American Historical Association Meeting	1,958.52
	$49,348.47

SCHEDULE I

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1937

General Fund

Principal Account

Balance January 1, 1937			$ 26,025.26
Receipts:			
Investments sold, matured or redeemed:			
$57,000.00 Railroad and Public Utility Bonds		$ 60,699.72	
1000 shs. Phila. Electric Co. Common		35,210.00	
On account mortgage 41 E. Mt. Pleasant Ave.		1,000.00	
		$ 96,909.72	
Walter Wood Real Estate Principal Account:			
Payments on account of advances by General Fund		20,000.00	
Transferred from Income		67,795.28	
			184,705.00
			$210,730.26
Disbursements:			
Investments Purchased:			
Industrial Bonds ($50,000.00)		$ 53,763.00	
Bank Stocks		34,149.00	
Preferred Stocks		37,140.00	
Common Stocks		75,380.51	
			200,432.51
Balance December 31, 1937			$ 10,297.75

Income and Operating Account

Balance January 1, 1937			$ 34,686.16
Receipts:			
Income from Investments		$ 23,427.95	
Girard Trust Co. Building Fund, reimbursement for alterations, refitting and furnishing Society's building		53,726.58	
Sale of publications		2,132.59	
Insurance recovery—re loss of 2 manuscripts		750.00	
Sale of frames of Microfilms		7.52	
Research—Miscellaneous refunds		307.83	
Exchange checks		42.23	
Transfer of Income from Trust Funds:			
Penrose Endowment Fund	$144,917.44		
Brush Endowment Fund	495.67		
Admission Fees Fund	212.01		
Carnegie Library Fund	4,071.36		
Entertainment Fund	185.36		
Publication Fund	1,024.83		
		150,906.67	
			231,301.37
Amount forwarded			$265,987.53

Amount brought forward			$265,987.53
Disbursements:			
Salaries—Executive Office		$ 9,480.00	
Salaries—Librarian and Assistant Librarians		8,132.50	
Secretaries' Expenses		2,665.79	
Telephone		344.37	
Publication Expenses		21,006.13	
Books and Binding		9,336.51	
Insurance		4,779.92	
Meetings		5,484.86	
American Historical Association Meeting		41.48	
Hall Expenses		2,903.80	
Hall Alterations and Repairs		1,783.33	
Hall Equipment		894.10	
Library Rental (Drexel Building)		7,200.00	
Auditing Fees		925.00	
Treasurer's Expense		2.20	
Research Fund Grants		67,129.00	
Research Expenses		30.93	
Legal Fees		3,783.32	
Portrait of Henry Norris Russell		1,500.00	
Camera Cost and Expenses		481.26	
Restoration of monument and grave of William Temple Franklin in Paris		225.07	
Miscellaneous Appropriations		84.62	
Exchange Checks		42.23	
Forwarding charges—sale of bonds		1.62	
Treasurer's Commissions	$5,427.39		
Agent's Commission (Girard Trust Company Carnegie Fund)	47.34		
	$5,380.05		
Charged other Funds	4,794.31		
		585.74	
Transfer to Principal		67,795.28	
			$216,639.06
Balance December 31, 1937			$ 49,348.47

Balance held for unexpended appropriations made under the 1937 Budget as follows:	
Books and Binding	$ 1,186.20
Publication Expenses	12,071.37
Research Fund	34,132.38
American Historical Association Meeting	1,958.52
	$49,348.47

SCHEDULE II

SUMMARY OF CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1937

TRUST FUNDS—PRINCIPAL ACCOUNT

	Balance 1-1-37	Receipts: Proceeds from Investments Sold or Matured	Receipts: Transfer from Building Fund (Girard Trust Co. Trustee)	Receipts: Transfer from Income Account	Total	Disbursements: Investments Purchased	Balance 12-31-37
General Purpose Funds:							
Admission Fees	$ 665.00	$ 535.27	—	—	$ 1,200.27	$ 1,200.00	$ .27
Brush Endowment	—	10.00	—	—	10.00	—	10.00
Eldridge Reeves Johnson	—	25,750.00	11,000.00	—	36,750.00	36,550.22	199.78
Penrose Endowment	1.57	382,262.98	—	—	382,264.55	372,949.17	9,315.38
	$ 666.57	$408,558.25	$11,000.00	—	$420,224.82	$410,699.39	$ 9,525.43
*Special Purpose Funds:**							
Thomas Balch International Law	$ 356.83	$ 317.20	—	$ 93.17	$ 767.20	$ 600.00	$ 167.20
Martin Boyé	252.21	882.01	—	13.14	1,147.36	1,100.00	47.36
Auguste Carlier	569.29	457.02	—	54.60	1,080.91	1,000.00	80.91
Carnegie Library	1,304.35	—	—	204.13	1,508.48	1,508.48	—
Entertainment	—	252.78	—	—	252.78	—	252.78
Benjamin Franklin	398.45	5.74	—	37.96	442.15	400.00	42.15
Thomas Jefferson Library	211.04	368.32	—	14.28	593.64	500.00	93.64
John F. Lewis	—	—	—	40.00	40.00	—	40.00
Magellanic	385.11	4,858.02	—	26.80	5,269.93	5,203.36	66.57
Michaux	543.40	17,363.16	—	212.94	18,119.50	17,902.31	217.19
Joseph Parker Norris	267.37	152.99	—	17.68	438.04	400.00	38.04
Henry Phillips, Jr.	492.38	31,370.59	—	391.43	32,254.40	31,851.12	403.28
Henry M. Phillips Prize Essay	885.82	545.99	—	45.97	1,477.78	1,400.00	77.78
Robert Proud Library	281.09	1,002.47	—	21.76	1,305.32	1,200.00	105.32
Publication	28.65	3,202.62	—	—	3,231.27	3,180.00	51.27
Henry Seybert	271.11	275.06	—	14.31	560.48	500.00	60.48
William Tilghman	81.99	762.53	—	8.13	852.65	800.00	52.65
	$6,329.09	$ 61,816.50	—	$1,196.30	$ 69,341.89	$ 67,545.27	$ 1,796.62
Totals	$6,995.66	$470,374.75	$11,000.00	$1,196.30	$489,566.71	$478,244.66	$11,322.05

* Excluding Wood Fund—See Schedules IV and V.

SCHEDULE III

SUMMARY OF CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1937

TRUST FUNDS—INCOME ACCOUNT

		Receipts			Disbursements					
	Balance 1-1-37	Gross Income from Investments	Transferred from Building Fund (Girard Trust Co. Trustee)	Total	For Purpose of Fund	Treasurer's and Agents' Commissions and Misc.	Transferred to General Fund	Transferred to Principal Account	Total	Balance 12-31-37
General Purpose Funds:										
Admission Fees	—	$ 217.45	—	$ 217.45	—	$ 5.44	$ 212.01	—	$ 217.45	—
Brush Endowment	—	508.40	—	508.40	—	12.73	495.67	—	508.40	—
Eldridge Reeves Johnson	—	6,878.75	$14,658.37	21,537.12	—	576.40	—	—	576.40	$20,960.72
Penrose Endowment	—	148,637.48	—	148,637.48	—	3,720.04	144,917.44	—	148,637.48	—
	—	$156,242.08	$14,658.37	$170,900.45	—	$4,314.61	$145,625.12	—	$149,939.73	$20,960.72
*Special Purpose Funds.**										
Thomas Balch International Law	$ 83.74	$ 186.29	—	$ 270.03	$ 45.60	$ 4.65	—	$ 93.17	$ 143.42	$ 126.61
Martin Boyé	—	131.31	—	131.31	34.23	3.28	—	13.14	50.65	80.66
Auguste Carlier	—	545.96	—	545.96	475.52	13.66	—	54.60	543.78	2.18
Carnegie Library	—	4,734.23	—	4,734.23	—	458.74	$ 4,071.36	204.13	4,734.23	—
Entertainment	—	190.12	—	190.12	—	4.76	185.36	—	190.12	—
Benjamin Franklin	—	379.56	—	379.56	327.43	9.48	—	37.96	374.87	4.69
Thomas Jefferson Library	—	142.75	—	142.75	65.67	3.56	—	14.28	83.51	59.24
John F. Lewis	344.50	400.00	—	744.50	300.00	10.00	—	40.00	350.00	394.50
Magellanic	—	267.93	—	267.93	48.95	6.69	—	26.80	82.44	185.49
Michaux	1,215.59	2,129.40	—	3,344.99	929.94	53.24	—	212.94	1,196.12	2,148.87
Joseph Parker Norris	—	176.80	—	176.80	100.45	4.43	—	17.68	122.56	54.24
Henry Phillips, Jr.	1,685.13	3,914.05	—	5,599.18	2,869.46	98.42	—	391.43	3,359.31	2,239.87
Henry M. Phillips Prize Essay	—	459.64	—	459.64	—	11.49	—	45.97	57.46	402.18
Robert Proud Library	—	217.48	—	217.48	118.77	5.44	—	21.76	145.97	71.51
Publication	—	1,051.12	—	1,051.12	—	26.29	1,024.83	—	1,051.12	—
Henry Seybert	—	143.01	—	143.01	88.60	3.58	—	14.31	106.49	36.52
William Tilghman	—	81.20	—	81.20	58.98	2.03	—	8.13	69.14	12.06
	$3,328.96	$ 15,150.85	—	$ 18,479.81	$5,463.60	$ 719.74	$ 5,281.55	$1,196.30	$ 12,661.19	$ 5,818.62
Totals	$3,328.96	$171,392.93	$14,658.37	$189,380.26	$5,463.60	$5,034.35	$150,906.67	$1,196.30	$162,600.92	$26,779.34

* Excluding Wood Fund—See Schedules IV and V.

SCHEDULE IV

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1937

WOOD FUND—PERSONALTY

Principal Account

Balance January 1, 1937		$ 4,075.08
Receipts:		
Cash from Executors of Estate of Walter Wood, deceased	$11,254.50	
Investments sold or redeemed	5,234.75	
		16,489.25
		$20,564.33
Disbursements:		
Investment:		
$2,000 Bond and Mortgage, Yardvill and Hamilton Sq. Road, Hamilton Twp., Mercer Co., N. J. 5% due 2-20-1940	$ 2,000.00	
Expended by executors for professional services	50.00	
Legal services re settlement 1934 income tax claim against Estate of Walter Wood	10,725.54	
		12,775.54
Balance December 31, 1937		$ 7,788.79

Income Account

Balance January 1, 1937		$ 2,264.21
Receipts:		
Cash from Executors of Estate of Walter Wood, deceased	$ 74.00	
Income from Investments	5,284.00	
		5,358.00
		$ 7,622.21
Disbursements:		
Treasurer's Commission		264.20
Balance December 31, 1937		$ 7,358.01

SCHEDULE V

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1937

WOOD FUND—REAL ESTATE

Principal Account

Balance January 1, 1937		$ 1,355.29
Receipts:		
Sale and Deposits on Sale of Real Estate	$19,300.00	
Cancellation of Perpetual Fire Insurance Policy	285.12	
Advance rent—1606 Ludlow St. due 1-15 and 2-15-1940	260.00	
Acknowledgment of Deed (Stults Farm)	1.25	
Recovery of damages to door—400 Chestnut St.	8.00*	19,854.37
		$21,209.66
Disbursements:		
Payment on account of loan—General Fund Principal	$20,000.00	
Commission on Sale of Hlucky Farm	275.00	
Commission on advance rent—1606 Ludlow St.	13.00	
Appraisal fees	35.00	
Cost of service and satisfaction of Mortgages and Judgments	41.37	
Replacement and Repairs to Real Estate	119.46	
Acknowledgments and Revenue Stamps	23.25	20,507.08
Balance December 31, 1937		$ 702.58

Income Account

Balance January 1, 1937		$ 6,027.35
Receipts:		
Income from Real Estate	$45,313.39	
Adjustment and Cancellation of Insurance	48.67	
Adjustment of Taxes	143.99	
Miscellaneous	10.19	45,516.24
		$51,543.59
Disbursements:		
Taxes on Real Estate	$15,725.67	
Water Rents	855.49	
Maintenance, Repairs and Insurance	23,794.68	
General Fund Income—interest on advances	6,493.34	
Adjustment of Taxes and Rents	41.47	
Refund of Rent—cancellation of lease 40 S. 16th St.	850.00	
Treasurer's Commission	363.53	
Miscellaneous	34.60	48,158.78
Balance December 31, 1937		$ 3,384.81

* In addition, $100.00 was received from Insurance Company but did not reach Treasurer's books until January 1938.

SCHEDULE VI

SUMMARY OF CASH

December 31, 1937

	Principal	Income	Total
General Fund	$10,297.75	$49,348.47	$ 59,646.22
Trust Funds for General Purposes:			
Admission Fees Fund	.27		.27
Brush Endowment Fund	10.00		10.00
Eldridge Reeves Johnson Fund	199.78	20,960.72	21,160.50
Penrose Endowment Fund	9,315.38		9,315.38
Trust Funds for Special Purposes:			
Wood Memorial Fund Personalty	7,788.79	7,358.01	15,146.80
Wood Memorial Fund Real Estate	702.58	3,384.81	4,087.39
Seventeen other Trust Funds (Combined) (See Schedules II and III for detail)	1,796.62	5,818.62	7,615.24
	$30,111.17	$86,870.63	$116,981.80

On deposit with Fidelity-Philadelphia Trust Company (Treasurer's Account)	$ 86,870.63
Included among the Trust Funds (Cash) of Fidelity-Philadelphia Trust Co.	30,111.17
	$116,981.80

SCHEDULE VII

GENERAL AND TRUST FUNDS

Principal

December 31, 1937

	Uninvested Cash 12-31-1937	Invested 12-31-37	Total Funds at Book Value 12-31-1937	Total Funds at Book Value 12-31-1936
For General Purposes:				
General	$10,297.75	$ 291,944.52	——	——
Loan to Wood Memorial Fund	——	210,000.00A	——	——
	$10,297.75	$ 501,944.52	$ 512,242.27	$ 503,309.96
Admission Fees	$ .27	$ 5,100.00	$ 5,100.27	$ 5,400.27
Brush Endowment	$ 10.00	$ 10,100.00	$ 10,110.00	$ 10,110.00
Eldridge Reeves Johnson	$ 199.78	$ 498,175.20	$ 498,374.98	——
Penrose Endowment	$ 9,315.38	$4,469,026.90	$4,478,342.28	$4,576,643.91
For Special Purposes:				
Wood Memorial Fund Personalty	$ 7,788.79	$ 106,308.98	——	——
Wood Memorial Fund Real Estate	702.58	580,727.20	——	——
Loan due General Fund	——	−210,000.00A	——	——
For the construction of a building adequate to the needs of the Society, any surplus remaining to be applied to such useful purposes as counsel and officers of Society may determine	$ 8,491.37	$ 477,036.18	$ 485,527.55	$ 485,996.55
Seventeen Other Special Funds:				
Thomas Balch International Law	$ 167.20	$ 3,060.00	$ 3,227.20	$ 3,284.03
For Books relating to the Law of Nations				
Martin Boyé	47.36	3,000.00	3,047.36	3,134.22
For Books—Chemistry and Geology				

Auguste Carlier............ For Books	80.91	12,950.00	13,030.91	13,226.31
Carnegie Library........... For maintenance of Library	——	100,020.22	100,020.22	99,816.09
Entertainment............. For entertainment	252.78	4,000.00	4,252.78	4,252.78
Benjamin Franklin.......... For books	42.15	9,400.00	9,442.15	9,554.19
Thomas Jefferson Library.... For books	93.64	3,400.00	3,493.64	3,579.36
John F. Lewis.............. For an award to the American Citizen who shall announce at any general or special meeting of the Society and publish among its papers some truth which the Council of the Society shall deem worthy of the award	40.00	10,000.00	10,040.00	10,000.00
Magellanic................ Prize for discovery or invention and for books in field of Navigation, Astronomy or Natural Philosophy	66.57	4,700.00	4,766.57	4,872.73
Michaux.................. For books on Forestry	217.19	48,400.00	48,617.19	48,435.00
Joseph Parker Norris........ For books	38.04	4,350.00	4,388.04	4,470.36
Henry Phillips, Jr........... For books on Archaeology and Philology	403.28	82,920.00	83,323.28	85,432.37
Henry M. Phillips Prize Essay Prize for essay on Science and Philosophy of Jurisprudence	77.78	12,000.00	12,077.78	12,431.81
Robert Proud Library....... For books	105.32	5,100.00	5,205.32	5,283.56
Publication................ For Publications of Society	51.27	25,350.00	25,401.27	25,428.72
Henry Seybert............. For books	60.48	3,450.00	3,510.48	3,596.17
William Tilghman.......... For books	52.65	1,800.00	1,852.65	1,844.52
Total Seventeen Funds..	$ 1,796.62	$ 333,900.22	$ 335,696.84	$ 338,642.22
Total all Funds	$30,111.17	$6,295,283.02	$6,325,394.19	$5,920,102.91

Invested in:		
U. S. Government Obligations	$2,167,500.00	$1,899,500.00
State, County and Municipal Bonds	1,276,000.00	1,609,000.00
Railway, Utility, Industrial and Other Bonds	1,378,501.00	861,551.00
Stocks	801,030.92	823,458.00
Mortgages and Mortgage Participations	77,921.74	76,921.74
Real Estate and Real Estate Participations	587,235.68	604,127.20
Notes Receivable	6,308.98	6,308.98
Perpetual Fire Insurance Policies	784.70	784.70
	$6,295,283.02	$5,881,651.62
Uninvested Cash	30,111.17	38,451.29
	$6,325,394.19	$5,920,102.91

Summary of Increase in Investments

Balance at Book Value 12-31-1936		$5,881,651.62
Investments transferred from Building Fund Girard Trust Company Trustee for Eldridge Reeves Johnson Fund at face value		489,000.00
Investments from Executors of Estate of Walter Wood, deceased, at face value		2,000.00
Investments Purchased—at cost		680,677.17
		$7,053,328.79
Investments Sold ($591,820.72) at book value		657,755.00
		$6,395,573.79
Deduct:		
Difference between cost of Investments Purchased during year and the Face or Par Value at which these Investments are shown on the books:		
Bonds	$23,745.33	
Stocks	76,545.44	
		100,290.77
Balance at Book Value 12-31-1937		$6,295,283.02

SCHEDULE VIII

BUILDING FUND—GIRARD TRUST COMPANY, TRUSTEE

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1937

Principal Account

Balance January 1, 1937		$779,133.60
Receipts:		
Mortgages paid in full or in part	$ 5,191.43	
Real Estate—Settlement Tax Claim	18.40	
Transferred from Income Account	14,447.33	
		19,657.16
		$798,790.76
Disbursements:		
Invested in Bonds	$595,157.52	
Invested in Stocks	118,044.13	
Cost of acquiring and conditioning Real Estate	202.62	
Transferred to General Fund in reimbursement for alterations, refitting and furnishing Society's building	53,726.58	
Transferred to Eldridge Reeves Johnson Trust Fund	25,658.37	
Forwarding charges on Investment Purchases	37.18	
		792,826.40
Balance December 31, 1937		$ 5,964.36

Income Account

Receipts:		
Income from Investments		$ 17,393.71
Disbursements:		
Real Estate expenses	$ 2,718.80	
Commission—Girard Trust Company	227.08	
Notary Fee	.50	
Transferred to Principal Account	14,447.33	
		$ 17,393.71

SCHEDULE IX

BUILDING FUND—GIRARD TRUST COMPANY, TRUSTEE

SUMMARY OF ASSETS

	Balance 1-1-1937	Additions	Deductions	Balance 12-31-1937
Pledges Receivable......	$ 11,229.17	——	——	$ 11,229.17
Investments:				
Bonds (Par Value)....	20,500.00	$579,000.00	$ 489,000.00	110,500.00
Stocks (At Cost)......	——	118,044.13	——	118,044.13
Mortgages (Participations).....	271,624.27	——	5,191.43	266,432.84
Real Estate (Participations).....	89,417.75	202.62	18.40	89,601.97
Cash—Principal........	779,133.60	19,657.16	792,826.40	5,964.36
Cash—Income.........	——	17,393.71	17,393.71	——
	$1,171,904.79	$734,297.62	$1,304,429.94	$601,772.47*

SUMMARY OF DECREASE IN FUNDS

Year ended December 31, 1937

Income from Investments..................................		$ 17,393.71
Less:		
Real Estate Expenses.........................	$ 2,718.80	
American Philosophical Society—General Fund—Reimbursement for alterations, refitting and furnishing Society's building....................	53,726.58	
Transferred to Eldridge Reeves Johnson Trust Fund:		
Cash.......................................	25,658.37	
Bonds (Par Value).........................	489,000.00	
Premium on Bonds Purchased above par (net of discounts)................................	16,157.52	
Commission—Girard Trust Co.................	227.08	
Forwarding Charges on Investments Purchased...	37.18	
Notary Fee..................................	.50	
		587,526.03
Net Decrease..		*$ 570,132.32*
Balance January 1, 1937.................................		1,171,904.79
Balance December 31, 1937...............................		$ 601,772.47

* Includes bonds at Par Value. Total Fund including bonds at cost is $601,502.47.

February 5, 1938

To the Council:

The Committee on Audit of the Treasurer's accounts reports that the Society's accounts have been examined by Wilson, Linvill and Parry, Certified Public Accountants, and their report which is herewith attached is approved by this Committee.

The total book value of the investments and cash held as Principal as shown by the Accountants' report is:

General Fund and Trust Funds for General Purposes	$5,989,697.35
Trust Funds for Special Purposes	335,696.84
Building Fund	590,543.30

J. Rodman Paul, *Chairman*
Arthur W. Goodspeed
William E. Lingelbach
J. Bertram Lippincott
John A. Miller
John M. Scott

WILSON, LINVILL & PARRY
Certified Public Accountants
Twelve South Twelfth Street
Philadelphia

February 1, 1938

J. Rodman Paul, Esq.,
Chairman Auditing Committee,
American Philosophical Society,
Philadelphia, Pa.

Dear Sir:

GENERAL AND TRUST FUNDS

We have examined the accounts of the American Philosophical Society for the year ended December 31, 1937 as contained in the records of the Treasurer, the Fidelity-Philadelphia Trust Company. The appended statements,

Schedules I to VII inclusive, are in accordance with these records.

We have examined paid cancelled checks and vouchers in connection with disbursements in the various funds except the Wood Memorial Fund Real Estate Income Account, as to which we have accepted the cash records of the Fidelity-Philadelphia Trust Company as agent, without any further examination. The cash in bank at December 31, 1937 as summarized in Schedule VI has been verified.

We have examined into the changes during the year in the investments in all of the funds. We examined the perpetual fire insurance policies carried as an investment in the General Fund and obtained detailed statements from the Fidelity-Philadelphia Trust Company and the Girard Trust Company showing at December 31, 1937 the bonds, stocks, real estate and other investments held by them as agents for the Society, thus satisfactorily accounting for all of the investments of the Society as called for by the records at December 31, 1937.

During the year the Eldridge Reeves Johnson Fund was established at the request of Mr. Johnson by transferring from the Girard Trust Company, Trustee of the Building Fund, his original contribution of $500,000.00 together with a portion of the net income of the Building Fund. The amount to be transferred in accordance with a resolution of June 29, 1937 was determined to be $533,129.84, for which amount the Girard Trust Company transferred $489,000.00 of bonds at July 1, 1937 market value and cash.

The investments composing the various funds as summarized in the appended statement (Schedule VII) are at book value, which in most instances is par or face value and is not represented to be either original cost or present market value. The Real Estate owned is shown at its appraised or assessed valuation. We have not determined the current market value of any of the investments.

Income due for the year from the investments has been received and recorded on the books prior to December 31st, except as follows:

General and Other Trust Funds:	
Delinquent Mortgage Interest	$ 110.00
Bond Interest in Default..................	2,349.40
(Including $1,284.40 in default January 1, 1937)	
Carnegie Library Fund:	
Delinquent Mortgage Interest	3,012.35
(Including $1,773.35 in default January 1, 1937)	
	$5,471.75

We have not accounted for income due from real estate (Wood Memorial Fund).

Comprehensive tests have been made of the income receivable from other sources, with satisfactory results.

BUILDING FUND

GIRARD TRUST COMPANY, TRUSTEE

We have examined statements submitted by the Girard Trust Company, Trustee, of the Building Fund for the year ended December 31, 1937, have examined the records in the Society's office of subscriptions or pledges to the fund, and have prepared the appended statement of Cash Receipts and Disbursements and Summary of the Assets for the year—Schedules VIII and IX.

The cash and investments are in accordance with a statement obtained by us from the Girard Trust Company, Trustee, setting forth in detail the assets in their possession at December 31, 1937. All of the investments are at par value, with real estate (participations) at amount of foreclosed mortgage plus costs of acquisition and subsequent improvements. We have not determined the present market value of any of the investments, or the collectibility of the unpaid pledges to the fund.

Changes during the year in the investments have been examined and we have accounted for all income due except delinquent mortgage interest \$8,487.62, of which amount \$5,445.85 was delinquent January 1, 1937. This delinquency does not include a second mortgage participation of \$2,192.50 (or the interest in arrears on same) which was accepted in lieu of interest in arrears June 1, 1932 to April 14, 1937 on a first mortgage participation. This second mortgage participation is not listed among the assets.

Respectfully submitted,

WILSON, LINVILL & PARRY

Certified Public Accountants

VI

AWARDS OF PRIZES

MAGELLANIC FUND, established in 1786 by the gift of 200 guineas by John Hyacinth de Magellan, of London, for a gold medal to be annually awarded under prescribed terms, to the author of the best discovery or most useful invention relating to navigation, astronomy, or natural philosophy (mere natural history only excepted). Any surplus of interest remaining to be used for such purposes as may be authorized under the Society's Charter and Laws.

Awards of the Magellanic Premium

December 1790. To *Francis Hopkinson, Philadelphia, Penna.* For the Invention of the Spring Block. "Description of a Spring Block Designed to Assist a Vessel in Sailing" (TRANS. Amer. Philos. Soc. **3**, Art. 40, 1793).

December 1792. To *Robert Patterson, Philadelphia, Penna.* For the Improvement of Electrical Rods, or Lightning Conductors, by Pointing them with Black-lead. "An Improvement on Metalic Conductors or Lightning-rods in a Letter to Dr. David Rittenhouse from Robert Patterson" (TRANS. Amer. Philos. Soc. **3**, Art. 35, 1793).

December 1792. To *William Thornton, London, England.* For "Cadmus" or a Philosophical Dissertation on the Elements of Written Language. "Cadmus, or a Treatise on the Elements of Written Language, illustrating, by a Philosophical Division of Speech, the power of each Character, thereby mutually fixing the Orthography and Orthoepy. With an Essay on the Mode of Teaching the Surd, or Deaf and Consequently Dumb to Speak" (TRANS. Amer. Philos. Soc. **3**, Art. 33, 1793).

December 1794. To *Nicolas Collin, Philadelphia, Penna.* For a Paper on an Elevator (Nititor [sic] in ardua virtus). "Description of a Speedy Elevator by the Inventor" (Trans. Amer. Philos. Soc. **4**, Art. 75, 1799).

November 1804. To *Captain William Mugford, Salem, Mass.* For the Invention of a Temporary Rudder. "An account and description of a Temporary Rudder Invented by Capt. William Mugford of Salem, Mass." (Trans. Amer. Philos. Soc. **6**, Art. 34, 1809).

December 1804. To *Dr. Ben. Smith Barton, Philadelphia, Penna.* For a Paper on a "Number of the Pernicious Insects of the United States."

October 1807. To *John Garnett, New Brunswick, N. J.* For a Paper on "A New Simple Nautical Chart." "Description and use of a new and simple Nautical Chart, for working the different problems in Navigation" (Trans. Amer. Philos. Soc. **6**, Art. 49, 1809).

April 1809. To *James Humphries, Jr., Philadelphia, Penna.* For a Model and Description of Steering Apparatus.

April 1820. To *Joshua Chapman, Bristol, Penna.* For an Improvement in the Manufacture of Canvas.

March 1823. To *Dr. Jas. Ewing, Philadelphia, Penna.* For the invention of the "Improved Hydrant."

May 1825. To *C. C. Brodie.* For an invention to repair the side of ships, under the surface of the water.

March 1836. To *James P. Espy, Philadelphia, Penna.* Author of the paper signed "Investigator."

December 1864. To *Pliny Earle Chase, Philadelphia, Penna.* For a paper on "The discovery of Certain new relations between the solar- and lunar-diurnal variations of magnetic force and of barometric pressure" (Proc. Amer. Philos. Soc. **9**: 487–495).

December 1887. To *Lewis M. Haupt, Philadelphia, Penna.* For a paper on "The Physical Phenomena of Harbor

Entrances. Their Causes and Remedies. Defects of Present Methods of Improvement" (PROC. Amer. Philos. Soc. **25**: 19–41).

April 1922. To *Paul R. Heyl and Lyman J. Briggs*, U. S. Bureau of Standards, Washington, D. C. For the invention of the Earth Inductor Compass. "The Earth Inductor Compass" (PROC. Amer. Philos. Soc. **61**: 15–32).

THE HENRY M. PHILLIPS PRIZE ESSAY FUND, established in 1888 by the gift of $5,000 by Miss Emily Phillips, of Philadelphia. Income to be used in the awarding of a prize for the best essay of real merit on the science and philosophy of jurisprudence.

Awards of The Henry M. Phillips Prize Essay

May 1895. To *George H. Smith, Esq., Los Angeles, Calif.* $500. "The Theory of State" (PROC. Amer. Philos. Soc. **34**: 181–334).

June 1900. To *W. H. Hastings, Esq., Wilber, Neb.* $2,000. "The Development of Law as Illustrated by the Decisions Relating to the Police Power of the State" (PROC. Amer. Philos. Soc. **39**: 359–554).

April 1912. To *Charles H. Burr, Esq., Philadelphia, Penna.* $2,000. "The Treaty-Making Power of the United States and the Methods of its Enforcement as Affecting the Police Powers of the States" (PROC. Amer. Philos. Soc. **51**: 271–422).

April 1921. To *Quincy Wright, Esq., Minneapolis, Minn.* $2,000. "The Relative Rights, Duties and Responsibilities of the President, of the Senate and the House, and of the Judiciary in Theory and Practice" (PROC. Amer. Philos. Soc. **60**: 99–455).

October 1935. To *Lon L. Fuller, Dean of the Law School, Duke University, Durham, N. C.* $1,500 and Diploma. "American Legal Realism." (PROC. Amer. Philos. Soc. **76**: 191–235).

THE JOHN F. LEWIS FUND, established in 1935 by the gift of Mrs. John F. Lewis, of Philadelphia, of $10,000 in memory of her late husband; the income to be used each year as an award to the American citizen who shall announce at any general or special meeting of the Society, and publish among its papers, some truth which the Council of the Society shall deem worthy of the award.

Award of The John F. Lewis Prize

April 1937. To *Ralph E. Cleland, Goucher College, Baltimore, Md.* $300 and Diploma, for presentation to the Society and publishing in its PROCEEDINGS. "Cytotaxonomic Studies on Certain Oenotheras from California" (Read April 19, 1934,—PROC. Amer. Philos. Soc. **75**: 339–429). "A Cyto-genetic and Taxonomic Attack upon the Phylogeny and Systematics of Oenothera (Evening Primrose) with Special Reference to the Sub-genus Onagra" (Read April 18, 1935,—PROC. Amer. Philos. Soc. **77**: 477–544).

VII

GENERAL MEETING LECTURERS

THE R. A. F. PENROSE, JR., LECTURERS

1934. Edwin G. Conklin
"A Generation's Progress in the Study of Evolution"

1935. W. F. G. Swann
"Is the Universe Running Down?"

1936. Dixon Ryan Fox
"The American Tradition in a New Day"

1937. Irving Langmuir
"The Surfaces of Solids and Liquids"

THE AUTUMN LECTURERS

1936. D'Arcy W. Thompson
"Astronomy in the Classics"

1937. William Lyon Phelps
"Truth and Poetry"

VIII

REPRESENTATION AT CELEBRATIONS OF SOCIETIES, INSTITUTIONS, ETC.

January 15. Celebration of the Birthday of Benjamin Franklin at Christ Church and Benjamin Franklin's Grave, Philadelphia, Pa. Dr. Edwin G. Conklin.

April 16–17. Forty-first Annual Meeting of the American Academy of Political and Social Sciences, Philadelphia, Pa. Dr. William E. Lingelbach and Dr. Emory R. Johnson.

May 6. Dedication of New Building of the Mellon Institute, Pittsburgh, Pa. Dr. Dayton C. Miller.

May 15. Celebration of the Centenary of the Birth of Daniel Garrison Brinton, Media, Pa. Dr. Edwin G. Conklin.

September 3. Restoration of the Tomb of William Temple Franklin, Père Lachaise Cemetery, Paris, France. Dr. Edward P. Cheyney and Mr. J. Bennett Nolan.

October 2. Inauguration of Levering Tyson as President of Muhlenberg College, Allentown, Pa. Dr. Albert P. Brubaker.

October 8. Inauguration of Edmund Ezra Day as President of Cornell University, Ithaca, N. Y. Dr. Frank P. Graves.

November 16. Fiftieth Anniversary of the Founding of the University of Allahabad, India. Mr. Sam Higgenbottom, President Agricultural Institute, Allahabad.

National Research Council, Division of Foreign Relations, Washington, D. C. (for Three Years, 1937–40). Dr. Leo S. Rowe.

American Council of Learned Societies, Washington, D. C. (for Four Years, 1937–41). Dr. Edward Capps.

IX

LIST OF MEMBERS

MEMBERS RESIDING WITHIN THE UNITED STATES

Date of Election

Abbot, Charles Greeley, M.Sc., D.Sc., LL.D. 1914
Astrophysicist, Secretary Smithsonian Institution,
Washington, D. C.

Abel, John Jacob, A.M., Sc.D., M.D., LL.D. 1915
Professor Emeritus of Pharmacology, Johns Hopkins
University. Johns Hopkins Medical School, Baltimore, Md.

Adams, Edwin Plimpton, M.S., Ph.D., Sc.D. 1915
Professor of Physics, Princeton University,
Princeton, N. J.

Adams, Roger, A.B., A.M., Ph.D., Sc.D. 1935
Head of the Chemistry Department, University of Illinois.
603 Michigan Avenue, Urbana, Ill.

Adams, Walter Sydney, A.M., Sc.D., LL.D. 1915
Astronomer, Director Mount Wilson Observatory,
Pasadena, Calif.

Adler, Cyrus, M.A., Ph.D., D.H.L., Litt.D. 1900
Philologist and Orientalist, President Dropsie College
for Hebrew and Cognate Learning,
Broad and York Streets, Philadelphia, Pa.

Aitken, Robert Grant, A.M., Sc.D., LL.D. 1919
Astronomer, Director Emeritus Lick Observatory.
1109 Spruce Street, Berkeley, Calif.

Albright, William F., Ph.D., Litt.D., D.H.L., Th.D. 1929
Orientalist and Archaeologist, Professor of Semitic
Languages, Johns Hopkins University, Baltimore, Md.

Alexander, James W., A.M., Ph.D., A.A. 1928
Professor of Mathematics, Institute for Advanced Study.
29 Cleveland Lane, Princeton, N. J.

	Date of Election
Allen, Charles Elmer, B.S., Ph.D. Professor of Botany, University of Wisconsin. 2014 Chamberlin Avenue, Madison, Wis.	1922
Andrews, Charles McLean, A.M., Ph.D., L.H.D., Litt.D., LL.D. Professor Emeritus of American History, Yale University. 424 St. Ronan Street, New Haven, Conn.	1924
Andrews, Donald H., A.B., Ph.D. Professor of Chemistry, Johns Hopkins University, Baltimore, Md.	1933
Andrews, Roy Chapman, M.A., Sc.D. Zoologist, Director American Museum of Natural History, New York, N. Y.	1927
Angell, James Rowland, A.B., A.M., Ph.D., Litt.D., LL.D. Psychologist, President Emeritus Yale University, New Haven, Conn.	1924
Armstrong, Edward Cooke, A.B., Ph.D., LL.D., L.H.D. Professor of French Language, Princeton University. 26 Edgehill Street, Princeton, N. J.	1932
Arthur, Joseph Charles, Sc.D., LL.D. Professor Emeritus of Botany, Purdue University. 915 Columbia Street, Lafayette, Ind.	1919
Aydelotte, Frank, A.M., B.Litt., L.H.D., LL.D., D.Litt., D.C.L. Educator, President Swarthmore College, Swarthmore, Pa.	1923
Baekeland, Leo H., D.Sc., D.Nat.Sc., D.Ch., D.Ap.Sc., LL.D. Chemist, President Bakelite Corporation. 247 Park Avenue, New York, N. Y.	1935
Bailey, Irving Widmer, A.B., M.F., Sc.D. Professor of Plant Anatomy, Harvard University. 17 Buckingham Street, Cambridge, Mass.	1926
Bailey, Liberty Hyde, M.S., Litt.D., D.Sc., LL.D. Botanist, Professor Emeritus of Horticulture, Director Bailey Hortorium, Cornell University, Ithaca, N. Y.	1896

Date of Election

Bancroft, Wilder Dwight, A.B., Ph.D., Sc.D., LL.D. 1920
Professor Emeritus of Physical Chemistry, Cornell University. 7 East Avenue, Ithaca, N. Y.

Barbour, Thomas, Ph.D., Sc.D. 1937
Director University Museum and Museum of Comparative Zoology, Professor of Zoology, Harvard University. 278 Clarendon Street, Boston, Mass.

Bartlett, Harley Harris, A.B. 1929
Chairman Department of Botany, Director Botanical Garden, University of Michigan. 538 Church Street, Ann Arbor, Mich.

Barton, George Aaron, A.M., Ph.D., S.T.D., LL.D. 1911
Orientalist and Archaeologist, Professor Emeritus of Semitic Languages, University of Pennsylvania. 131 Newton Street, Weston, Mass.

Bateman, Harry, M.A., Ph.D. 1924
Professor of Mathematics, Theoretical Physics and Aeronautics, California Institute of Technology, Pasadena, Calif.

Beard, Charles Austin, LL.D., Ph.D. 1936
Historian, Formerly Professor of Politics, Columbia University. New Milford, Conn.

Becker, Carl, Ph.D., Litt.D. 1936
John Stambaugh Professor of History, Cornell University, Ithaca, N. Y.

Bell, Eric Temple, A.M. 1937
Professor of Mathematics, California Institute of Technology. 434 Michigan Avenue, Pasadena, Calif.

Benedict, Francis Gano, A.M., Ph.D., Sc.D., M.D. (hon.) 1910
Physiologist, Director (ret.) Nutrition Laboratory, Carnegie Institution of Washington (1907–37), Machiasport, Maine.

deBenneville, James S., A.B. 1897
Chemist. 907 West Roosevelt Boulevard, Philadelphia, Pa.

Berkey, Charles Peter, B.S., M.S., Ph.D., Sc.D. 1928
Professor of Geology, Columbia University, New York, N. Y.

	Date of Election
Berry, Edward Wilber Professor of Paleontology, Dean Johns Hopkins University, Baltimore, Md.	1919
Bigelow, Henry Bryant, Ph.D. Director Woods Hole Oceanographic Institution; Professor of Zoology, Harvard University. Museum of Comparative Zoology, Cambridge, Mass.	1937
Birge, Edward Asahel, Ph.D., LL.D., Sc.D. Zoologist, President Emeritus University of Wisconsin. 2011 Van Hise Avenue, Madison, Wis.	1923
Birkhoff, George David, A.M., Ph.D., Sc.D., D. (hon.) Perkins Professor of Mathematics, Harvard University. 984 Memorial Drive, Cambridge, Mass.	1921
Blakeslee, Albert F., A.M., Ph.D., D.Sc. Botanist, Director Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor, Long Island, N. Y.	1924
Bliss, Gilbert Ames, B.S., M.S., Ph.D., Sc.D. Professor of Mathematics, Chairman Department of Mathematics, University of Chicago, Chicago, Ill.	1926
Boas, Franz, Ph.D., M.D., LL.D., Sc.D. Professor Emeritus of Anthropology, Columbia University. Grantwood, Bergen County, N. J.	1935
Bogert, Marston Taylor, A.B., LL.D., Ph.B., R.N.D., D.Sc. Professor of Organic Chemistry, Columbia University, New York, N. Y.	1909
Bolton, Herbert Eugene, Ph.D., D.Litt., L.H.D., LL.D. Sather Professor of History, Chairman Department of History, Director Bancroft Library, University of California, Berkeley, Calif.	1937
Bowen, Norman L., M.A., B.Sc., Ph.D., Sc.D. Geologist, Charles L. Hutchinson Distinguished Service Professor of Petrology, University of Chicago, Chicago, Ill.	1930
Bowman, Isaiah, B.S., Ph.D., M.A., D.Sc., LL.D. Geographer, President Johns Hopkins University, Baltimore. Md.	1923

Date of Election

Bridgman, Percy Williams, A.M., Ph.D., Sc.D. 1916
Physicist, Hollis Professor of Mathematics and Natural Philosophy, Harvard University. Research Laboratory of Physics, Cambridge, Mass.

Briggs, Lyman J., Ph.D., Sc.D., D.Eng., LL.D. 1935
Physicist, Director National Bureau of Standards. 3208 Newark Street, Cleveland Park, Washington, D. C.

Bronk, Detlev W., M.S., Ph.D., Sc.D. 1934
Physiologist, Johnson Professor of Biophysics, Director Eldridge Reeves Johnson Foundation for Medical Physics, Director Institute of Neurology, University of Pennsylvania, Philadelphia, Pa.

Brown, Ernest William, Sc.D., LL.D. 1898
Professor Emeritus of Mathematics, Yale University. 116 Everit Street, New Haven, Conn.

Brubaker, Albert P., A.M., M.D., LL.D. 1895
Professor Emeritus of Physiology, Jefferson Medical College. 3426 Powelton Avenue, Philadelphia, Pa.

Bryant, William L. 1935
Paleontologist, Director Park Museum, Providence, R. I.

Buck, Carl Darling, A.B., Ph.D., Litt.D. 1923
Professor Emeritus of Comparative Philology, University of Chicago, Chicago, Ill.

Buddington, Arthur F., Ph.B., M.S., Ph.D. 1931
Professor of Geology, Chairman Department of Geology, Princeton University, Princeton, N. J.

Bumpus, Hermon Carey, Ph.D., Sc.D., LL.D. 1909
Zoologist, Educator (ret.), Formerly Director American Museum of Natural History. Duxbury, Mass.

Bush, Vannevar, M.S., Sc.D., Eng.D. 1937
Vice-president, Dean of Engineering, Massachusetts Institute of Technology. 404 Common Street, Belmont, Mass.

Byrd, Richard Evelyn, D.Eng., Sc.D., LL.D. 1930
Geographer, Navigator, Rear-Admiral (ret.) United States Navy. 9 Brimmer Street, Boston, Mass.

Date of Election

Calvert, Philip Powell, Ph.D. 1918
Professor of Zoology, University of Pennsylvania.
P. O. Box 14, Cheyney, Pa.

Campbell, Douglas Houghton, Ph.D., LL.D. 1910
Professor Emeritus of Botany, Stanford University, Calif.

Campbell, William Wallace, M.S., Sc.D., LL.D. 1903
Astronomer, Director Emeritus Lick Observatory,
President Emeritus University of California.
1980 Vallejo Street, San Francisco, Calif.

Cannon, Annie J., B.S., M.A., Sc.D., LL.D. 1925
Astronomer, Curator Astronomical Photographs,
Harvard College Observatory, Cambridge, Mass.

Cannon, Walter Bradford, A.M., M.D., Sc.D., LL.D. 1908
Professor of Physiology, Harvard Medical School,
Boston, Mass.

Capps, Hon. Edward, Ph.D., LL.D., Litt.D., L.H.D. 1920
Professor Emeritus of Classics, Princeton University,
Princeton, N. J.

Carlson, Anton Julius, A.M., Ph.D., M.D., LL.D. 1928
Professor of Physiology, University of Chicago.
5228 Greenwood Avenue, Chicago, Ill.

Carpenter, Rhys, Ph.D. 1935
Professor of Archaeology, Bryn Mawr College.
Jerry Run, R.D. 2, Downingtown, Pa.

Carrel, Alexis, M.D., Sc.D., LL.D. 1909
Surgeon, Biologist, Rockefeller Institue for Medical
Research. 66th Street and York Avenue, New York, N. Y.

Case, Ermine Cowles, A.B., A.M., M.S., Ph.D. 1931
Chairman Department of Geology, Director and Curator
of Vertebrates, Museum of Paleontology, University of
Michigan, Ann Arbor, Mich.

Castle, William Ernest, A.M., Ph.D., Sc.D., LL.D. 1910
Professor Emeritus of Genetics, Harvard University;
Research Associate in Genetics, University of California.
Hilgard Hall, Berkeley, Calif.

Cather, Willa, Litt.D., LL.D. 1934
Author. Care A. A. Knopf, 730 Fifth Avenue,
New York, N. Y.

Date of Election

Cattell, James McKeen, Ph.D., LL.D., D.H.L., Sc.D. 1888
Psychologist, Editor. Garrison, N. Y.

Chapman, Frank Michler, Sc.D. 1921
Curator in Ornithology, American Museum of Natural History, New York, N. Y.

Chase, George Henry, A.B., A.M., Ph.D., L.H.D. 1929
Professor of Archaeology, Dean Graduate School of Arts and Sciences, Harvard University.
1 Bryant Street, Cambridge, Mass.

Cheyney, Edward Potts, A.M., LL.D. 1904
Professor Emeritus of History, University of Pennsylvania. R.F.D. 3, Media, Pa.

Chinard, Gilbert, B.L., L.èsL., LL.D. 1932
Professor of French Literature, Princeton University, Princeton, N. J.

Chittenden, Russell H., Ph.D., LL.D., Sc.D., M.D. (hon.) 1904
Professor Emeritus of Physiological Chemistry, Director Emeritus Sheffield Scientific School, Yale University.
83 Trumbull Street, New Haven, Conn.

Cleland, Ralph Erskine, A.B., M.S., Ph.D. 1932
Botanist, Professor of Biology, Goucher College, Baltimore, Md.

Cockerell, Theodore Dru Alison 1928
Professor Emeritus of Zoology, University of Colorado, Boulder, Colo.

Coghill, George Ellett, Ph.D., Sc.D. 1935
Anatomist. Box 77A, R.F.D. 2, Gainesville, Fla.

Commons, John Rogers, LL.D. 1936
Professor of Economics (ret.), University of Wisconsin, Madison, Wis.

Compton, Arthur Holly, B.Sc., Ph.D., Sc.D., LL.D. 1925
Professor of Physics, University of Chicago.
5637 Woodlawn Avenue, Chicago, Ill.

Compton, Karl Taylor, Ph.D., Sc.D., D.Eng., LL.D. 1923
Physicist, President Massachusetts Institute of Technology, Cambridge, Mass.

Conant, James Bryant, Ph.D., LL.D. 1935
Chemist, President Harvard University.
17 Quincy Street, Cambridge, Mass.

	Date of Election
Conklin, Edwin Grant, Ph.D., Sc.D., LL.D. Professor Emeritus of Biology, Princeton University, Princeton, N. J.	1897
Cook, Gustavus Wynne, Sc.D. Investigator in Astronomical Science. Roslyn House, Wynnewood, Pa.	1934
Corwin, Edward Samuel, Ph.D., LL.D., Litt.D. Professor of Jurisprudence, Princeton University, Princeton, N. J.	1936
Crawford, James Pyle Wickersham, A.B., Ph.D., Litt.D. Professor of Romance Languages, University of Pennsylvania. 4012 Pine Street, Philadelphia, Pa.	1929
Cret, Paul Philippe, Sc.D., A.N.A., I.A.L. Architect, Professor of Design, University of Pennsylvania. 516 Woodland Terrace, Philadelphia, Pa.	1928
Crew, Henry, Ph.D. Professor Emeritus of Physics, Northwestern University. 620 Library Place, Evanston, Ill.	1921
Crile, George, A.M., M.D., LL.D. Surgeon, Director Cleveland Clinic Foundation. Euclid Avenue at East 93rd Street, Cleveland, Ohio.	1912
Crocker, William, A.B., A.M., Ph.D. Botanist, Director Boyce Thompson Institute for Plant Research. 1086 North Broadway, Yonkers, N. Y.	1931
Cross, Whitman, B.S., Ph.D., Sc.D. Geologist, United States Geological Survey (ret.). 101 East Kirke Street, Chevy Chase, Md.	1915
Cross, Hon. Wilbur L., A.B., Ph.D., Litt.D., L.H.D., LL.D. Governor of Connecticut (1932–); Professor Emeritus of English, Yale University. 24 Edgehill Road, New Haven, Conn.	1934
Curtis, Heber Doust, A.M., Ph.D., Sc.D. Astronomer, Director The Observatory, University of Michigan, Ann Arbor, Mich.	1920
Cushing, Harvey, A.M., M.D., Sc.D., LL.D., Litt.D. Consulting Neuro-Surgeon, Yale School of Medicine, New Haven, Conn.	1930

Date of Election

Dahlgren, Ulric, A.B., M.S. 1919
Professor of Biology, Princeton University,
Princeton, N. J.

Daly, Reginald Aldworth, A.M., Ph.D., Sc.D. 1913
Professor of Geology, Harvard University.
23 Hawthorn Street, Cambridge, Mass.

Darrach, William, A.B., A.M., M.D., Sc.D., LL.D. 1929
Professor of Clinical Surgery, Dean Emeritus of
the Medical Faculty, Columbia University.
180 Fort Washington Avenue, New York, N. Y.

Darrow, Karl Kelchner, Ph.D. 1936
Physicist, Bell Telephone Laboratories.
230 West 105th Street, New York, N. Y.

Davenport, Charles Benedict, S.B., A.M., Ph.D. 1907
Biologist, Research Associate, Carnegie Institution of
Washington, Cold Spring Harbor, Long Island, N. Y.

Davis, Bradley Moore, A.M., Ph.D. 1914
Professor of Botany, University of Michigan,
Ann Arbor, Mich.

Davis, Harvey Nathaniel, Ph.D., Sc.D., LL.D., D.Eng. 1935
Mechanical Engineer, President Stevens Institute of
Technology. Hoxie House, Castle Point, Hoboken, N. J.

Davis, Hon. John William, A.B., LL.B., LL.D. 1923
Lawyer, Solicitor General United States Army (1913–18);
United States Ambassador to Great Britain (1918–21).
15 Broad Street, New York, N. Y.

Davisson, Clinton J., Ph.D., D.Sc. 1929
Physicist, Bell Telephone Laboratories. 463 West Street,
New York, N. Y.

Day, Arthur L., Ph.D., Sc.D. 1912
Geophysicist, Director (ret.) Geophysical Laboratory
(1907–36), Carnegie Institution of Washington.
1565 Old Georgetown Road, Bethesda, Md.

Day, Edmund Ezra, Ph.D., LL.D. 1937
President Cornell University, Ithaca, N. Y.

Delano, Hon. Frederic Adrian 1935
Administrator (ret.); Vice-chairman National
Resources Committee since 1933. 2400 16th Street,
Washington, D. C.

	Date of Election
Dempster, Arthur Jeffrey, A.B., A.M., Ph.D. Professor of Physics, University of Chicago. 5757 Kenwood Avenue, Chicago, Ill.	1932
Derleth, Charles, Jr., C.E., LL.D. Engineer, Dean College of Engineering, University of California, Berkeley, Calif.	1936
Dewey, John, Ph.D., LL.D. Professor of Philosophy, Columbia University, New York, N. Y.	1911
Dinsmoor, William Bell, Litt.D. Professor of Archaeology, Columbia University. 9 East 77th Street, New York, N. Y.	1933
Dodd, Hon. William Edward, Ph.D., LL.D. United States Ambassador to Germany (1933–37); Professor of American History, University of Chicago, Chicago, Ill.	1936
Dodds, Harold Willis, Ph.D., LL.D. Administrator, President Princeton University, Princeton, N. J.	1935
†Donaldson, Henry Herbert, A.B., Ph.D., Sc.D. Anatomist, Professor of Neurology, Wistar Institute of Anatomy and Biology, 36th Street and Woodland Avenue, Philadelphia, Pa.	1906
Dresden, Arnold, M.S., Ph.D. Professor of Mathematics, Swarthmore College. 606 Elm Avenue, Swarthmore, Pa.	1932
††Duane, Russell, A.B., LL.B. Lawyer. 1617 Land Title Building, Philadelphia, Pa.	1906
Dugan, Raymond Smith, B.A., M.A., Ph.D. Professor of Astronomy, Princeton University, Princeton, N. J.	1931
Duggar, Benjamin Minge, A.M., Ph.D. Professor of Physiologic and Economic Botany, University of Wisconsin, Madison, Wis.	1921
Dunn, Gano, M.S., E.E. Engineer, President J. G. White Engineering Corporation. 80 Broad Street, New York, N. Y.	1924

† Deceased January 23, 1938.
†† Deceased January 19, 1938.

Date of Election

Du Pont, Francis I. 1930
Chemist, E. I. du Pont de Nemours and Company.
P. O. Box 683, Wilmington, Del.

Du Pont, Pierre Samuel, B.S. 1917
Chemist, Manufacturer, E. I. du Pont de Nemours and Company. Du Pont Building, Wilmington, Del.

Durand, William Frederick, Ph.D., LL.D. 1917
Professor Emeritus of Mechanical Engineering, Stanford University, Calif.

East, Edward Murray, M.S., Ph.D., LL.D. 1916
Botanist, Professor of Genetics, Harvard University. Biological Laboratories, Cambridge, Mass.

Eckfeldt, Jacob B. 1880
Chemist, Formerly Assayer United States Mint.
Ambler, Pa.

Edgerton, Franklin, Ph.D. 1935
Professor of Sanskrit and Comparative Philology, Yale University. 174 Blake Road, Hamden, New Haven, Conn.

Einstein, Albert, Ph.D., M.D. 1930
Professor of Theoretical Physics, Institute for Advanced Study, Princeton, N. J.

Eisenhart, Luther Pfahler, A.B., Ph.D., Sc.D., LL.D. 1913
Professor of Mathematics, Dean Graduate School, Princeton University. Wyman House, Princeton, N. J.

Emmet, William LeRoy, Sc.D. 1898
Consulting Engineer, General Electric Company, Schenectady, N. Y.

Erlanger, Joseph, B.S., M.D., LL.D., Sc.D. 1927
Professor of Physiology, Washington University.
5127 Waterman Avenue, St. Louis, Mo.

Farrand, Livingston, A.M., M.D., LL.D. 1924
Educator, President Emeritus Cornell University.
Federal Hill Road, Brewster, N. Y.

Farrand, Max, Ph.D., LL.D., L.H.D. 1928
Historian, Director Huntington Library and Art Gallery, San Marino, Calif.

Date of Election

Ferguson, William Scott, A.M., Ph.D., LL.D., Litt.D. 1937
Professor of Ancient and Modern History, Harvard University. 8 Scott Circle, Cambridge, Mass.

Fernald, Merritt Lyndon, S.B., D.C.L. 1936
Professor of Natural History, Director Gray Herbarium, Harvard University, Cambridge, Mass.

Fetter, Frank Albert, Ph.D., LL.D. 1935
Professor Emeritus of Political Economy, Princeton University. 168 Prospect Avenue, Princeton, N. J.

Finley, John Huston, M.A., LL.D., L.H.D., J.U.D., Litt.D. 1919
Editor, *The New York Times*, New York, N. Y.

Fisher, Irving, A.B., Ph.D., LL.D. 1927
Professor of Political Economy, Yale University. 460 Prospect Street, New Haven, Conn.

Flexner, Simon, M.D., Sc.D., LL.D. 1901
Pathologist, Director Emeritus Rockefeller Institute for Medical Research. 66th Street and York Avenue, New York, N. Y.

Foote, Paul Darwin, A.B., M.A., Ph.D. 1927
Physicist, Executive Vice-president Gulf Research and Development Company. P.O. Drawer 2038, Pittsburgh, Pa.

Forbes, Alexander, A.B., A.M., M.D. 1931
Professor of Physiology, Harvard Medical School, Shattuck Street, Boston, Mass.

Ford, Worthington Chauncey, A.M., Litt.D., LL.D. 1922
Historian, Statistician. Care Morgan & Cie, 14 Place Vendôme, Paris, France.

Fosdick, Raymond Blaine, B.A., M.A., LL.B., LL.D. 1930
Lawyer, President Rockefeller Foundation and General Education Board, 49 West 49th Street, New York, N. Y.

Fox, Dixon Ryan, Ph.D., Pd.D., L.H.D., Litt.D., LL.D., D.C.L. 1935
Historian, President Union College, Schenectady, N. Y.

Fox, Herbert, A.B., M.D. 1932
Professor of Comparative Pathology, University of Pennsylvania; Director William Pepper Laboratory, Hospital of the University of Pennsylvania, Philadelphia, Pa.

Date of Election

Franck, James, Ph.D. 1937
Professor of Physics, Johns Hopkins University, Baltimore, Md.

Frank, Tenney, Ph.D. 1927
Professor of Latin, Johns Hopkins University. 110 Elmhurst Road, Roland Park, Baltimore, Md.

Frost, Robert, L.H.D., Litt.D. 1937
Poet, Professor of English, Amherst College. South Shaftsbury, Vt.

Gaposchkin, Cecilia Payne, B.A., Ph.D. 1936
Astronomer, Harvard College Observatory, Cambridge, Mass.

Gasser, Herbert Spencer, A.M., M.D., D.Sc. 1937
Physiologist, Director Rockefeller Institute for Medical Research. 66th Street and York Avenue, New York, N. Y.

Gates, Thomas Sovereign, Ph.B., LL.B., LL.D. 1930
Administrator, President University of Pennsylvania, Philadelphia, Pa.

Gay, Edwin Francis, A.B., Ph.D., Litt.D., LL.D. 1932
Professor Emeritus of Economic History, Harvard University. 2040 Pasqual Street, Pasadena, Calif.

Gest, William Purves, A.B., A.M., LL.B., LL.D. 1926
Lawyer, Chairman Board Fidelity-Philadelphia Trust Company. Merion, Pa.

Gies, William J., B.S., Ph.B., M.S., Ph.D., Sc.D., LL.D. 1915
Professor of Biological Chemistry, Columbia University Medical School. 630 West 168th Street, New York, N. Y.

Gifford, Walter Sherman, A.B., LL.D., D.Sc. 1931
Administrator, President American Telephone and Telegraph Company. 195 Broadway, New York, N. Y.

Gomberg, Moses, B.S., Sc.D., LL.D. 1920
Professor Emeritus of Chemistry, University of Michigan. 712 Onondaga Street, Ann Arbor, Mich.

Goodrich, Herbert Funk, A.B., LL.B., LL.D. 1937
Dean Law School, Professor of Law, Vice-president, University of Pennsylvania. 7701 Cresheim Road, Chestnut Hill, Philadelphia, Pa.

Date of Election

Goodspeed, Arthur Willis, A.B., Ph.D. 1896
Professor Emeritus of Physics, University of Pennsylvania. 4623 Sansom Street, Philadelphia, Pa.

Grandgent, Charles Hall, A.B., L.H.D., Litt.D. 1929
Professor Emeritus of Romance Languages, Harvard University. 107 Walker Street, Cambridge, Mass.

Graves, Frank Pierrepont, A.M., Ph.D., Litt.D., L.H.D., LL.D. 1927
Educator, President University of the State of New York, Commissioner of Education. State Education Building, Albany, N. Y.

Greene, Evarts B., Ph.D., Litt.D., L.H.D., LL.D. 1931
Professor of American History, Columbia University, New York, N. Y.

Gregory, Herbert Ernest, Ph.D. 1923
Geologist, Director Bernice P. Bishop Museum, Honolulu, Hawaii.

Gregory, William King, A.M., Ph.D. 1925
Professor of Vertebrate Paleontology, Columbia University; Curator Department of Comparative Anatomy, Department of Ichthyology, American Museum of Natural History, New York, N. Y.

Griffith, J. P. Crozer, A.B., M.D., Ph.D. 1907
Physician, Professor of Pediatrics, University of Pennsylvania. 1810 Spruce Street, Philadelphia, Pa.

Guggenheim, William, B.S. 1930
Industrialist, Administrator, Philanthropist. 3 Riverside Drive, New York, N. Y.

†Hale, George Ellery, Sc.D., Ph.D., LL.D. 1902
Astronomer, Honorary Director Mount Wilson Observatory, Pasadena, Calif.

Haney, John L., A.B., A.M., B.S., Ph.D. 1929
Educator, President Central High School, Philadelphia. 6419 Woodbine Avenue, Overbrook, Philadelphia, Pa.

Harkins, William Draper, A.B., Ph.D. 1925
Professor of Physical Chemistry, University of Chicago. 5437 Ellis Avenue, Chicago, Ill.

† Deceased February 21, 1938.

Date of Election

Harkness, Edward S., A.B., M.A., LL.D. 1934
Administrator, Philanthropist. 654 Madison Avenue, New York, N. Y.

Harper, Robert A., M.A., Ph.D., D.Sc. 1909
Professor Emeritus of Botany, Columbia University, New York, N. Y.

Harrison, Ross G., M.A., Ph.D., M.D., Sc.D. 1913
Professor of Biology, Director Osborn Zoological Laboratory, Yale University. 142 Huntington Street, New Haven, Conn.

Harvey, E. Newton, B.Sc., Ph.D. 1929
Professor of Physiology, Princeton University. 2 College Road, Princeton, N. J.

Hawk, Philip Bovier, M.S., Ph.D. 1915
Chemist, President and Director Food Research Laboratories, Inc., of New York. 114 East 32nd Street, New York, N. Y.

Hayward, Nathan, A.B., S.B. 1937
President (ret.) The Franklin Institute. 12 South Twelfth Street, Philadelphia, Pa.

Hazen, Charles D., A.B., Ph.D., L.H.D., Litt.D. 1923
Professor of History, Columbia University, New York, N. Y.

Heiser, Victor George, M.D., A.B., Sc.D. 1918
Physician, President International Leprosy Association. Room 410, Metropolitan Tower, New York, N. Y.

Henderson, Lawrence J., M.D., Sc.D. 1921
Professor of Biological Chemistry, Harvard University. 4 Willard Street, Cambridge, Mass.

Henderson, Robert, B.A., D.Sc. 1927
Mathematician, Actuarial Consultant. Crown Point, Essex County, N. Y.

Henderson, Yandell, Ph.D. 1935
Professor of Applied Physiology, Yale University. 440 Prospect Street, New Haven, Conn.

Hendrickson, George Lincoln, A.B., L.H.D., A.M., LL.D. 1932
Professor of Greek and Latin Literature, Yale University, New Haven, Conn.

Date of Election

Hobbs, William Herbert, A.M., Ph.D., D.Eng. 1909
Professor Emeritus of Geology, University of Michigan, Ann Arbor, Mich.

Holland, Leicester Bodine, B.S., M.A., Ph.D., F.A.I.A. 1931
Archaeologist, Professor of Fine Arts, University of Pennsylvania; Chief Division of Fine Arts, Library of Congress. 4203 Pine Street, Philadelphia, Pa.

Hooton, Earnest A., B.A., M.A., Ph.D., B.Litt., Sc.D. 1931
Professor of Anthropology, Curator of Somatology, Peabody Museum, Harvard University, Cambridge, Mass.

Hoover, Hon. Herbert, Dr. Eng., M.D., Sc.D., LL.D., D.C.L., J.D. 1918
Engineer, Thirty-first President of the United States. Stanford University, Calif.

Hopkins, B Smith, Ph.D., D.Sc. 1927
Professor of Inorganic Chemistry, University of Illinois, Urbana, Ill.

Howard, Leland Ossian, M.D., Ph.D., Sc.D., LL.D. 1911
Zoologist, Consulting Entomologist, United States Public Health Service. Bureau of Entomology, United States Department of Agriculture, Washington, D. C.

Howell, William Henry, A.B., Ph.D., M.D., Sc.D., LL.D. 1903
Professor Emeritus of Physiology, Formerly Dean Medical Faculty and Director School of Hygiene, Johns Hopkins University. 112 St. Dunstan's Road, Baltimore, Md.

Hrdlička, Aleš, M.D., Sc.D. 1918
Curator Division of Physical Anthropology, United States National Museum, Washington, D. C.

Hubble, Edwin P., B.Sc., Ph.D., B.A., D.Sc., LL.D. 1929
Astronomer, Mount Wilson Observatory, Pasadena, Calif.

Huebner, Solomon Stephen, B.L., M.L., Ph.D., Sc.D. 1930
Economist, Professor of Insurance and Commerce, University of Pennsylvania. 677 South Highland Avenue, Merion, Pa.

Date of Election

Hughes, Hon. Charles Evans, A.B., A.M., LL.B., LL.D., D.C.L. 1926
Chief Justice of the United States.
2223 R Street, N.W., Washington, D. C.

Hulett, George A., A.B., Ph.D. 1913
Professor Emeritus of Physical Chemistry, Princeton University. 44 Washington Road, Princeton, N. J.

Humphreys, William Jackson, A.B., C.E., Ph.D. 1929
Professor Emeritus of Meteorological Physics, George Washington University; Collaborator United States Weather Bureau, Washington, D. C.

Huntington, Edward Vermilye, A.B., A.M., Ph.D., Sc.D. 1933
Mathematician, Professor of Mechanics, Harvard University. 48 Highland Street, Cambridge, Mass.

Ives, Herbert E., B.S., Ph.D., Sc.D. 1917
Physicist, Bell Telephone Laboratories.
32 Laurel Place, Montclair, N. J.

Jackson, Chevalier, M.D., Sc.D., LL.D. 1919
Physician, Professor of Bronchoscopy, Temple University.
3432 North Broad Street, Philadelphia, Pa.

Jackson, Dugald Caleb, C.E., D.Sc. 1931
Professor Emeritus of Electrical Engineering, Honorary Lecturer, Massachusetts Institute of Technology. 5 Mercer Circle, Cambridge, Mass.

Jacobs, Merkel Henry, A.B., Ph.D. 1930
Professor of Physiology, University of Pennsylvania, Philadelphia, Pa.

Jayne, Horace Howard Furness, A.B., A.M. 1934
Archaeologist, Chief Division of Eastern Art, Pennsylvania Museum; Director University Museum, University of Pennsylvania. Wallingford, Pa.

Jenks, John Story 1936
Banker, Trustee, President University Museum, University of Pennsylvania. 123 South Broad Street, Philadelphia, Pa.

Jennings, Herbert S., Ph.D., Sc.D., LL.D. 1907
Professor of Zoology, Director Zoological Laboratories, Johns Hopkins University, Baltimore, Md.

Johnson, Douglas, Ph.D., D.Sc. 1920
Geologist and Geographer, Professor of Physiography, Columbia University, New York, N. Y.

Date of Election

Johnson, Eldridge Reeves, A.E.D. 1928
Industrialist, Founder Victor Talking Machine Company.
608 West Jersey Trust Building, Camden, N. J.

Johnson, Emory R., Litt.M., Ph.D., Sc.D. 1915
Professor of Transportation and Commerce, Logan Hall,
University of Pennsylvania, Philadelphia, Pa.

Jones, Lewis Ralph, Ph.B., Ph.D., Sc.D., LL.D. 1925
Professor of Plant Pathology, University of Wisconsin.
146 North Prospect Avenue, Madison, Wis.

Joslin, Elliott Proctor, B.A., M.A., Ph.B., M.D. 1925
Physician, Clinical Professor Emeritus of Medicine,
Harvard Medical School. 81 Bay State Road,
Boston, Mass.

Kemmerer, Edwin Walter, A.B., Ph.D., LL.D., D.C.S., D.Sc., Hon.D. 1932
Walker Professor of International Finance,
Princeton University, Princeton, N. J.

Kennelly, Arthur Edwin, A.M., Sc.D., D.Eng. 1896
Professor Emeritus of Electrical Engineering,
Harvard University and Massachusetts Institute
of Technology, Cambridge, Mass.

Kettering, Charles Franklin, M.E., E.E., D.Eng., D.Sc. 1930
Research Engineer, Vice-president, General Motors
Corporation; General Director Research Laboratories
Division, General Motors Corporation.
Ridgeleigh Terrace, Dayton, Ohio.

Kidder, Alfred Vincent, Ph.D., LL.D. 1934
Archaeologist, Chairman Division of Historical
Research, Carnegie Institution of Washington.
10 Frisbie Place, Cambridge, Mass.

Kofoid, Charles A., A.M., Ph.D., Sc.D., LL.D. 1924
Professor Emeritus of Zoology, University of California,
Berkeley, Calif.

Lamb, Arthur Becket, Ph.D., D.Sc. 1936
Professor of Chemistry Harvard University.
12 Oxford Street, Cambridge Mass.

Lamont, Thomas William, A.B., LL.D. 1932
Banker, Trustee. 23 Wall Street, New York, N. Y.

Date of Election

Lampland, Carl O., A.B., A.M., LL.D. 1931
Astronomer, Lowell Observatory, Flagstaff, Ariz.

Landsteiner, Karl, M.D., D.Sc. 1935
Pathologist, Rockefeller Institute for Medical Research.
25 East 86th Street, New York, N. Y.

Langmuir, Irving, M.A., Ph.D., Sc.D., LL.D. 1922
Chemist and Physicist, Associate Director,
Research Laboratory, General Electric Company,
Schenectady, N. Y.

Lanman, Charles R., A.B., Ph.D., LL.D. 1906
Professor Emeritus of Sanskrit, Harvard University.
9 Farrar Street, Cambridge, Mass.

Lawrence, Ernest Orlando, A.M., Ph.D. 1937
Professor of Physics, University of California.
111 Tamalpais Road, Berkeley, Calif.

Lawson, Andrew Cowper, M.A., Ph.D., Sc.D., LL.D. 1925
Professor of Mineralogy and Geology (ret.),
University of California, Berkeley, Calif.

†Lea, Arthur H., A.B., L.H.D. 1912
Man of Affairs. 1717 Fidelity-Philadelphia Trust
Building, 123 South Broad Street, Philadelphia, Pa.

Lefschetz, Solomon, M.E., Ph.D. 1929
Research Professor of Mathematics, Princeton University.
129 Broadmead, Princeton, N. J.

Leith, Charles Kenneth, B.S., Ph.D., LL.D., D.Sc. 1926
Professor of Geology, University of Wisconsin.
Moraine, Old Sauk Road, Madison, Wis.

Leland, Waldo G., A.B., A.M., Litt.D. 1931
Historian, Permanent Secretary American Council of
Learned Societies. 907 Fifteenth Street,
Washington, D. C.

Leuschner, Armin Otto, A.B., Ph.D., Sc.D. 1924
Professor of Astronomy, Chairman Department
of Astronomy, University of California.
1816 Scenic Avenue, Berkeley, Calif.

Levene, Phoebus A., M.D. 1923
Chemist, Rockefeller Institute for Medical Research.
129 East 82nd Street, New York, N. Y.

† Deceased January 7, 1938.

Date of Election

Leverett, Frank, B.Sc., Sc.D. 1924
Geologist (ret.), United States Geological Survey.
1724 South University Avenue, Ann Arbor, Mich.

Lewis, Gilbert Newton, A.B., A.M., Ph.D., D.Sc. 1918
Professor of Chemistry, Dean College of Chemistry,
University of California, Berkeley, Calif.

Lillie, Frank Rattray, B.A., Ph.D., Sc.D. 1916
Professor Emeritus of Zoology and Embryology,
University of Chicago. 5801 Kenwood Avenue,
Chicago, Ill.

Lillie, Ralph Stayner, B.A., Ph.D., Sc.D. 1937
Professor of General Physiology, University of Chicago.
5545 Kenwood Avenue, Chicago, Ill.

Lindgren, Waldemar, M.E., Sc.D. 1917
Professor Emeritus of Geology, Massachusetts
Institute of Technology, Cambridge, Mass.

Lingelbach, William E., B.A., Ph.D. 1916
Professor of Modern European History, University of
Pennsylvania. 4304 Osage Avenue, Philadelphia, Pa.

Lippincott, J. Bertram 1921
Publisher, Chairman Board J. B. Lippincott Company.
1712 Spruce Street, Philadelphia, Pa.

Livingston, Burton E., B.S., Ph.D. 1933
Professor of Plant Physiology and Forest Ecology,
Director Laboratory of Plant Physiology,
Johns Hopkins University, Baltimore, Md.

Loeb, Leo, M.D. 1910
Professor Emeritus of Pathology, Washington University.
Washington University Medical School, St. Louis, Mo.

Loomis, Alfred Lee, A.B., LL.B., D.Sc., M.Sc. 1930
Physicist, Director Loomis Laboratories.
Tuxedo Park, N. Y.

Lovejoy, Arthur Oncken, A.B., A.M., LL.D. 1932
Professor of Philosophy, Johns Hopkins University.
827 Park Avenue, Baltimore, Md.

Lovett, Edgar Odell, Ph.D., Sc.D., LL.D. 1904
Mathematician and Astronomer,
President The Rice Institute, Houston, Texas.

Date of Election

Lowell, Abbott Lawrence, A.B., LL.B., Ph.D., Litt.D., LL.D. 1909
President Emeritus Harvard University.
171 Marlborough Street, Boston, Mass.

Lowes, John Livingston, Ph.D., LL.D., Litt.D., L.H.D. 1934
Francis Lee Higginson Professor of English Literature, Harvard University. 984 Memorial Drive, Cambridge, Mass.

Lyman, Theodore, A.M., Ph.D. 1918
Professor Emeritus of Physics, Director Jefferson Laboratory, Harvard University, Cambridge, Mass.

McClung, Clarence E., A.M., Ph.D. 1913
Professor of Zoology, Director Zoological Laboratory, University of Pennsylvania, Philadelphia, Pa.

McClure, Charles Freeman Williams, A.M., Sc.D. 1897
Professor Emeritus of Comparative Anatomy, Princeton University, Princeton, N. J.

MacCurdy, George Grant, Ph.D. 1925
Professor Emeritus of Anthropology, Yale University; Director American School of Prehistoric Research, Old Lyme, Conn.

McDaniel, Walton Brooks, A.M., Ph.D. 1917
Professor Emeritus of Latin, University of Pennsylvania.
264 South 44th Street, Philadelphia, Pa.

MacDougal, Daniel Trembly, M.A., Ph.D., LL.D. 1916
Botanist, Research Associate (ret.), Carnegie Institution of Washington. Carmel, Calif.

Macfarlane, John Muirhead, B.S., Sc.D., LL.D., Litt.D. 1892
Professor Emeritus of Botany, University of Pennsylvania.
427 West Hansberry Street, Germantown, Philadelphia, Pa.

McGregor, James Howard, B.S., M.A., Ph.D. 1929
Professor of Zoology, Columbia University, New York, N. Y.

Magie, William Francis, A.M., Ph.D., LL.D., D.Sc. 1896
Professor Emeritus of Physics, Princeton University.
118 Library Place, Princeton, N. J.

Manly, John Matthews, A.M., Ph.D., LL.D., Litt.D. 1912
Professor Emeritus of English, University of Chicago.
6030 Kimbark Avenue, Chicago, Ill.

	Date of Election
Mark, Edward Laurens, A.M., Ph.D., LL.D. Professor Emeritus of Anatomy, Harvard University. 109 Irving Street, Cambridge, Mass.	1907
†**Martin, Edward, A.M., M.D., LL.D., Sc.D.** Professor Emeritus of Surgical Physiology, University of Pennsylvania; Clinical Professor of Surgery, Woman's Medical College of Pennsylvania. Orchard Farm, Media, Pa.	1933
Mason, William Smith, Ph.B., A.M., L.H.D., D.Litt. Man of Affairs, Collector of Frankliniana, University Trustee. 1401 Ridge Avenue, Evanston, Ill.	1928
Matthews, Albert, A.B. Modern Philologist and Historian. 19 St. Botolph Street, Boston, Mass.	1899
Mees, Charles Edward Kenneth, D.Sc. Physicist, Vice-president in Charge of Research and Development, Eastman Kodak Company. Kodak Park, Rochester, N. Y.	1937
Merriam, Charles Edward, Ph.D., LL.D. Professor of Political Science, University of Chicago. 6041 University Avenue, Chicago, Ill.	1935
Merriam, John C., B.S., Ph.D., Sc.D., LL.D. Paleontologist, President Carnegie Institution of Washington, Washington, D. C.	1914
Merrill, Elmer Drew, B.S., M.S., Sc.D., LL.D. Professor of Botany, Administrator of Botanical Collections, Harvard University. Arnold Arboretum, Jamaica Plain, Mass.	1932
Miller, Dayton Clarence, A.M., Sc.D., LL.D., D.Eng. Professor Emeritus of Physics, Case School of Applied Science, Cleveland, Ohio.	1919
Miller, Gerrit Smith, Jr., A.B. Zoologist, Curator of Mammals, United States National Museum, Washington, D. C.	1927
Miller, Hon. Hunter, LL.B., D.C.L. International Law, Historical Adviser, Department of State, Washington, D. C.	1928
Miller, John Anthony, A.M., Ph.D., LL.D. Professor Emeritus of Astronomy, Director Sproul Observatory, Swarthmore College. Wallingford, Pa.	1915

† Deceased March 17, 1938.

Date of Election

Millikan, Robert Andrews, A.B., Ph.D., Sc.D., LL.D. 1914
Director Norman Bridge Laboratory of Physics, Chairman Executive Council, California Institute of Technology, Pasadena, Calif.

Minot, George Richards, A.B., M.D., S.D. 1935
Professor of Medicine, Harvard University; Director Thorndike Memorial Laboratory, Boston City Hospital, Boston, Mass.

Mitchell, Howard Hawks, Ph.D. 1925
Professor of Mathematics, University of Pennsylvania. 416 Sycamore Avenue, Merion, Pa.

Mitchell, Samuel Alfred, M.A., Ph.D., LL.D. 1923
Professor of Astronomy, Director Leander McCormick Observatory, University of Virginia, University, Va.

Mitchell, Wesley Clair, A.B., Ph.D., LL.D., D.Litt. 1931
Professor of Economics, Columbia University; Director of Research, National Bureau of Economic Research. 161 West Twelfth Street, New York, N. Y.

Montgomery, James Alan, A.B., Ph.D., S.T.D. 1925
Philologist, Formerly Director and President American School of Oriental Research; Professor of Hebrew, Graduate School, University of Pennsylvania. 6806 Greene Street, Germantown, Philadelphia, Pa.

Moore, George Thomas, A.M., Ph.D. 1905
Botanist, Director Missouri Botanical Garden, St. Louis, Mo.

Moore, J. Percy, Ph.D. 1918
Professor of Zoology, University of Pennsylvania, Philadelphia, Pa.

Moore, Hon. John Bassett, LL.D. 1907
International Law, Diplomatist, Judge Permanent Court of International Justice (1921–28). 960 Park Avenue, New York, N. Y.

Morgan, Marshall S., A.B. 1933
President Fidelity-Philadelphia Trust Company. R.F.D. 2, Malvern, Pa.

Morgan, Thomas Hunt, B.S., Ph.D., D.Sc., LL.D. 1915
Zoologist, Director Kerckhoff Laboratories of Biological Sciences, California Institute of Technology, Pasadena, Calif.

Date of Election

Morison, Samuel Eliot, Ph.D., M.A., Litt.D. 1937
Professor of History, Harvard University.
Harvard College Library 417, Cambridge, Mass.

Morris, Harrison Smith 1899
Author, Formerly Director Pennsylvania Academy of The Fine Arts. Oak Lane Post Office, Philadelphia, Pa.

Morris, Lawrence J., A.B. 1936
Man of Affairs, Secretary Pennsylvania Hospital.
240 South 4th Street, Philadelphia, Pa.

Morris, Hon. Roland S., A.B., LL.B., LL.D., D.C.L., L.H.D. 1922
Lawyer, Diplomatist, Professor of International Law, University of Pennsylvania; United States Ambassador to Japan (1917–21). 1617 Land Title Building, Philadelphia, Pa.

Morse, Marston, Ph.D., Sc.D. 1936
Professor of Mathematics, Institute for Advanced Study, Princeton, N. J.

Moulton, Forest Ray, A.B., Ph.D., Sc.D. 1916
Formerly Professor of Astronomy, University of Chicago; Permanent Secretary American Association for the Advancement of Science. Smithsonian Institution Building, Washington, D. C.

Murlin, John Raymond, B.S., A.M., Ph.D., Sc.D. 1932
Professor of Physiology, Director Department of Vital Economics, University of Rochester, 260 Crittenden Boulevard, Rochester, N. Y.

Nitze, William Albert, Ph.D., L.H.D. 1936
Professor of Romance Languages and Literatures, University of Chicago, Chicago, Ill.

Noble, G. Kingsley, Ph.D. 1933
Zoologist, Curator of Herpetology and of Experimental Biology, American Museum of Natural History, New York, N. Y.

Norris, George Washington 1937
Banker, Formerly Governor Philadelphia Federal Reserve Bank. Land Title Building, Philadelphia, Pa.

Date of Election

Norris, George William, B.A., M.D. 1922
Physician, Author, Chief Medical Service "A," Pennsylvania Hospital. Dimock, Susquehanna County, Pa.

Novy, Frederick G., Sc.D., M.D., LL.D. 1934
Dean Emeritus Medical School, Professor Emeritus of Bacteriology, University of Michigan, Ann Arbor, Mich.

Noyes, William Albert, A.B., B.S., Ph.D., LL.D., Chem.D., D.Sc. 1914
Professor Emeritus of Chemistry, University of Illinois, Urbana, Ill.

Olivier, Charles P., M.A., Ph.D. 1932
Professor of Astronomy, University of Pennsylvania; Director Flower Observatory, Upper Darby, Pa.

O'Neill, Eugene Gladstone, Litt.D. 1935
Author, Playwright. Danville, Contra Costa County, Calif.

Osgood, William Fogg, A.M., Ph.D., LL.D. 1915
Professor Emeritus of Mathematics, Harvard University. 10 Dorset Road, Belmont, Mass.

Osterhout, Winthrop John Vanleuven, A.M., Ph.D., Sc.D. 1917
Physiologist, Rockefeller Institute for Medical Research. 66th Street and York Avenue, New York, N. Y.

Packard, Francis Randolph, M.D. 1933
Physician, Author. 304 South 19th Street, Philadelphia, Pa.

Parker, George Howard, Sc.D. 1911
Professor Emeritus of Zoology, Harvard University. 16 Berkeley Street, Cambridge, Mass.

Paton, Stewart, M.A., M.D. 1914
Psychiatrist, Author. 208 Stratford Road, Baltimore, Md.

Patterson, Ernest Minor, A.B., A.M., Ph.D., LL.D. 1932
Professor of Economics, University of Pennsylvania. 404 South 47th Street, Philadelphia, Pa.

Patterson, Lamar Gray 1898
Chemist. Perdido Beach, Ala.

Paul, J. Rodman, A.M. 1899
Lawyer, Trustee Drexel Institute, Director City Parks Association. 505 Chestnut Street, Philadelphia, Pa.

Date of Election

Pauling, Linus Carl, Ph.D., Sc.D. 1936
Professor of Chemistry, Chairman Division of Chemistry and Chemical Engineering, Director Gates and Crellin Laboratories of Chemistry, California Institute of Technology, Pasadena, Calif.

Pearl, Raymond, Ph.D., Sc.D., LL.D., Litt.D. 1915
Professor of Biology, Johns Hopkins School of Hygiene and School of Medicine. 1901 East Madison Street, Baltimore, Md.

Pender, Harold, A.B., Ph.D., Sc.D. 1917
Consulting Engineer, Dean Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa.

Penniman, Josiah Harmar, A.B., Ph.D., LL.D., Litt.D., L.H.D. 1901
Professor of English Literature, Provost, University of Pennsylvania, Philadelphia, Pa.

Pepper, Hon. George Wharton, B.A., LL.B., LL.D., D.C.L. 1897
Lawyer, United States Senator (1922–27); Formerly Professor of Law, University of Pennsylvania. 2231 Land Title Building, Philadelphia, Pa.

Pepper, William, A.B., M.D., Sc.D. 1937
Dean Medical School, University of Pennsylvania. Prospect Avenue, Melrose Park, Philadelphia, Pa.

Phelps, William Lyon, Ph.D., Litt.D., L.H.D., LL.D., D.D., D.S.T. 1927
Author, Professor Emeritus of English Literature, Yale University. 110 Whitney Avenue, New Haven, Conn.

Prince, Hon. John Dyneley, B.A., Ph.D. 1913
Orientalist and Comparative Philologist, Professor of East European Languages, Columbia University, New York, N. Y.

Putnam, Herbert, Litt.D., LL.D. 1937
Librarian of Congress, Washington, D. C.

Rand, Edward Kennard, A.B., A.M., Ph.D., Litt.D., LL.D. 1925
Professor of Latin, Harvard University. 107 Lake View Avenue, Cambridge, Mass.

Ravenel, Mazÿck P., M.D., 1901
Physician, Editor-in-Chief American Journal of Public Health, University of Missouri, Columbia, Mo.

Date of Election

Read, Conyers, A.B., Ph.D., B.Litt. 1934
Professor of English History, University of Pennsylvania.
226 South 16th Street, Philadelphia, Pa.

Reese, Charles Lee, Ph.D., Sc.D. 1922
Chemist, Director E. I. du Pont de Nemours & Company.
1600 Brinckle Avenue, Wilmington, Del.

Reeves, Jesse S., Ph.D., L.H.D., LL.D. 1934
Professor of Political Science, University of Michigan.
1945 Cambridge Road, Ann Arbor, Mich.

Reid, Harry Fielding, C.E., A.B., Ph.D. 1910
Professor Emeritus of Dynamical Geology and
Geography, Johns Hopkins University, Baltimore, Md.

Repplier, Agnes, Litt.D. 1928
Author. 920 Clinton Street, Philadelphia, Pa.

Rhoads, Charles James, A.B. 1921
Banker (ret.), Trustee Bryn Mawr College,
Haverford College. Bryn Mawr, Pa.

Richards, Alfred Newton, Ph.D., Sc.D., M.D., LL.D. 1935
Professor of Pharmacology, University of Pennsylvania.
6 Rugby Road, Bryn Mawr, Pa.

Richards, Horace Clark, A.B., Ph.D. 1907
Professor of Mathematical Physics, Director Laboratory
of Physics, University of Pennsylvania.
509 Woodland Terrace, Philadelphia, Pa.

Richtmyer, Floyd K., Ph.D. 1935
Professor of Physics, Dean Graduate School,
Cornell University, Ithaca, N. Y.

Riddle, Oscar, A.B., Ph.D., LL.D. 1926
Physiologist, Carnegie Station for Experimental
Evolution, Cold Spring Harbor, Long Island, N. Y.

Roberts, Hon. Owen J., A.B., LL.B., LL.D., D.C.L. 1934
Associate Justice Supreme Court of the United States,
Washington, D. C.

Robinson, David Moore, Ph.D., LL.D., L.H.D., Litt.D. 1936
Professor of Archaeology and Epigraphy, Lecturer in
Greek Literature, Johns Hopkins University,
Baltimore, Md.

Date of Election

Rockefeller, John D., Jr., A.B., A.M. 1931
Administrator, Trustee Rockefeller Institute for Medical Research; Chairman Board Rockefeller Foundation.
30 Rockefeller Plaza, New York, N. Y.

Rolfe, John Carew, A.M., Ph.D., Litt.D. 1907
Professor Emeritus of Latin, University of Pennsylvania; Secretary Philadelphia Branch, English Speaking Union.
4014 Pine Street, Philadelphia, Pa.

Rosenbach, A. S. W., B.S., Ph.D., D.F.A. 1928
Author, Bibliographer, President Gratz College.
1320 Walnut Street, Philadelphia, Pa.

Rostovtzeff, Michael I., Ph.D., LL.D. 1929
Professor of Ancient History and Archaeology, Yale University. 470 Whitney Avenue, New Haven, Conn.

Rowe, Leo S., A.B., B.S., Ph.D., LL.D. 1911
Political Scientist, Director Pan-American Union, Washington, D. C.

Russell, Henry Norris, A.M., Ph.D., D.Sc. 1913
Professor of Astronomy, Director Observatory, Princeton University. 79 Alexander Street, Princeton, N. J.

Ruthven, Alexander G., B.S., Ph.D., LL.D., Sc.D. 1931
Zoologist, President University of Michigan, Ann Arbor, Mich.

Sanders, Henry A., A.B., A.M., Ph.D. 1932
Professor of Latin, Chairman Department of Speech and General Linguistics, University of Michigan.
2037 Geddes Avenue, Ann Arbor, Mich.

Sapir, Edward, A.M., Ph.D., Sc.D. 1937
Professor of Anthropology and Linguistics, Yale University. 224 Edgehill Road, Hamden, New Haven, Conn.

Sarton, George A. L., D.Sc., L.H.D., LL.D. 1934
Historian of Science, Editor of Isis.
Harvard Library 185, Cambridge, Mass.

Sauveur, Albert, Sc.D., Eng.D. 1919
Engineer, Professor Emeritus of Metallurgy, Harvard University, Cambridge, Mass.

Date of Election

Scattergood, J. Henry, A.B. 1931
Man of Affairs, Treasurer Haverford College, Bryn Mawr College. Villa Nova, Pa.

Schaeffer, J. Parsons, A.M., M.D., Ph.D., Sc.D. 1927
Professor of General Anatomy, Director Daniel Baugh Institute of Anatomy, Jefferson Medical College. 4634 Spruce Street, Philadelphia, Pa.

Schelling, Felix E., Ph.D., Litt.D., LL.D. 1902
Professor Emeritus of English Literature, University of Pennsylvania, Philadelphia, Pa.

Schlesinger, Frank, Ph.D., Sc.D. 1912
Astronomer, Director Yale University Observatory. Observatory House, New Haven, Conn.

Schramm, Jacob Richard, A.B., Ph.D. 1932
Editor-in-chief Biological Abstracts, Professor of Botany, Director Department of Botany, University of Pennsylvania, Philadelphia, Pa.

Schuchert, Charles, M.A., LL.D., Sc.D. 1913
Professor Emeritus of Paleontology, Yale University. Yale Station, New Haven, Conn.

Schultz, Adolph H. 1936
Associate Professor of Physical Anthropology, School of Medicine, Johns Hopkins University, Baltimore, Md.

Schurman, Hon. Jacob Gould, A.B., A.M., Sc.D., Ph. D., LL.D. 1908
Administrator, Diplomatist, Formerly President Cornell University; United States Ambassador to Germany (1925–30). Bedford Hills, N. Y.

Schweinitz, George E. de, A.M., M.D., LL.D., Sc.D. 1912
Physician, Professor Emeritus of Ophthalmology, Graduate School of Medicine, University of Pennsylvania. 1705 Walnut Street, Philadelphia, Pa.

Scott, James Brown, A.B., A.M., J.U.D., LL.D., D.C.L. 1930
Jurist, President American Society of International Law. 1201 Nineteenth Street, N.W., Washington, D. C.

Scott, John Morin, A.B. 1926
Lawyer. 1903 Spruce Street, Philadelphia, Pa.

Date of Election

Scott, William Berryman, M.A., Ph.D., Sc.D., LL.D. 1886
Professor Emeritus of Geology and Paleontology, Princeton University. 7 Cleveland Lane, Princeton, N. J.

Seares, Frederick Hanley, B.S., LL.D. 1917
Astronomer, Assistant Director Mount Wilson Observatory, Pasadena, Calif.

See, Thomas Jefferson Jackson, A.M., Lt.M., Sc.M., Ph.D., D.Sc. 1897
Astronomer, Geometer, Professor of Mathematics, United States Navy. 614 Ohio Street, Vallejo, Calif.

Setchell, William Albert, A.M., Ph.D. 1919
Professor of Botany, University of California, Berkeley, Calif.

Shapley, Harlow, A.M., Ph.D., LL.D., Sc.D. 1922
Astronomer, Director Harvard College Observatory, Cambridge, Mass.

Shotwell, James Thomson, Ph.D., LL.D. 1936
Professor of History, Columbia University; Trustee and Director, Division of Economics and History, Carnegie Endowment for International Peace.
405 West 117th Street, New York, N. Y.

Shull, George Harrison, B.S., Ph.D. 1918
Professor of Botany and Genetics, Princeton University.
60 Jefferson Road, Princeton, N. J.

Simpson, George Gaylord, Ph.D. 1936
Associate Curator of Vertebrate Paleontology, American Museum of Natural History, New York, N. Y.

Singer, Edgar Arthur, Jr., B.S., Ph.D. 1925
Professor of Philosophy, University of Pennsylvania.
4224 Chester Avenue, Philadelphia, Pa.

Sioussat, St. George Leakin, A.B., Ph.D. 1928
Professor of American History, University of Pennsylvania, Philadelphia, Pa.

Slipher, Vesto Melvin, A.M., Ph.D., LL.D., Sc.D. 1921
Astronomer, Director Lowell Observatory, Flagstaff, Ariz.

Smith, Preserved, A.M., Ph.D., Litt.D. 1937
Professor of History, Cornell University.
156 Cascadilla Park, Ithaca, N. Y.

Date of Election

Smyth, Charles Phelps, A.B., A.M., Ph.D. 1932
Associate Professor of Chemistry, Princeton University, Princeton, N. J.

Spoehr, Herman Augustus, Ph.D., D.Sc. 1931
Chairman Division of Plant Biology, Carnegie Institution of Washington, Stanford University, Calif.

Stebbins, Joel, Ph.D., Sc.D. 1925
Professor of Astronomy, Director Washburn Observatory, University of Wisconsin, Madison, Wis.

Stefansson, Vilhjalmur, Ph.D., LL.D. 1923
Arctic Explorer. Harvard Club, New York, N. Y.

Stengel, Alfred, M.D., Sc.D., LL.D. 1903
Physician, Professor of Medicine, Vice-president, University of Pennsylvania. Maloney Building, 36th and Spruce Streets, Philadelphia, Pa.

Stillwell, Lewis Buckley, Sc.D. 1898
Electrical Engineer. Elm Road, Princeton, N. J.

Stockard, Charles R., M.S., Ph.D., M.D., Sc.D. 1924
Professor of Anatomy, Cornell Medical College. 1300 York Avenue, New York, N. Y.

Stone, Witmer, A.M., Sc.D. 1913
Zoologist, Vice-president, Curator, Department of Vertebrates, Academy of Natural Sciences, Philadelphia. Nineteenth and the Parkway, Philadelphia, Pa.

Struve, Otto, Ph.D. 1937
Professor of Astrophysics, University of Chicago; Director Yerkes Observatory, Williams Bay, Wis.

Sturtevant, Alfred Henry, Ph.D. 1936
Professor of Genetics, California Institute of Technology, Pasadena, Calif.

Swann, William Francis Gay, M.A., D.Sc. 1926
Physicist, Director Bartol Research Foundation, Whittier Place, Swarthmore, Pa.

Tatlock, John S. P., A.M., Ph.D. 1937
Professor of English, University of California. 1994 San Antonio Street, Berkeley, Calif.

Taussig, Frank W., A.B., Ph.D., LL.B., Litt.D., LL.D. 1929
Professor Emeritus of Political Economy, Harvard University, Cambridge, Mass.

Date of Election

Taylor, Deems, A.B., Mus.D., Litt.D. 1934
Musician, Composer, Writer. The Haviland Road, Stamford, Conn.

Taylor, Henry Osborn, A.B., LL.B., D.Litt., L.H.D. 1926
Author, Historian. 135 East 66th Street, New York, N. Y.

Taylor, Hugh Stott, D.Sc. 1928
Professor of Physical Chemistry, Chairman Department of Chemistry, Princeton University. 115 Broadmead, Princeton, N. J.

Thorndike, Edward L., A.B., A.M., Ph.D., Sc.D., LL.D. 1930
Professor of Educational Psychology, Teachers College, Columbia University, New York, N. Y.

Tilney, Frederick, A.B., M.D., Ph.D., Sc.D. 1930
Professor of Neurology, Columbia University. Neurological Institute, 706 West 168th Street, New York, N. Y.

Tittmann, Otto Hilgard, Sc.D., LL.D. 1906
Geodesist. Leesburg, Va.

Tolman, Richard Chace, Ph.D. 1932
Professor of Physical Chemistry and Mathematical Physics, California Institute of Technology, Pasadena, Calif.

Tozzer, Alfred Marston, A.B., A.M., Ph.D. 1937
Professor of Anthropology, Harvard University. 7 Bryant Street, Cambridge, Mass.

Trelease, William, Sc.D., LL.D. 1903
Professor Emeritus of Botany, University of Illinois, Urbana, Ill.

True, Rodney H., M.S., Ph.D. 1923
Professor Emeritus of Botany, Director Morris Arboretum, University of Pennsylvania, Philadelphia, Pa.

Tucker, Richard Hawley, C.E., Sc.D. 1908
Astronomer, Formerly of Lick Observatory. 1525 Waverly Street, Palo Alto, Calif.

Tyzzer, Ernest Edward, Ph.B., A.M., M.D., Sc.D. 1931
Professor of Comparative Pathology, Harvard Medical School. Wakefield, Mass.

Date of Election

Urey, Harold Clayton, Ph.D. 1935
Professor of Chemistry, Columbia University.
355 Highwood Avenue, Leonia, N. J.

Vauclain, Samuel M., Sc.D. 1899
Engineer, Chairman Board of the Baldwin Locomotive Works. 123 South Broad Street, Philadelphia, Pa.

Vaughan, Thomas Wayland, A.M., Ph.D., LL.D. 1923
Geologist and Oceanographer, Director Emeritus Scripps Institution of Oceanography. 3333 P Street, Washington, D. C.

Veblen, Oswald, A.B., Ph.D., D.Sc. 1912
Professor of Mathematics, Institute for Advanced Study.
58 Battle Road, Princeton, N. J.

Warren, Charles Hyde, Ph.B., Ph.D. 1928
Dean Sheffield Scientific School, Professor of Geology, Yale University. 59 Lincoln Street, New Haven, Conn.

Webster, David Locke, A.B., Ph.D. 1922
Professor and Executive Head, Department of Physics, Stanford University, Calif.

Weimer, Albert Barnes, A.B. 1927
Lawyer, State Reporter of Pennsylvania (ret.).
The Warwick, Philadelphia, Pa.

Wetherill, Samuel Price, B.S. 1933
Engineer. 1402 Morris Building, Philadelphia, Pa.

Wetmore, Alexander, A.B., M.S., Ph.D., D.Sc. 1930
Zoologist, Assistant Secretary Smithsonian Institution; In Charge United States National Museum, Washington, D. C.

Weyl, Hermann 1935
Professor of Mathematics, Institute for Advanced Study.
Fine Hall, Princeton, N. J.

Whitney, Willis R., S.B., Ph.D., Sc.D., Ch.D., LL.D. 1931
Chemist, Vice-president in Charge of Research, General Electric Company, Schenectady, N. Y.

Willis, Bailey, E.M., C.E., Ph.D. 1905
Professor Emeritus of Geology, Stanford University, Calif.

Date of Election

Wilson, Edwin Bidwell, A.B., Ph.D. 1917
Professor of Vital Statistics, Harvard School of Public Health. 55 Shattuck Street, Boston, Mass.

Wilson, George Grafton, Ph.D., LL.D. 1936
Professor Emeritus of International Law, Harvard University, Cambridge, Mass.

Wilson, Harold Albert, M.A., M.Sc., D.Sc. 1914
Professor of Physics, The Rice Institute, Houston, Texas

Wilson, Henry Van Peters, A.B., Ph.D. 1932
Kenan Professor of Zoology, University of North Carolina, Chapel Hill, N. C.

Wissler, Clark, A.M., Ph.D., LL.D. 1924
Professor of Anthropology, Yale University; Curator of Anthropology, American Museum of Natural History, New York, N. Y.

Wister, Owen, A.B., LL.B., LL.D., Litt.D. 1897
Author. 807 Real Estate Trust Building, Philadelphia, Pa.

Witmer, Lightner, A.M., Ph.D. 1897
Professor Emeritus of Psychology, University of Pennsylvania, Philadelphia, Pa.

Woodworth, Robert Sessions, Ph.D., Sc.D., LL.D. 1936
Professor of Psychology, Columbia University, New York, N. Y.

Wright, Frederick E., Ph.D. 1914
Petrologist, Geophysical Laboratory, Carnegie Institution of Washington. 2134 Wyoming Avenue, Washington, D. C.

Wright, Sewall, B.S., M.S., Sc.D. 1932
Professor of Zoology, University of Chicago. 5762 Harper Avenue, Chicago, Ill.

Wright, William Hammond, D.Sc. 1935
Astronomer, Director Lick Observatory, Mount Hamilton, Calif.

Yeatman, Pope, E.M., D.E. 1920
Mining Engineer. 165 Broadway, New York, N. Y.

Yerkes, Robert Mearns, Ph.D., D.Sc., LL.D. 1936
Director Yale Laboratories of Primate Biology; Professor of Psychobiology, Yale University, New Haven, Conn.

Date of Election

Young, James Thomas, Ph.D. 1933
Political Scientist, Professor of Public Administration, University of Pennsylvania, Philadelphia, Pa.

Young, Owen D., LL.B., LL.D., D.H.L., D.C.S., Litt.D. 1929
Lawyer, Corporation Official, Chairman Board General Electric Company. 570 Lexington Avenue, New York, N. Y.

Zeleny, John, M.A., Ph.D. 1915
Professor of Physics, Yale University.
44 Cold Spring Street, New Haven, Conn.

Zinsser, Hans, M.D., Sc.D. 1937
Professor of Bacteriology and Immunology, Harvard Medical School. 52 Chestnut Street, Boston, Mass.

Total Resident Members—399

December 31, 1937.

FOREIGN MEMBERS

	Date of Election
Adams, Frank Dawson, Ph.D., D.Sc., LL.D., F.R.S. Geologist, Vice-Principal Emeritus McGill University, Montreal, Canada.	1916
Brögger, Waldemar Christofer, LL.D., D.Sc., F.R.S., Ph.D. Formerly Professor of Mineralogy and Geology, Oslo University, Oslo, Norway.	1899
Debye, Peter Director Kaiser Wilhelm-Institut für Physik, Berlin-Dahlem, Boltzmannstrasse, Germany.	1936
Eddington, Sir Arthur Stanley, M.A., B.Sc., D.Sc., LL.D., F.R.S. Astronomer, Director The Observatory, Cambridge, England.	1931
Evans, Sir Arthur, Kt., M.A., D.Litt., LL.D., F.R.S., F.B.A. Extraordinary Professor of Prehistoric Archaeology, Oxford University. Youlbury, Oxford, England.	1913
Heisenberg, Werner, Ph.D. Professor of Theoretical Physics, University of Leipzig. Bozenerweg 14, Leipzig, Germany.	1937
Hilbert, David Professor of Mathematics, University of Göttingen. Wilhelm-Weber-Strasse, Göttingen, Germany.	1932
Hopkins, Sir Frederick Gowland, M.A., M.B., D.Sc., LL.D., D.C.L., F.R.S. Physiologist, Professor of Biochemistry, University of Cambridge. Saxmeadham, Grange Road, Cambridge, England.	1937
Hu Shih, B.A., Ph.D. Philosopher, Dean Peiping National University. 4 Mi Liang Ku, Peiping, China.	1936

Date of Election

Irvine, Sir James Colquhoun, C.B.E., Ph.D., Sc.D., LL.D., D.C.L., F.R.S. 1933
Chemist, Principal and Vice-chancellor, University of St. Andrews, Fifeshire, Scotland.

Keith, Sir Arthur, Kt., F.R.S., M.D., D.Sc., F.R.C.S., LL.D. 1931
Anthropologist, Master Buckston Browne Research Farm, Downe, Farnborough, Kent, England.

Keith, Arthur Berriedale, D.C.L., D.Litt., LL.D. 1935
Barrister at Law, Advocate and Orientalist, Regius Professor of Sanskrit and Comparative Philology, Lecturer on the Constitution of the British Empire, University of Edinburgh, Edinburgh, Scotland.

Kenyon, Sir Frederic George, M.A., D.Litt., LL.D., L.H.D., Ph.D. 1937
Archaeologist, Secretary British Academy, President London Society of Antiquaries, Formerly Director British Museum. Kirkstead, Godstone, Surrey, England.

Krauss, Friedrich S., Prof.Dr. 1889
Anthropologist. vii/2 Neustiftgasse 12, Vienna, Austria.

Larmor, Sir Joseph, Kt., M.A., Sc.D., LL.D., D.C.L., F.R.S. 1913
Physicist, Professor Emeritus of Mathematics, Cambridge University; Fellow St. John's College, Cambridge, England.

Lodge, Sir Oliver Joseph, Kt., Sc.D., LL.D., F.R.S. 1901
Physicist, Formerly Principal University of Birmingham, Normanton, Lake, Salisbury, England.

Mackenzie, Arthur Stanley, Ph.D., D.C.L., LL.D., F.R.S.C. 1899
Physicist, Formerly President Dalhousie University. 25 Kent Street, Halifax, Nova Scotia.

McMurrich, James Playfair, M.A., Ph.D., LL.D. 1907
Professor Emeritus of Anatomy, Anatomical Laboratory, University of Toronto, Toronto, Canada.

de Margerie, Emmanuel 1932
Geologist, Formerly President Geological Society of France. 110 Rue du Bac, Paris VII, France.

Penck, Albrecht F. K., Ph.D., Sc.D. 1908
Professor Emeritus of Geography, University of Berlin. Knesebeckstrasse 48, Berlin W15, Germany.

Date of Election

Petrie (William Matthew), Sir Flinders, Kt., D.C.L., Litt.D., LL.D., Ph.D., F.R.S., F.S.A. 1905
Professor Emeritus of Egyptology, University College, London; Founder British School of Egyptian Archaeology. Care American School of Research, Jerusalem, Palestine.

Picard, Emile, Sc.D. 1910
Mathematician, Permanent Secretary Academy of Sciences, Professor Paris University. 25 Quai Conti, Paris (vi), France.

Planck, Max, Ph.D., M.D., D.Sc. 1933
Professor of Physics, University of Berlin, Berlin, Germany.

Plaskett, John Stanley, C.B.E., B.A., D.Sc., LL.D., F.R.S. 1930
Director (ret.) Dominion Astrophysical Observatory. 318 Armit Street, Esquimalt, Victoria, B. C., Canada.

Prain, Sir David, Kt., M.A., M.B., LL.D., F.R.S. 1917
Botanist, Formerly Trustee British Museum and Director Royal Botanic Gardens, Kew. The Well Farm, Warlingham, Surrey, England.

Richardson, Owen Willans, M.A., D.Sc., LL.D., F.R.S. 1910
Physicist, Research Professor of the Royal Society; Director of Research in Physics, King's College. 45 Haverstock Hill, Hampstead, London, N.W. 3, England.

Spemann, Hans, Ph.D., Sc.D. 1937
Professor of Zoology, Freiburg University. Freiburg, I.B., Mercystrasse 35, Germany.

Szombathy, Josef Hofrat 1886
Anthropologist. Vienna XIX, Obkirchergasse 15, Austria.

Thomson, Sir Joseph John, O.M., Kt., M.A., Sc.D., Ph.D., LL.D., F.R.S. 1903
Physicist, Master Trinity College. Trinity Lodge, Cambridge, England.

Volterra, Vito, Ph.D., Sc.D., LL.D., Math.Dr., Phys.Dr. 1914
Professor of Mathematics, Universities of Pisa, Turin and Rome. Via in Lucina 17, Rome, Italy.

Wilkins, Sir Hubert, Kt., M.C., F.R.G.S., M.B.O.U. 1930
Geographer. Royal Society's Club, St. James, London, England.

Total Foreign Members—31

December 31, 1937.

CLASSIFIED LIST OF MEMBERS

CLASS I. MATHEMATICAL AND PHYSICAL SCIENCES

Mathematics

Alexander, James W.	Princeton, N. J.
Bateman, Harry	Pasadena, Calif.
Bell, Eric Temple	Pasadena, Calif.
Birkhoff, George David	Cambridge, Mass.
Bliss, Gilbert Ames	Chicago, Ill.
Dresden, Arnold	Swarthmore, Pa.
Eisenhart, Luther Pfahler	Princeton, N. J.
Henderson, Robert	Crown Point, N. Y.
Hilbert, David	Göttingen, Germany
Huntington, Edward Vermilye	Cambridge, Mass.
Lefschetz, Solomon	Princeton, N. J.
Lovett, Edgar Odell	Houston, Texas
Mitchell, Howard Hawks	Merion, Pa.
Morse, Marston	Princeton, N. J.
Osgood, William Fogg	Belmont, Mass.
Picard, Emile	Paris, France
Veblen, Oswald	Princeton, N. J.
Volterra, Vito	Rome, Italy
Weyl, Hermann	Princeton, N. J.

Astronomy

Abbot, Charles Greeley	Washington, D. C.
Adams, Walter Sydney	Pasadena, Calif.
Aitkin, Robert Grant	Berkeley, Calif.
Brown, Ernest William	New Haven, Conn.
Campbell, William Wallace	San Francisco, Calif.
Cannon, Annie J.	Cambridge, Mass.
Cook, Gustavus Wynne	Wynnewood, Pa.
Curtis, Heber Doust	Ann Arbor, Mich.
Dugan, Raymond Smith	Princeton, N. J.
Eddington, Arthur Stanley	Cambridge, England
Gaposchkin, Cecilia Payne	Cambridge, Mass.

†Hale, George Ellery .... Pasadena, Calif.
Hubble, Edwin P. .... Pasadena, Calif.
Lampland, Carl O. .... Flagstaff, Ariz.
Leuschner, Armin Otto .... Berkeley, Calif.
Miller, John Anthony .... Wallingford, Pa.
Mitchell, Samuel Alfred .... University, Va.
Moulton, Forest Ray .... Washington, D. C.
Olivier, Charles P. .... Upper Darby, Pa.
Plaskett, John Stanley .... Victoria, B. C., Canada
Russell, Henry Norris .... Princeton, N. J.
Schlesinger, Frank .... New Haven, Conn.
Seares, Frederick Hanley .... Pasadena, Calif.
See, Thomas Jefferson Jackson .... Vallejo, Calif.
Shapley, Harlow .... Cambridge, Mass.
Slipher, Vesto Melvin .... Flagstaff, Ariz.
Stebbins, Joel .... Madison, Wis.
Struve, Otto .... Williams Bay, Wis.
Tucker, Richard Hawley .... Palo Alto, Calif.
Wright, William Hammond .... Mt. Hamilton, Calif.

Physics

Adams, Edwin Plimpton .... Princeton, N. J.
Bridgman, Percy Williams .... Cambridge, Mass.
Briggs, Lyman J. .... Washington, D. C.
Compton, Arthur Holly .... Chicago, Ill.
Compton, Karl Taylor .... Cambridge, Mass.
Crew, Henry .... Evanston, Ill.
Darrow, Karl Kelchner .... New York, N. Y.
Davisson, Clinton J. .... New York, N. Y.
Debye, Peter .... Berlin, Germany
Dempster, Arthur Jeffrey .... Chicago, Ill.
Einstein, Albert .... Princeton, N. J.
Foote, Paul Darwin .... Pittsburgh, Pa.
Franck, James .... Baltimore, Md.
Goodspeed, Arthur Willis .... Philadelphia, Pa.
Heisenberg, Werner .... Leipzig, Germany
Humphreys, William Jackson .... Washington, D. C.
Ives, Herbert E. .... Montclair, N. J.
Larmor, Joseph .... Cambridge, England
Lawrence, Ernest Orlando .... Berkeley, Calif.
Lodge, Oliver Joseph .... Salisbury, England
Loomis, Alfred Lee .... Tuxedo Park, N. Y.
Lyman, Theodore .... Cambridge, Mass.

† Deceased.

Mackenzie, Arthur Stanley..................Halifax, Nova Scotia
Magie, William Francis.........................Princeton, N. J.
Mees, Charles Edward Kenneth.................Rochester, N. Y.
Miller, Dayton Clarence.......................Cleveland, Ohio
Millikan, Robert Andrews......................Pasadena, Calif.
Planck, Max...................................Berlin, Germany
Richards, Horace Clark.......................Philadelphia, Pa.
Richardson, Owen Willans.....................London, England
Richtmyer, Floyd K............................Ithaca, N. Y.
Swann, William Francis Gay ....Swarthmore, Pa.
Thomson, Joseph John......................Cambridge, England
Tittmann, Otto Hilgard.........................Leesburg, Va.
Tolman, Richard Chace.........................Pasadena, Calif.
Webster, David Locke...............Stanford University, Calif.
Wilson, Harold Albert.........................Houston, Texas
Zeleny, John.................................New Haven, Conn.

Chemistry

Adams, Roger.......................................Urbana, Ill.
Andrews, Donald H.............................Baltimore, Md.
Baekeland, Leo H...............................New York, N. Y.
Bancroft, Wilder Dwight.........................Ithaca, N. Y.
deBenneville, James S.........................Philadelphia, Pa.
Bogert, Marston Taylor.........................New York, N. Y.
Conant, James Bryant.........................Cambridge, Mass.
Du Pont, Francis I............................Wilmington, Del.
Du Pont, Pierre Samuel.......................Wilmington, Del.
Eckfeldt, Jacob B..................................Ambler, Pa.
Gomberg, Moses..............................Ann Arbor, Mich.
Harkins, William Draper...........................Chicago, Ill.
Hawk, Philip Bovier...........................New York, N. Y.
Hopkins, B Smith..................................Urbana, Ill.
Hulett, George A...............................Princeton, N. J.
Irvine, James Colquhoun.....................Fifeshire, Scotland
Lamb, Arthur Becket..........................Cambridge, Mass.
Langmuir, Irving.............................Schenectady, N. Y.
Levene, Phoebus A.............................New York, N. Y.
Lewis, Gilbert Newton..........................Berkeley, Calif.
Noyes, William Albert.............................Urbana, Ill.
Patterson, Lamar Gray.......................Perdido Beach, Ala.
Pauling, Linus Carl...........................Pasadena, Calif.
Reese, Charles Lee............................Wilmington, Del.

Smyth, Charles Phelps..........................Princeton, N. J.
Taylor, Hugh Stott............................Princeton, N. J.
Urey, Harold Clayton..........................Leonia, N. J.
Whitney, Willis R..........................Schenectady, N. Y.

Engineering

Bush, Vannevar................................Belmont, Mass.
Davis, Harvey N...............................Hoboken, N. J.
Derleth, Charles, Jr..........................Berkeley, Calif.
Dunn, Gano..................................New York, N. Y.
Durand, William Frederick...........Stanford University, Calif.
Emmet, William LeRoy......................Schenectady, N. Y.
Hoover, Herbert.....................Stanford University, Calif.
Jackson, Dugald Caleb......................Cambridge, Mass.
Kennelly, Arthur Edwin.....................Cambridge, Mass.
Kettering, Charles Franklin.....................Dayton, Ohio
Pender, Harold..............................Philadelphia, Pa.
Sauveur, Albert..............................Cambridge, Mass.
Stillwell, Lewis Buckley.....................Princeton, N. J.
Vauclain, Samuel M.........................Philadelphia, Pa.
Wetherill, Samuel Price.......................Haverford, Pa.
Yeatman, Pope................................New York, N. Y.

CLASS II. GEOLOGICAL AND BIOLOGICAL SCIENCES

Geology, Paleontology, Geography

Adams, Frank Dawson.......................Montreal, Canada
Berkey, Charles Peter........................New York, N. Y.
Berry, Edward Wilber.........................Baltimore, Md.
Bowen, Norman L...............................Chicago, Ill.
Bowman, Isaiah...............................Baltimore, Md.
Brögger, Waldemar Christofer...................Oslo, Norway
Bryant, William L..........................Providence, R. I.
Buddington, Arthur F.........................Princeton, N. J.
Byrd, Richard Evelyn...........................Boston, Mass.
Case, Ermine Cowles.........................Ann Arbor, Mich.
Cross, Whitman.............................Chevy Chase, Md.
Daly, Reginald Aldworth....................Cambridge, Mass.
Day, Arthur L.................................Bethesda, Md.
Gregory, Herbert Ernest.....................Honolulu, Hawaii
Gregory, William King.......................New York, N. Y.

Hobbs, William Herbert........................Ann Arbor, Mich.
Johnson, Douglas..............................New York, N. Y.
Lawson, Andrew Cowper.........................Berkeley, Calif.
Leith, Charles Kenneth........................Madison, Wis.
Leverett, Frank...............................Ann Arbor, Mich.
Lindgren, Waldemar............................Cambridge, Mass.
de Margerie, Emmanuel.........................Paris, France
Merriam, John C...............................Washington, D. C.
Penck, Albrecht F. K..........................Berlin, Germany
Reid, Harry Fielding..........................Baltimore, Md.
Schuchert, Charles............................New Haven, Conn.
Scott, William Berryman.......................Princeton, N. J.
Simpson, George Gaylord.......................New York, N. Y.
Stefansson, Vilhjalmur........................New York, N. Y.
Vaughan, Thomas Wayland.......................Washington, D. C.
Warren, Charles Hyde..........................New Haven, Conn.
Wilkins, Hubert...............................London, England
Willis, Bailey........................Stanford University, Calif.
Wright, Frederick E...........................Washington, D. C.

Zoology, Anatomy

Andrews, Roy Chapman ....New York, N. Y.
Barbour, Thomas...............................Boston, Mass.
Bigelow, Henry Bryant.........................Cambridge, Mass.
Birge, Edward Asahel..........................Madison, Wis.
Bumpus, Hermon Carey..........................Duxbury, Mass.
Calvert, Philip Powell........................Cheyney, Pa.
Castle, William Ernest........................Berkeley, Calif.
Chapman, Frank Michler........................New York, N. Y.
Cockerell, Theodore D. A......................Boulder, Colo.
Coghill, George Ellett........................Gainesville, Fla.
Conklin, Edwin Grant..........................Princeton, N. J.
Dahlgren, Ulric...............................Princeton, N. J.
Davenport, Charles Benedict.....Cold Spring Harbor, L. I., N. Y.
†Donaldson, Henry Herbert.....................Philadelphia, Pa.
Harrison, Ross G..............................New Haven, Conn.
Howard, Leland Ossian.........................Washington, D. C.
Jennings, Herbert S...........................Baltimore, Md.
Kofoid, Charles A.............................Berkeley, Calif.
Lillie, Frank Rattray.........................Chicago, Ill.
McClung, Clarence E...........................Philadelphia, Pa.
McClure, Charles F. W.........................Princeton, N. J.
McGregor, James Howard........................New York, N. Y.

† Deceased.

McMurrich, James Playfair....................Toronto, Canada
Mark, Edward Laurens....................Cambridge, Mass.
Miller, Gerrit Smith, Jr....................Washington, D. C.
Moore, J. Percy....................Philadelphia, Pa.
Morgan, Thomas Hunt....................Pasadena, Calif.
Noble, G. Kingsley....................New York, N. Y.
Parker, George Howard....................Cambridge, Mass.
Pearl, Raymond....................Baltimore, Md.
Ruthven, Alexander G....................Ann Arbor, Mich.
Schaeffer, J. Parsons....................Philadelphia, Pa.
Spemann, Hans....................Freiburg, Germany
Stockard, Charles R....................New York, N. Y.
Stone, Witmer....................Philadelphia, Pa.
Sturtevant, Alfred Henry....................Pasadena, Calif.
Wetmore, Alexander....................Washington, D. C.
Wilson, Henry Van Peters....................Chapel Hill, N. C.
Wright, Sewall....................Chicago, Ill.

Botany, Bacteriology

Allen, Charles Elmer....................Madison, Wis.
Arthur, Joseph Charles....................Lafayette, Ind.
Bailey, Irving Widmer....................Cambridge, Mass.
Bailey, Liberty Hyde....................Ithaca, N. Y.
Bartlett, Harley Harris....................Ann Arbor, Mich.
Blakeslee, Albert F.............Cold Spring Harbor, L. I., N. Y.
Campbell, Douglas Houghton..........Stanford University, Calif.
Cleland, Ralph Erskine....................Baltimore, Md.
Crocker, William....................Yonkers, N. Y.
Davis, Bradley Moore....................Ann Arbor, Mich.
Duggar, Benjamin Minge....................Madison, Wis.
East, Edward Murray....................Cambridge, Mass.
Fernald, Merritt Lyndon....................Cambridge, Mass.
Harper, Robert A....................New York, N. Y.
Jones, Lewis Ralph....................Madison, Wis.
Livingston, Burton E....................Baltimore, Md.
MacDougal, Daniel Trembly....................Carmel, Calif.
Macfarlane, John Muirhead....................Philadelphia, Pa.
Merrill, Elmer Drew....................Jamaica Plain, Mass.
Moore, George Thomas....................St. Louis, Mo.
Novy, Frederick G....................Ann Arbor, Mich.
Prain, David....................Warlingham, Surrey, England
Schramm, Jacob Richard....................Philadelphia, Pa.
Setchell, William Albert....................Berkeley, Calif.

Shull, George Harrison .... Princeton, N. J.
Spoehr, Herman Augustus .... Stanford University, Calif.
Trelease, William .... Urbana, Ill.
True, Rodney H. .... Philadelphia, Pa.
Zinsser, Hans .... Boston, Mass.

Anthropology, Psychology

Angell, James Rowland .... New Haven, Conn.
Boas, Franz .... Grantwood, N. J.
Cattell, James McKeen .... Garrison, N. Y.
Hooton, Earnest A. .... Cambridge, Mass.
Hrdlička, Aleš .... Washington, D. C.
Keith, Arthur .... Farnborough, Kent, England
Krauss, Friedrich S. .... Vienna, Austria
MacCurdy, George Grant .... Old Lyme, Conn.
Paton, Stewart .... Baltimore, Md.
Schultz, Adolph H. .... Baltimore, Md.
Szombathy, Josef Hofrat .... Vienna, Austria
Thorndike, Edward L. .... New York, N. Y.
Tozzer, Alfred Marston .... Cambridge, Mass.
Wissler, Clark .... New York, N. Y.
Witmer, Lightner .... Philadelphia, Pa.
Woodworth, Robert Sessions .... New York, N. Y.
Yerkes, Robert Mearns .... New Haven, Conn.

Physiology, Pathology

Benedict, Francis Gano .... Boston, Mass.
Bronk, Detlev W. .... Philadelphia, Pa.
Brubaker, Albert P. .... Philadelphia, Pa.
Cannon, Walter Bradford .... Boston, Mass.
Carlson, Anton Julius .... Chicago, Ill.
Chittenden, Russell H. .... New Haven, Conn.
Erlanger, Joseph .... St. Louis, Mo.
Flexner, Simon .... New York, N. Y.
Forbes, Alexander .... Boston, Mass.
Fox, Herbert .... Philadelphia, Pa.
Gasser, Herbert Spencer .... New York, N. Y.
Gies, William J. .... New York, N. Y.
Harvey, E. Newton .... Princeton, N. J.
Henderson, Lawrence J. .... Cambridge, Mass.
Henderson, Yandell .... New Haven, Conn.
Hopkins, Frederick Gowland .... Cambridge, England

Howell, William Henry........................Baltimore, Md.
Jacobs, Merkel Henry........................Philadelphia, Pa.
Landsteiner, Karl............................New York, N. Y
Lillie, Ralph Stayner............................Chicago, Ill
Loeb, Leo......................................St. Louis, Mo.
Murlin, John Raymond........................Rochester, N. Y.
Osterhout, Winthrop J. V.......................New York, N. Y.
Richards, Alfred Newton.......................Bryn Mawr, Pa.
Riddle, Oscar..................Cold Spring Harbor, L. I., N. Y.
Tyzzer, Ernest Edward.........................Wakefield, Mass.

Medicine, Pharmacology, Surgery

Abel, John Jacob..............................Baltimore, Md.
Carrel, Alexis..................................New York, N. Y.
Crile, George....................................Cleveland, Ohio
Cushing, Harvey..............................New Haven, Conn.
Darrach, William..............................New York, N. Y.
Griffith, J. P. Crozer..........................Philadelphia, Pa.
Heiser, Victor George.........................New York, N. Y.
Jackson, Chevalier............................Philadelphia, Pa.
Joslin, Elliott Proctor............................Boston, Mass.
†Martin, Edward.....................................Media, Pa.
Minot, George Richards.........................Boston, Mass.
Norris, George William...........................Dimock, Pa.
Packard, Francis Randolph...................Philadelphia, Pa.
Pepper, William.............................Philadelphia, Pa.
Ravenel, Mazÿck P..............................Columbia, Mo.
Schweinitz, George E de......................Philadelphia, Pa.
Stengel, Alfred...............................Philadelphia, Pa.
Tilney, Frederick..............................New York, N. Y.

CLASS III. SOCIAL SCIENCES

Political Sciences

Commons, John Rogers..........................Madison, Wis.
Day, Edmund Ezra..................................Ithaca, N. Y.
Dodds, Harold Willis...........................Princeton, N. J.
Fetter, Frank Albert...........................Princeton, N. J.
Fisher, Irving.................................New Haven, Conn.
Gay, Edwin Francis..........................San Marino, Calif.
Huebner, Solomon Stephen.........................Merion, Pa.
Johnson, Emory R............................Philadelphia, Pa.
Kemmerer, Edwin Walter.......................Princeton, N. J.

† Deceased.

Merriam, Charles Edward..........................Chicago, Ill.
Mitchell, Wesley Clair..........................New York, N. Y.
Patterson, Ernest Minor..........................Philadelphia, Pa.
Reeves, Jesse S..........................Ann Arbor, Mich.
Rowe, Leo S..........................Washington, D. C.
Taussig, Frank W..........................Cambridge, Mass.
Wilson, Edwin Bidwell..........................Boston, Mass.
Young, James Thomas ....Philadelphia, Pa.

Modern History

Andrews, Charles McLean..........................New Haven, Conn.
Beard, Charles Austin..........................New Milford, Conn.
Becker, Carl..........................Ithaca, N. Y.
Bolton, Herbert Eugene..........................Berkeley, Calif.
Cheyney, Edward Potts..........................Media, Pa.
Dodd, William Edward..........................Chicago, Ill.
Farrand, Max..........................San Marino, Calif.
Ford, Worthington Chauncey..........................Paris, France
Fox, Dixon Ryan..........................Schenectady, N. Y.
Greene, Evarts B..........................New York, N. Y.
Hazen, Charles D..........................New York, N. Y.
Lingelbach, William E..........................Philadelphia, Pa.
Morison, Samuel Eliot..........................Boston, Mass.
Read, Conyers..........................Philadelphia, Pa.
Shotwell, James Thomson..........................New York, N. Y.
Sioussat, St. George Leakin..........................Philadelphia, Pa.

Jurisprudence

Corwin, Edward Samuel..........................Princeton, N. J.
Davis, John William..........................New York, N. Y.
†Duane, Russell..........................Philadelphia, Pa.
Goodrich, Herbert Funk..........................Philadelphia, Pa.
Hughes, Charles Evans..........................Washington, D. C.
Keith, Arthur Berriedale..........................Edinburgh, Scotland
Miller, Hunter..........................Washington, D. C.
Moore, John Bassett..........................New York, N. Y.
Morris, Roland S..........................Philadelphia, Pa.
Paul, J. Rodman..........................Philadelphia, Pa.
Pepper, George Wharton..........................Philadelphia, Pa.
Roberts, Owen J..........................Washington, D. C.
Scott, James Brown..........................Washington, D. C.

Scott, John Morin.............................Philadelphia, Pa.
Weimer, Albert Barnes.........................Philadelphia, Pa.
Wilson, George Grafton........................Cambridge, Mass.

Administration, Government

Delano, Frederic Adrian......................Washington, D. C.
Fosdick, Raymond Blaine......................New York, N. Y.
Gates, Thomas Sovereign.......................Philadelphia, Pa.
Gest, William Purves..............................Merion, Pa.
Gifford, Walter Sherman......................New York, N. Y.
Guggenheim, William..........................New York, N. Y.
Harkness, Edward S...........................New York, N. Y.
Lowell, Abbott Lawrence..........................Boston, Mass.
Morgan, Marshall S...............................Malvern, Pa.
Putnam, Herbert.............................Washington, D. C.
Rockefeller, John D., Jr.....................New York, N. Y.
Schurman, Jacob Gould......................Bedford Hills, N. Y.
Young, Owen D................................New York, N. Y.

Affairs

Hayward, Nathan...............................Philadelphia, Pa.
Jenks, John Story.............................Philadelphia, Pa.
Johnson, Eldridge Reeves.........................Camden, N. J.
Lamont, Thomas William.......................New York, N. Y.
†Lea, Arthur H................................Philadelphia, Pa.
Lippincott, J. Bertram........................Philadelphia, Pa.
Mason, William Smith............................Evanston, Ill.
Morris, Lawrence J............................Philadelphia, Pa.
Norris, George Washington.....................Philadelphia, Pa.
Rhoads, Charles James...........................Bryn Mawr, Pa.
Scattergood, J. Henry............................Villa Nova, Pa.

CLASS IV. HUMANITIES

Philosophy, Education

Dewey, John..................................New York, N. Y.
Farrand, Livingston............................Brewster, N. Y.
Graves, Frank Pierrepont.........................Albany, N. Y.
Haney, John L.................................Philadelphia, Pa.
Hu Shih..Peiping, China
Lovejoy, Arthur Oncken..........................Baltimore, Md.
Penniman, Josiah Harmar.......................Philadelphia, Pa.
Singer, Edgar Arthur, Jr......................Philadelphia, Pa.

† Deceased.

Ancient, Medieval and Cultural History

Ferguson, William Scott........................Cambridge, Mass.
Leland, Waldo G............................Washington, D. C.
Rostovtzeff, Michael I........................New Haven, Conn.
Sarton, George A. L.........................Cambridge, Mass.
Smith, Preserved..................................Ithaca, N. Y.
Taylor, Henry Osborn.........................New York, N. Y.

Archaeology

Albright, William F...............................Baltimore, Md.
Barton, George Aaron.............................Weston, Mass.
Carpenter, Rhys............................Downingtown, Pa.
Chase, George Henry.........................Cambridge, Mass.
Dinsmoor, William Bell........................New York, N. Y.
Evans, Arthur.................................Oxford, England
Holland, Leicester Bodine.....................Philadelphia, Pa.
Jayne, Horace Howard Furness.................Wallingford, Pa.
Kenyon, Frederic George.............Godstone, Surrey, England
Kidder, Alfred Vincent.......................Cambridge, Mass.
Petrie, Flinders.............................Jerusalem, Palestine
Robinson, David Moore.........................Batlimore, Md.

Philology and Languages

Adler, Cyrus...................................Philadelphia, Pa.
Armstrong, Edward Cooke......................Princeton, N. J.
Aydelotte, Frank............................Swarthmore, Pa.
Buck, Carl Darling...............................Chicago, Ill.
Capps, Edward................................Princeton, N. J.
Chinard, Gilbert...............................Princeton, N. J.
Crawford, J. P. Wickersham...................Philadelphia, Pa.
Edgerton, Franklin..........................New Haven, Conn.
Frank, Tenney..................................Baltimore, Md.
Grandgent, Charles Hall.......................Cambridge, Mass.
Hendrickson, George Lincoln.................New Haven, Conn.
Lanman, Charles R...........................Cambridge, Mass.
McDaniel, Walton Brooks.....................Philadelphia, Pa.
Matthews, Albert................................Boston, Mass.
Montgomery, James Alan......................Philadelphia, Pa.
Nitze, William Albert............................Chicago, Ill.
Prince, John Dyneley..........................New York, N. Y.
Rand, Edward Kennard.......................Cambridge, Mass.
Rolfe, John Carew...........................Philadelphia, Pa.

Sanders, Henry A. .... Ann Arbor, Mich.
Sapir, Edward .... New Haven, Conn.
Tatlock, John S. P. .... Berkeley, Calif.

Literature, Fine Arts

Cather, Willa .... New York, N. Y.
Cret, Paul Philippe .... Philadelphia, Pa.
Cross, Wilbur L. .... New Haven, Conn.
Finley, John Huston .... New York, N. Y.
Frost, Robert .... South Shaftsbury, Vt.
Lowes, John Livingston .... Cambridge, Mass.
Manly, John Matthews .... Chicago, Ill.
Morris, Harrison Smith .... Philadelphia, Pa.
O'Neill, Eugene Gladstone .... Danville, Calif.
Phelps, William Lyon .... New Haven, Conn.
Repplier, Agnes .... Philadelphia, Pa.
Rosenbach, A. S. W. .... Philadelphia, Pa.
Schelling, Felix E. .... Philadelphia, Pa.
Taylor, Deems .... Stamford, Conn.
Wister, Owen .... Philadelphia, Pa.

MEMBERS ELECTED APRIL 23, 1937

CLASS I. MATHEMATICAL AND PHYSICAL SCIENCES

Resident

Eric Temple Bell..............................Pasadena, Calif.
Vannevar Bush..............................Belmont, Mass.
James Franck..............................Baltimore, Md.
Ernest Orlando Lawrence....................Berkeley, Calif.
Charles Edward Kenneth Mees..................Rochester, N. Y.
Otto Struve..............................Williams Bay, Wis.

Foreign

Werner Heisenberg..........................Leipzig, Germany

CLASS II. GEOLOGICAL AND BIOLOGICAL SCIENCES

Resident

Thomas Barbour..............................Cambridge, Mass.
Henry Bryant Bigelow........................Cambridge, Mass.
Herbert Spencer Gasser.......................New York, N. Y.
Ralph Stayner Lillie..............................Chicago, Ill.
William Pepper..............................Philadelphia, Pa.
Alfred Marston Tozzer.........................Cambridge, Mass.
Hans Zinsser..............................Boston, Mass.

Foreign

Sir Frederick Gowland Hopkins.............Cambridge, England
Hans Spemann..............................Freiburg, Germany

CLASS III. SOCIAL SCIENCES

Resident

Herbert Eugene Bolton.........................Berkeley, Calif.
Edmund Ezra Day..............................New York, N. Y.
Herbert Funk Goodrich.......................Philadelphia, Pa.

Nathan Hayward....................................Philadelphia, Pa.
Samuel Eliot Morison....................................Boston, Mass.
George Washington Norris............................Philadelphia, Pa.

CLASS IV. HUMANITIES

Resident

William Scott Ferguson..............................Cambridge, Mass.
Robert Frost..S. Shaftsbury, Vt.
Herbert Putnam.....................................Washington, D. C.
Edward Sapir.......................................New Haven, Conn.
Preserved Smith...Ithaca, N. Y.
John S. P. Tatlock....................................Berkeley, Calif.

Foreign

Charles Marie Joseph Bédier...............................Paris, France
Sir Frederick George Kenyon.......................London, England

MEMBERS DECEASED DURING 1937

	Date of Election
Julius Stieglitz, January 10, aet. 69	1919
William H. Collins, January 14, aet. 59	1932
William Pitt Mason, January 25, aet. 83	1896
Elihu Root, February 6, aet. 92	1906
Henry Martyn Chance, February 19, aet. 81	1880
Lewis M. Haupt, March 10, aet. 93	1878
Elihu Thomson, March 13, aet. 83	1876
Clarence B. Moore, March 24, aet. 84	1897
Charles Henry Smyth, Jr., April 4, aet. 71	1908
Milton J. Greenman, April 7, aet. 70	1899
Leroy Wiley McCay, April 13, aet. 79	1897
William Morton Wheeler, April 19, aet. 72	1916
Charles Homer Haskins, May 14, aet. 67	1921
Samuel Wagner, May 17, aet. 94	1885
Frederic E. Ives, May 27, aet. 81	1922
Ambrose Swasey, June 15, aet. 90	1921
Herbert Weir Smyth, July 16, aet. 79	1908
Guglielmo Marconi, July 20, aet. 63	1901
Vernon Kellogg, August 8, aet. 69	1920
A. V. Williams Jackson, August 8, aet. 75	1909
Thomas Garrigue Masaryk, September 14, aet. 87	1936
Ernest Rutherford, October 19, aet. 66	1904
Edward L. Nichols, November 10, aet. 83	1904
Newton Diehl Baker, December 25, aet. 66	1936

TABLE OF TOTALS

	Resident Members	Foreign Members
December 31, 1936	395	30
Elected during 1937	25	4
Deceased during 1937	21	3
December 31, 1937	399	31

X

OBITUARY NOTICES

ALEXANDER CREVER ABBOTT

(1860–1935)

Dr. Alexander C. Abbott was born in Baltimore, Md., on February 26, 1860, and died at Waquoit, Mass., on September 11, 1935. His education was obtained in the Baltimore public schools, the Johns Hopkins University, the University of Maryland, and the Universities of Munich and Berlin. He graduated in medicine from the University of Maryland in 1884. At the Johns Hopkins University Abbott came under the influence of Drs. William H. Welch and William T. Councilman. He was advised to prepare for a career in Public Health and studied with von Pettenkofer in Munich for a year and a half, and with Koch in Berlin for a winter semester. Returning to Baltimore in 1889, he became Sanitarian to the Johns Hopkins Hospital and Assistant in Bacteriology and Hygiene at the Johns Hopkins University. In 1891 he was called to the University of Pennsylvania and in 1896 became Pepper Professor of Hygiene and Director of the Hygienic Laboratory in succession to Dr. John S. Billings.

Dr. Abbott was a pioneer teacher and investigator in bacteriology and hygiene in this country. Beginning with his Baltimore period he became a regular contributor to those sciences. I have collected titles of seventy papers and books by him dealing with these subjects. In 1891, with Dr. Welch, he isolated the diphtheria bacillus for the first time in the United States; papers on the relation of the pseudo- to the true diphtheria bacillus followed, and other papers relating to the spirillum of Asiatic cholera and other water spirals, infection and immunity, and all other aspects of bacteriology, hygiene and preventive medicine.

His text books on the Principles of Bacteriology and the Hygiene of Transmissible Diseases were widely used and exerted a strong influence on the development of these subjects in the medical curriculum.

Dr. Abbott was the recipient of the degrees of D.Sc. and Dr.P.H. He was elected a member of the American Philosophical Society on February 19, 1897. He is survived by his widow, Mrs. Georgina Osler Abbott, and three children, Britton Vaughan, Katharine (Mrs. Archibald Malloch), and Dr. William Osler Abbott.

SIMON FLEXNER.

CARL BARUS

(1856–1935)

Carl Barus, son of Carl Barus, Sr., and Sophia Möllman, was born at Cincinnati, Ohio, February 19, 1856, He died on September 20, 1935, as the result of cerebral hemorrhage.

Educated in the public schools of Cincinnati, Barus was a classmate of William Howard Taft, graduating with honors from Woodward High School in 1874. After graduation he entered the Columbia School of Mines, but at the advice of Professor Rood spent four years at Wurtzburg, Germany, under Professor Kohlrausch, where he received the degree of Ph.D. in 1879. His doctoral dissertation was on the relation between the hardness and magnetization of steel.

Director Clarence King of the United States Geological Survey invited Barus in 1880 to assist in the establishment of a laboratory for the study of problems of physical geology. In this connection he made measurements of the electrical conductivity of ore bodies at the Comstock Lode in Nevada, but soon established himself with Dr. William Hallock at New Haven in a program of high temperature platinum-iridium pyrometry. But their laboratory was soon ordered to be dismantled and the apparatus removed to Washington.

From 1884 to 1892, in quarters at the United States National Museum, Barus carried on a long series of fundamental geophysical investigations. These related to the viscosity of solids, the calibration of pyrometers, the volume-temperature relations of rocks, the thermal conductivity of rocks, and the dependence of their specific heats on temperature. In part of the work he developed high pressure technique for the study of rocks. This pioneering geophysical investigation attracted wide attention, and was especially praised by Lord Kelvin. During this fruitful period Barus also made pioneering researches in colloid chemistry.

Owing to political complications, Barus' Washington laboratory was upset in 1892, and for several years he was at rather loose ends. But in the year 1895, Barus was called to succeed Eli Whitney Blake as Hazard Professor of Physics at Brown University, Providence, Rhode Island. In this connection he remained the rest of his life.

Barus carried on a heavy teaching program, but not to the discontinuance of his research work. His summers were spent in the laboratory. With small means, and building apparatus with his own hands, he made a multitude of researches. For ten years he was principally engaged in the study of coronas in fog chambers, and this led to a somewhat bitter controversy with C. T. R. Wilson. After 1910, Barus was chiefly devoted in his research work to the application of the interferometer to various problems, especially in optics and acoustics.

As a teacher Barus was rather the lecturer, than the intimate, but he lavished great pains on preparation, and was highly conscientious in examining and correcting the students' work. He played a large part in reorganizing the graduate work at Brown, and from 1903 till his retirement in 1926 was Dean of the Graduate Department.

A man of wide scientific reading, Barus was one of the notable collaborators who established the American Physical Society. He received many honors, being at the time of

his election to the National Academy of Sciences in 1892 its youngest member. He received the Rumford medals of the American Academy of Arts and Sciences. Brown and Clark Universities awarded him the degree of LL.D. He was elected a member of the American Philosophical Society on April 3, 1903. During the Great War he was associated with the National Research Council.

Dr. Barus married in 1887 Annie Gertrude Howes of Boston, by whom he had two children, Maxwell Barus and Deborah Barus. Mrs. Barus died in 1928.

Besides his eminent scientific attainments, Barus was well versed in literature and music. He mastered to a creditable degree several musical instruments, and was the composer of about forty instrumental pieces. He had deep interest in current affairs. By all standards he was a man of weight and an ornament to American life.

Charles G. Abbot.

JAMES MONTGOMERY BECK

(1861–1936)

James Montgomery Beck, lawyer, orator, author and statesman, was elected a member of the American Philosophical Society on April 29, 1926, and served as a Councillor of the Society from 1931 to 1934.

He was born in the city of Philadelphia on the 9th day of July, 1861, the son of James Nathan and Margaretta Darling Beck, and he departed this life at his home in Washington on April 12, 1936. He received his early education in the public schools of his native city and was graduated from Moravian College in 1880. He then studied law in the office of Alfred Outerbridge, a noted expert in the law of real property. In 1884 he was admitted to the Bar of Pennsylvania and entered upon the practice of his profession with the late William F. Harrity, under the firm name of Harrity & Beck. From that time until his death

he was diligently engaged in the pursuit of his chosen profession, for even when in public office his duties never took him far from the field of the law.

His first public position was that of Assistant United States Attorney for the Eastern District of Pennsylvania, to which he was appointed in 1888 and in which he remained until 1892. Four years later he was appointed United States Attorney for the same District and left that office in 1900 to become Assistant Attorney General in Washington. Here he served for three years under Presidents McKinley and Roosevelt, when he returned to private practice as a member of the firm of Shearman & Sterling in New York. In 1917 he established the firm of Beck, Crawford & Harris in that city, with himself as its senior partner; but he was called back to public service in 1921 by President Harding, who designated him as Solicitor General. After four years of arduous labor in that exacting office, he tendered his resignation to President Coolidge, who wrote him that:

"In accepting your resignation, I wish to make particular acknowledgment of the faithfulness and distinguished ability with which you have discharged the duties of your high position. Your record as Solicitor General will stand as one of the most notable proofs that the Government is so many times fortunate in being able to enlist the most eminent of talents and highest fidelity, not because of the compensation, but because of the fine sentiments of patriotism which animate those who thus do honor to the public service.

"At a great sacrifice to yourself in everything save only reputation you have given your splendid energy and excellent capacity to the furtherance of the national interests. Contemplating your record of achievement, I have to express the hope that it may be alike an inspiration and a model to many others."

So splendid an encomium might well suffice to mark the end of a career, but a year later, upon the retirement of the sitting member for the First Congressional District of Pennsylvania, Mr. Beck was elected to that position. He was re-elected to the 71st, 72d, and 73d Congresses where he served with distinction. He took a leading part in the

debates on Prohibition and the repeal of the Eighteenth Amendment and the announcement that he was to speak on any question was sufficient to ensure a full attendance of the House.

In September of 1934, however, he announced his intention to relinquish his seat since Congress had become "merely a rubber stamp for the Executive." He expressed his frame of mind in a later statement that "The present might be called the 'Muddle Ages,' for never was there such loose and dangerous thinking."

He began life as a Democrat and was chosen by the Pennsylvania Delegation to make the nominating speech for Robert E. Pattison in the Democratic National Convention of 1896. He found himself unable to follow the party on the Silver question, however, and supported William McKinley in the ensuing campaign. Thereafter he remained with the Republican party, but never surrendered his independence of thought and was at times severely critical of measures which received the party support. He was a partisan of causes rather than of parties or persons and his first devotion was to the Constitution of the United States and the principles of government it embodies. By that he weighed both men and measures and in its defense he was tireless both in speech and in writing.

But whether in or out of Congress, in public or private life, Mr. Beck was and remained a lawyer in the highest sense of that term. During a professional life extending over a half-century he appeared for the Government and for private litigants in many cases of the first importance and in variety and multitude not surpassed perhaps by those of any lawyer of his day. Their very number makes detailed reference for this record impossible. None of his contemporaries at the Bar excelled him in fluency or beauty of diction, in apt literary allusion, or in a thorough knowledge of the subjects to which he addressed himself.

To his love for the law he joined a love of art and literature that came to him both by education and inheritance.

His father was a teacher of music, one sister a noted artist, and another a gifted pianist. He read widely and of Shakespeare and the Bible he was a profound student. Few of his speeches were without an apt and telling quotation from one or the other. One of his notable benefactions was the gift of a bronze statue of John Marshall to Fairmount Park; and he retained until his death his membership in the Art Club of Philadelphia and the Shakespeare Society.

At the outbreak of the World War, he summed up the case for the Allies in a book entitled "The Evidence in the Case," which was widely read and applauded both in this country and abroad, where it was translated and published in other languages. He was a frequent contributor to magazines and periodicals and many of his speeches and occasional addresses, for which he was in great demand, were given wide circulation. His more formal writings included "War and Humanity," "The Reckoning," "The Passing of the New Freedom," "The Constitution of the United States," "The Vanishing Rights of the States," "Our Wonderland of Bureaucracy," and a volume of collected addresses which he entitled "May It Please the Court."

His scholarship was recognized by honorary degrees from Moravian and Muhlenberg Colleges, the University of Pennsylvania, McGill, Lafayette, Franklin & Marshall, and Loyola. His foreign decorations included those of the French Legion of Honor, the Belgian Order of the Crown, and the Polish Order of Polonia Restituta. He was made an honorary bencher of Gray's Inn in London and thereafter enjoyed the rare distinction of being "called," without other requirement, to the English Bar and being heard in argument before the Privy Council.

When the sudden summons came, he went with his distinction won, his honors gathered, and his life's work well done.

JOHN W. DAVIS.

JAMES HENRY BREASTED

(1865–1935)

With the unexpected death of James Henry Breasted on December 2, 1935, American humanistic studies have lost their most distinguished representative. He was great as an Egyptologist, successful as a popularizer, able as an administrator. But greater than these achievements were his contributions to thought as historian of civilization and as humanist in the noblest sense of the term.

Breasted was born in Rockford, Illinois, August 27, 1865; he received his A.B. at North Central College (Naperville) in 1888, his A.M. at Yale in 1891, and his Ph.D. at Berlin in 1894, when past twenty-eight. This lateness in receiving his doctorate was due partly to the necessity of earning his way under which he labored, and partly to the fact that he had made two false starts, once when he studied pharmacy at Chicago, and again when he studied for the ministry for three years, again at Chicago. However, he did not really lose anything by being forced to adapt himself to conditions and to use his hands and his brain in unaccustomed situations. At thirty he had a far wider real education than most of the young German doctors of philology who had received their doctorates five to ten years earlier in life. His education was not only scholastic; it was also characterized by that practical ability which can only be acquired in the school of life.

Breasted's Egyptological career developed brilliantly along conventional academic lines for the first twenty-five years. He rose steadily through the grades of assistant (1894), instructor (1896), assistant professor (1898), associate professor (1902), and professor (1905) at the University of Chicago. Several trips to Egypt were crowned by two long seasons of field-work in 1905–7. Laborious years of research were rewarded in 1905–6 by the publication of six volumes of fundamental importance, the *History of Egypt* (1905) and five volumes of his monumental *An-*

cient Records of Egypt (1906). The 2500 pages of these books were throughout of the first calibre. His *History* not only passed through several reprintings and editions in English; it was also translated into German, French, Russian, and Arabic, twice by distinguished foreign scholars. It was at once hailed as a masterpiece, as the first example of how the history of the recently recovered cultures of the Ancient East should be written. His *Records,* which formed the principal source from which the material for his *History* was drawn, were the first sound and reliable translations of any appreciable body of the Egyptian historical inscriptions. Thanks to his years of study under Erman, followed by years of intimate association with his teacher and the leading members of the school, Breasted had learned the methods of modern philology, which had, by the application of strict methods of linguistic induction and deduction to the newly deciphered texts, mastered the problems of Egyptian grammar and lexicon, so that documents could be confidently translated without resort to clever guessing.

The following years were marked by a stream of publications, several of which were of the greatest importance. By 1919 Breasted was easily the foremost Orientalist of America, and his foreign reputation was growing rapidly. It was in that spring that he gave the William Ellery Hale Lectures on Evolution at the annual meeting of the National Academy of Sciences. These lectures, entitled "The Origins of Civilization," were later published, with lavish illustration, in *The Scientific Monthly,* where they made a deep impression. It became clear that our Western civilization—in fact, all civilization—would remain an unsolved and insoluble enigma until the wealth of archaeological remains from the Near East had been properly studied. To this goal the rest of Breasted's life was to be devoted.

In 1919 Breasted succeeded in interesting Mr. John D. Rockefeller, Jr., in his projects, and the Oriental Institute

of the University of Chicago was founded with the aid of an annual grant of $10,000. This was followed in the next fifteen years by larger and larger grants, until the total grants made by the Rockefeller group and by Mr. Rockefeller personally are said to have reached $13,000,000, a large part of which was set aside to erect the splendid building of the Oriental Institute in Chicago and to endow the organization. The excavations and recording enterprises which Breasted launched with the aid of these princely gifts were almost invariably well selected—in fact they were chosen with a scholarly unselfishness which is as rare as it is admirable. Most of the money went to the maintenance of important but unexciting campaigns of excavation and the recording of rapidly perishing inscriptions and monuments of architecture. Breasted resisted the temptation to make sensational discoveries at the expense of ultimate information. All his undertakings—some twenty in number—were carefully prepared, and all his expedition-directors were trained to do their work according to the latest and most thorough methods of archaeological recording, the so-called Reisner-Fisher system. Of course, there were mistakes in the selection of men for the new tasks, but the wonder is that so few serious errors were made in selecting men who would be equally good as scholars and as men of affairs, who could excavate scientifically and write creditable reports at the same time that they were skilled engineers and diplomats. In retrospect, writing a year and a half after Breasted's death, one can say that the only important mistake in policy was in the lavish scale of expenditure, but Breasted was undoubtedly a victim of his environment. However, the painful necessity of retrenchment which has followed his death could have been largely averted by a more prudent and less optimistic management.

Breasted remained an historian in the fullest and best sense of the term. After his great initial contributions to Egyptian history came his epoch-making *Development of*

Religion and Thought in Ancient Egypt (1912); his brilliant textbook, *Ancient Times* (1916, 1934), which has revolutionized the writing of texts on ancient history, and which was republished in various forms in succeeding years; his remarkable publication of the Dura frescos in *Oriental Forerunners of Byzantine Painting* (1920), his masterly edition and interpretation of the *Edwin Smith Surgical Papyrus* (1930), and finally his chef-d'oeuvre, *The Dawn of Conscience* (1933). It will be many years before we can adequately evaluate the influence on historical and social philosophy which these works are exerting. It is already certain that it is immense, whatever one may think of this or that view-point of the author, such as his invincible meliorism.

Honors came to Breasted by right. Besides receiving many conventional academic honors, he was elected to the National Academy of Sciences and was just about to be made a *membre associé* of the Académie des Inscriptions when he died. His reputation was equally great abroad and at home, among professional scholars, men of letters, and the educated public. His personal influence on the policy of American research foundations was one of the many beneficent aspects of his later career.

Breasted was elected a member of the American Philosophical Society on April 26, 1919, and served as a Vice-president from 1927 to 1932 and as a Councillor from 1923 to 1926. With his death the Society loses a member whom Benjamin Franklin would have been proud to know, a scholar whose career was an ornament to it, and whose memory will long be cherished in its hall of fame.

William F. Albright.

NATHANIEL LORD BRITTON

(1859–1934)

On June 25, 1934, Doctor Britton died at his home in New York City, being then in his seventy-sixth year. He was born at New Dorp, Staten Island, New York, January

15, 1859. Educated at Columbia University, receiving his first degree in mining engineering in 1879, his formal education was completed in 1881 when he received the Ph.D. degree, his thesis being in botany. Immediately following his graduation in 1879 he was appointed Assistant in Geology in Columbia University, becoming successively Instructor in Geology and Botany, Adjunct Professor of Botany, and on his acceptance of the Directorship of the New York Botanical Garden, Professor of Botany Emeritus.

Interested in botany from his early youth, this soon became Britton's chosen field, and to the advancement of botanical science he devoted his full attention and energies throughout his productive life. A voluminous writer, author of very numerous technical papers and standard works on classification, his name is written large in the annals of North and South American botany and that of the West Indies.

Not only a productive scientist, Dr. Britton was an organizer and administrator of more than usual ability. To him the science of botany is greatly indebted for his foresighted and disinterested efforts in establishing the New York Botanical Garden, thus materially assisting in placing botanical research on a firmer basis in the United States. This institution with its great library, its comprehensive reference collections, and its established prestige in the field of botanical science, was essentially Dr. Britton's creation. Starting with the idea in 1888, he saw it take form in 1895. In 1896 he was appointed as its first Director to serve the institution loyally and well until his retirement in June, 1929.

It is one thing to establish one's self as one of the outstanding productive botanists of his time, but quite another thing, at the same time to establish and develop in connection with his active scientific work, one of the most important botanical institutions in the world, and assuredly the New York Botanical Garden ranks among the first three of its kind. Nor were Dr. Britton's energies exhausted by his

scientific work and creative ability as indicated in the establishment, development and endowment of the Garden. He was one of the founders of the Staten Island Institute of Arts and Sciences, and took a very active part in the affairs of the Torrey Botanical Club and of the New York Academy of Sciences. He was the moving spirit in the organization of the scientific survey of Porto Rico and the Virgin Islands. He was elected to membership in the American Philosophical Society on April 21, 1928; and was also a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and a foreign member of the Linnean Society of London.

Dr. Britton was a man of simple habits of life and of modest demeanor. Slight in build, giving one the impression of frailty, he was energetic and active in the extreme. He was married to Elizabeth Gertrude Knight in 1885 and survived her by only a few months; there were no children. Dr. Britton freely used his own personal income to further the work in which he was interested. His generous bequest of one-half of his personal fortune to five institutions and organizations in New York attest his interest in the future progress in fields in which he was particularly interested. His name has been perpetuated in the designation of the reference collections of the New York Botanical Garden as the "Britton Herbarium" and by the establishment of the technical periodical *Brittonia*. No better monument to his memory could be devised than that living one, the New York Botanical Garden, which is a memorial to his creative and executive ability.

ELMER D. MERRILL.

JOHN CADWALADER, JR.

(1874–1934)

John Cadwalader, Jr. was elected a member of the American Philosophical Society on April 24, 1926. He died in Philadelphia on June 10, 1934.

Born at Philadelphia on February 24, 1874, of distinguished ancestry on both sides, his father of the same name was a lawyer and publicist, prominent in the civic and social life of his city, and his grand-father, also of the same name, was a learned and able judge of the United States District Court at Philadelphia, whose decisions, dutifully collected and published by his grandson, are regarded as of great value and authority. Back of these stretch a long line of forbears eminent in the civil and military affairs of the colonial and revolutionary periods. "In either Law, Medicine or Military Service, there has been a Cadwalader in the higher ranks of achievement and reputation in Philadelphia for over 250 years." (Obituary notice Philadelphia *Evening Bulletin*.) On the side of his mother Mary Helen Fisher he was descended from Fishers and Middletons, outstanding families of Philadelphia and South Carolina.

After attending the Classical Institute of Dr. John W. Faries in Philadelphia, he graduated from the University of Pennsylvania in 1893; he then went to Yale and graduated there the following year. Afterwards he pursued his legal education in the office of George Tucker Bisham, Esquire, and at the Law School of the University of Pennsylvania and was admitted to the Philadelphia Bar on June 12, 1897.

On August 22, 1908, he married Margaret daughter of Dr. Henry Denton Nicoll of New York and Anne Bancker Camac of Philadelphia and had four children, John, Anne (Mrs. John H. W. Ingersoll), Henry and George who died an infant.

He was an hereditary Democrat in politics and always took a deep interest in all public and political questions, writing and speaking in favor of good government and sound principles of administration. He was a member of the first Board of Registration Commission for Elections in Philadelphia from 1906 to 1911 and performed the

arduous duties of this position to the satisfaction of the public.

As a lawyer he was thoroughly grounded in the principles of law, his judgment was sound and his advice valuable; his practice was largely in the care of estates and the affairs of corporations with which he was connected. Without indulging in oratorical flights he was a clear and convincing speaker. He was a member of the various Bar Associations.

John Cadwalader was keenly sensible of the responsibility laid upon him as a good citizen, to give service and sacrifice in time, money and effort for the benefit of the community in which he lived. This is shown by the remarkable number of institutions, public or private in their nature, with which he was connected, and to all of which he gave unstintedly his attention and support.

In 1903 as a very young man he became secretary of the Board of the venerable Library Company of Philadelphia, founded by Benjamin Franklin, and afterwards in 1909 a director, and finally president in succession to Mr. Owen Wister in 1932, which position he held until his death. His interest in and work for the Library were unremitting and he enjoyed his association with the interesting and distinguished men who were his colleagues on the Board. His friend and fellow-director the late John S. Newbold wrote of him:—

"Contacts with men like Messrs George Harrison Fisher and Owen Wister, Drs. Horace Howard Furness, Henry C. Chapman and S. Weir Mitchell and Judges Craig Biddle and J. I. Clark Hare, with all of whom he served at one time or another, made him wise and thoughtful in his judgments on matters of policy, and a mine of information as to decisions of such a nature taken in past years. . . . To this formal recognition of the irreparable loss the Library Company suffers in being deprived of his faithful services we must now add the painful tribute of our personal grief. His death removes from our deliberations one for whom we all had the most affectionate sentiments and who commanded our respect and admiration. He preserved for all us the peculiar amenities that

have marked the meetings of the Board for many generations and have rendeded service to the Library a unique experience. A noble and upright gentleman has been taken from us."

He was president of the "Friends of the Library of the University of Pennsylvania" and a member and vice president of the Historical Society of Pennsylvania.

In the City Parks Association of Philadelphia which has been instrumental in procuring many small parks and breathing spaces for the health and happiness of the community, he was most active and useful almost from the time of its inception until his death, and was its treasurer during that time. He was also a member of the Board of the Children's Hospital and at one time its secretary, and a manager of the Board of the Pennsylvania Institution for the Blind and the Chapin Home for the Aged Blind—to all of which he gave the same unsparing service.

In other literary and in many social organizations he was no less active. He was a member of the Shakespeare Society and a founder and member of the Landmark Society for preserving old buildings of historic interest in and near Philadelphia. He was a member of the Wistar Party, that venerable gathering for social enjoyment of gentlemen connected with the American Philosophical Society. He was a member of the English-Speaking Union; of the Philadelphia and University Clubs; of the Alliance Francaise; of the Pennsylvania Society of the War of 1812; and other associations.

In religion he was a devout churchman, a vestryman and rector's warden of old St. Peter's Episcopal Church, Philadelphia, where his ancestors had worshipped for generations. He was also a trustee of Trinity Church, York Harbor, Maine, where he made his summer home. The faith that he professed he practiced in his life, and was enabled by it to meet trials and difficulties and death itself with manly fortitude.

In all these varied activities there stood forth the man, modest, faithful, diligent and helpful. In manner he was

grave and dignified but underneath this serious exterior there bubbled a spring of humor, finding expression from time to time in clever and witty verses, which he read to the delectation and amusement of his close friends.

His lifelong friend the late Bishop Davies, of Western Massachusetts, who knew him very intimately, thus described his character—

"His fidelity to duty, his high integrity, his sound judgment and his calm wisdom, made him of great value. . . . It would be very difficult in a brief notice to record what manner of man John Cadwalader was. I can truly say that I have never known any one with a finer sense of honor, or one who more strongly felt the ever present obligation of duty. He had plenty of fun in him and a keen sense of humor, but there was about him a touch of gravity, such as is characteristic of those to whom the things of the spirit are never far distant. While he was entirely normal, I think that the ordinary physical pleasures of life made little appeal to him. The things that interested him most were family life, his friends, fulfilling duties, doing good, classical literature, and righteous constitutional government. In him there was an extraordinary combination of strength and sweetness, of force and gentleness, of humility and gallantry. He had that indefinable charm that comes in part from true humility—no man ever thought more depreciatingly of himself, in part from purity of character and life, and in part from a great, gallant, loving heart. Two phrases leap to my pen as I think of him, high moral principle, and deep affection. He had a great sympathy for the suffering, and helped them to the extent of his ability; but none but his family and intimate friends could know the depth and tenderness of his nature."

Surely a noble tribute of friend to friend.

J. Rodman Paul.

HERMANN COLLITZ

(1855–1935)

Hermann Collitz was born in Bleckede, Hanover, Germany, on February 4, 1855, and died May 13, 1935. After a regular gymnasium training, and studying philology both

at Göttingen and Berlin, he took his Ph.D. degree at the University of Göttingen in 1878. His studies included Sanskrit and comparative philology but were more particularly in Germanic philology; he also gave considerable attention to the Iranian and the Slavic languages.

For a short time he was instructor at the University of Halle but came to the United States and was appointed Professor of Comparative Philology and German in 1897 at Bryn Mawr College. Here he served until 1907, when he was appointed Professor of Germanic philology at Johns Hopkins University, and emeritus Professor in 1927. The University of Chicago conferred on him the honorary degree of L.H.D. in 1916.

He was a member of numerous learned societies and mingled not only with scholars in Germanic philology but also in the oriental sciences. One of his earliest publications was on the relationship of Greek dialects but his main work was in Germanic philology.

He was the first President of the Linguistic Society of America; President of the Modern Languages Assn. of America; Associate Editor of Modern Language Notes, 1903–13; cooperating editor of the *Journal of English and Germanic Philology,* 1909–29; and of the *American Journal of Philology,* 1920–29. He was elected a member of the American Philosophical Society on April 4, 1902.

In 1930 the Johns Hopkins Press published a volume entitled *Studies in Honor of Hermann Collitz.* His students attested to the fact that he was a pleasant, excellent and persuasive teacher, and this was particularly so in the seminars which he conducted in old high German and old Norse. He was a kind and gentle man devoted to teaching and to his studies, and he built up the best private library of comparative and Germanic linguistics in the United States.

CYRUS ADLER.

WILLIAM DUANE

(1872–1935)

William Duane was born in Philadelphia, February 17, 1872. He was a lineal descendant of Benjamin Franklin and grandson of William John Duane, Secretary of the Treasury under President Jackson. His father, Charles Williams Duane, was rector of St. Andrews Church, West Philadelphia, and Duane received his early education in that city. After graduating from the University of Pennsylvania in 1892 as valedictorian of his class, he spent three years at Harvard, receiving from that university the degrees of A.B. in 1893 and A.M. in 1895.

During his stay at Harvard he also acted as assistant in the Physical Laboratory, and at this time too he carried out, in collaboration with Professor John Trowbridge, his first research—A Measurement of the Velocity of Electric Waves. This was the first measurement of this important physical quantity made in America, and the result obtained differs but little from the value accepted today.

Being awarded the Harvard Tyndall Fellowship he spent the next two years in Germany, studying at Göttingen and Berlin. At the latter university his investigation of the thermo-electromotive force of electrolytes, carried out at the suggestion of Nernst, earned him his doctor's degree in 1897. While in Germany he also published several minor papers.

The next year he returned to the United States, having accepted appointment as Professor of Physics at the University of Colorado, in charge of the Hale Physical Laboratory. Here he remained for eight years, and although much occupied with teaching and administrative duties a number of papers appeared under his name.

In the year 1904–05 he spent his sabbatical leave at the Sorbonne in Paris in the laboratory of M. and Mme. Curie. His interest in the field of radioactivity aroused by this association determined the trend of his future activity. Ac-

cordingly in 1907 he resigned his professorship at Colorado to become Research Assistant in the Curie Radium Laboratory. Here he carried out a number of investigations, among the most important of which may be mentioned the study of the properties and range of alpha particles, the amount of heat generated in radioactive substances (using a very sensitive differential calorimeter devised for the purpose) and the development of a standard method of estimating the amount of a sample of radium. He also was the first to devise a photographic method of registering and counting the number of alpha particles emitted by radium, etc.

Because of his wide experience in the field of radioactivity he was appointed in 1913 Research Fellow of the recently formed Cancer Commission at Harvard, and returned to that institution with the rank of Assistant Professor; and when a few years later the chair of Biophysics was established, Duane was chosen as its first occupant. This position, the first of its kind in America, he held for the rest of his life. He speedily became one of the leading authorities on the therapeutic action of radium and its derivatives, and developed valuable techniques in the handling, measurement and applications of these substances.

But this work, important as it was, did not constitute the sole or even the principal field of Duane's activity. The year of his appointment at Harvard was marked by Laue's discovery of the diffraction of X-rays. This opened a wide field of investigation for which Duane was peculiarly fitted by his previous experience, and he threw himself with enthusiasm into this new line of research. There issued from the Harvard laboratory a succession of papers by Duane and his students which comprised a most important contribution to the knowledge of the nature and properties of X-rays and their bearing upon important problems of atomic structure. Among the most notable of these investigations are the precision measurements of X-ray wave lengths, and the measurement of Planck's constant "h" by

observation of the absorption limit of the general X-ray spectrum. Important work was also carried on in the study of the curative action of X-rays.

Duane's achievements did not lack recognition. In 1922 he was awarded the John Scott Medal and Premium "for his researches in radioactivity and X-rays," and the same year the Leonard Prize of the American Roentgen Ray Society for the medical applications of these agents. In 1923 the National Academy of Sciences honored him by the award of the Comstock Prize for his "Contributions to the Knowledge of the Structure of Matter based on his investigations of X-rays." He received honorary degrees from his alma mater, Pennsylvania, and from the University of Colorado. He was a member of the American Philosophical Society (elected April 23, 1921), the National Academy of Sciences, the National Research Council (chairman of the Division of Physical Sciences in 1912) and many other scientific organizations, including the Société Française de Physique in which he served as councillor. He was selected as chairman of a committee of the National Research Council on X-ray Spectra, and published a valuable report on that subject.

Never of a robust physique, ill health gradually diminished Duane's activity, until he found himself obliged to give up his active duties in 1934, retiring with the title of Professor emeritus. He survived less than one more year, and passed away on March 7, 1935 at his home in Devon, Pa.

Duane was of a retiring disposition, never unduly self-assertive and always willing to give credit to his coworkers. He was of attractive personality and highly esteemed by his colleagues. To quote the words of one of these, "He was quietly courteous, quietly friendly, quietly efficient. He was a lovable man and a worthy descendant of his famous ancestors."

HORACE C. RICHARDS.

CHARLES HARRISON FRAZIER

(1870–1936)

Born in Philadelphia in 1870, graduated from the College Department of the University of Pennsylvania in 1889 and from the Medical School in 1892, Dr. Frazier's whole career was centered in his native city and, with the exception of a part of his early medical training in Berlin, his professional activities were almost wholly confined to the University of Pennsylvania. He was elected a member of the American Philosophical Society on April 14, 1905.

After a probationary period of service in subordinate positions in surgery at the University, Episcopal, and Philadelphia General Hospitals, extending from 1896 to 1901, he was elected Professor of Clinical Surgery in the latter year and thereafter devoted himself to general surgery during the next fifteen years. Subsequently his almost exclusive interest was in the domain of neurosurgery—a field which owes to him some of its brilliant achievements.

Before any reference is made to the major interest of his life-work, that of neurosurgery, it is appropriate to state that his activities—medical and otherwise—have reached out in various directions and that he had keen interests quite apart from his scientific vocation.

During a period of ten years, in addition to his duties as Professor of Clinical Surgery, he was Dean of the Medical School and served in that office with conspicuous ability. This was during a transitional period in American medical education when newer methods and reorganization of objectives were considerations of major importance and his efforts during this time were of the greatest value to the Medical School.

In 1914 he organized the Public Charities Association of Pennsylvania of which he was President from its foundation and had built up a state-wide group that has exercised a most salutary influence on the State's care of handicapped, feeble-minded, insane and penal classes. No mat-

ter how intensely he might be occupied with his immediate professional labors, he never lacked time to devote himself whole-heartedly to this important public work.

From about 1918 his entire surgical interest and life was devoted to the cultivation of neurosurgery and he was, in this country, as well as throughout the world, one of the band of pioneers who established this fruitful branch of surgery as a new field of medical science. His conception of its domain was not that of a surgeon prepared to lend his skill to the neurologist who indicated what might be done, but rather that of the neurosurgeon who combines neurological conceptions with surgical solutions.

It would be idle for one, not technically informed, to attempt an evaluation of the relative merits of the many types of operations and innovations that stand to his credit, but among them it is clear to all that the introduction of a new and simplified procedure for the surgical cure of tic douloureux and his performance of this operation in over 700 cases is an outstanding achievement; that his contributions to the technic and his experience with the operation "chordotomy" led to its recognition by the medical profession; that his extensive experience with pituitary diseases and his introduction of new methods of surgical approach made him a master in this field; and that his other work in brain tumors, nerve anastomosis and a variety of other neurosurgical procedures rounded out a career of extraordinary productiveness.

ALFRED STENGEL.

MILTON JAY GREENMAN

(1866–1937)

When a visitor to the Wistar Institute of Anatomy and Biology entered the office of the Director, he found a genial, alert man, trained in biology, gifted to an unusual degree with mechanical and inventive abilities, with business capacity and good judgment, based on the imagination needed

for an administrator. Thus Dr. Greenman was peculiarly fitted to bear his many responsibilities.

He died on April 7, 1937, in his seventy-first year, failing rapidly in the few weeks before his death—and the Institute thus lost its real scientific founder, to the sorrow of all those associated with him.

In 1892 he graduated in medicine from the University of Pennsylvania, and became at once associated with Dr. Horace Jayne in the biological work at the University. In 1893 Dr. Jayne became Director of the Wistar Institute, and Dr. Greenman was associated with him as Assistant Director. During this period he made a remarkable preparation of the bones of the human skeleton, which now forms an exhibition of these structures quite unequalled in detail and elegance.

On the retirement of Dr. Jayne, in 1905, he was made Director of the Institute. This brought him in direct contact with General Isaac J. Wistar, the Founder of the Institute, and under him he developed his business training. Almost at once he began to consider the problems of the further development of the Institute, which, in the earlier years, had grown more as a museum than as a center for investigation. Pursuing this idea, a group of ten anatomists was called in council, and a plan for the research work drawn up. At the suggestion of the anatomical group, and with the approval of General Wistar, this work was to be in the field of neurology. It began in 1906, and, with the aid of the Advisory Board formed from the original group of advisers, has continued ever since. Following the purpose of making the Institute helpful to the biologists of the country, Dr. Greenman began taking over the responsibility for the publication of a biological journal. The first experiment was made with the Journal of Morphology. Then, gradually, other journals were added until, at the present time, eight such journals have been acquired and are published, together with the bibliographic cards referring to them. This step brought up the prob-

lem of printing, and through the generosity of a member of the Board of Managers, a suitable printing plant was established.

From the beginning of the laboratory work the albino rat had been used as the animal of choice. Large numbers of these had to be kept, and well kept. Here again, through the generosity of a member of the Board, an adequate colony house was built for these animals, not only to furnish those used in the Institute laboratories, but also to permit distribution to other laboratories working with these animals. In 1916–17, Dr. Greenman turned aside for a time, to make two excellent studies on the nervous system of the rat. However, increasing executive duties prevented him from further work in this field. The problem of the welfare of the rat colony was always before him, and to supply fresh food and pure water, a station was required in the country, where these conditions could be met. In 1928 this was accomplished by the establishment of the Effingham B. Morris Biological Farm, near Bristol and about thirty miles from Philadelphia. Through the generosity of Mr. Morris, this station developed rapidly, furnishing buildings not only for laboratories, but for the culture of amphibians and for the rearing of the opossum—a project in which Dr. Greenman had been interested for many years. Thus was added a division of the Institute which called for much administrative care. Here Dr. Greenman had his home.

He acted as Secretary of the Board of Managers, who were his devoted friends and admirers, and it was through them that many activities not warranted by the resources of the Institute were made possible. Dr. Greenman has left behind him an unusual record of achievements directed to the advance of biology and of biologists the world over. His work will be long remembered.

Dr. Greenman was elected a member of the American Philosophical Society on May 19, 1899.

Henry H. Donaldson.

CHARLES HOMER HASKINS

(1870–1937)

On May 14, 1937, Professor Charles H. Haskins, a distinguished member of the American Philosophical Society, died at his home in Cambridge, Massachusetts. Professor Haskins was an inspiring teacher, a great historian, an able administrator and wise counselor. He obtained the A.B. degree at the Johns Hopkins University at the age of 17, and the Ph.D. at 20, and during the course of his life received honorary degrees from many institutions including the Litt.D. from Harvard, Wisconsin, Strassburg, Padua, Manchester, Louvain, and Caen. He was instructor in history at the Johns Hopkins University, 1889–90; Assistant Professor of European History at the University of Wisconsin, 1890–92; Professor of History at Harvard University, 1902 to 1912, when he became Gurney Professor of History and Political Science. In 1928 he was elected to the Henry Charles Lea Professorship of Medieval History, and continued as Emeritus Professor after he retired in 1931. From 1908 to 1924 he was Dean of the Graduate School of Arts and Science.

Professor Haskins was a recognized leader in the historical profession as a scholar and writer of works of highly scientific character, witness his *Normans in European History* (1915), *Norman Institutions* (1918), *The Rise of the Universities* (1923), *Studies in the History of Medieval Science* (1924), *The Renaissance of the 12th Century* (1927), *Studies in Medieval Culture* (1929), and many articles and reviews. He was a great teacher and director of research. Few Departments of History throughout the country have not been enriched directly or indirectly by the students and the influences from his classroom. As secretary of the Committee of Seven on History in the Schools, he was a forceful leader in the interests of history and the humanities, and contributed much toward the program of the social studies for a generation. To his wisdom

and tact as an administrator of academic affairs his memorable Deanship of the Graduate School of Arts and Sciences at Harvard is ample testimony. In conference he rarely spoke without clarifying the issue and contributing substantially to its solution. Possessed of imagination and vision as well as sound judgment, he became a pioneer in matters of organized scholarship. Of especial significance in this connection was his cooperation with his friends, the late Dr. J. Franklin Jameson and Dr. Waldo G. Leland in organizing the American Council of Learned Societies, and serving as Chairman of the Council from 1920–26. Later in life, President Wilson called on him for service in connection with the work of the Paris Peace Conference. As Chief of the Division on Western Europe of the American Commission, he participated actively in the work of the special committees on the Saar Valley, Alsace Lorraine, Belgian and Danish affairs.

He was a Fellow of the Medieval Academy and its President from 1926–27; a Fellow of the American Academy of Arts and Sciences, member of the American Historical Association, of the American Philosophical Society (elected April 23, 1921) and other learned bodies at home and abroad. He was made an officer of the Legion of Honor, and Commander of the Order of the Crown of Belgium. The many honors that came to him were a recognition not only of his scholarship and administrative ability, but equally so of his superb qualities as a friend and counselor. His last years were years of much physical suffering, which he endured with heroism and without complaint. He is survived by his widow, Mrs. C. H. Haskins (Clair Allen), and three children, George Lea, Charles Allen, and Clair Elizabeth.

William E. Lingelbach.

LEWIS MUHLENBERG HAUPT

(1844–1937)

The life of Lewis Muhlenberg Haupt furnishes an illustrious example of service in the arts of peace through training in the U. S. Military Academy followed, as it was, by a short period of active service in the Army after graduation from West Point.

Haupt was born March 21, 1844 in Gettysburg, Pa., and died in Cynwyd, Pa., March 10, 1937. He was the son of General Herman Haupt—a graduate of the U. S. Military Academy, class of 1835—and Ann Cecelia (Keller) Haupt. The family traces back to an ancestor John Sebastian Haupt who had married a French Huguenot Princess in the court of Marie Antoinette and, emigrating from the German Palatinate, reached Philadelphia September 9, 1738, settling finally near Riegelsville in Bucks Co., Pa. General Herman Haupt was a Brigadier General in charge of military railroads during the Civil War. Later he built the Hoosac Tunnel, designed the Horseshoe Curve on the Pennsylvania R. R., was active in railroad development and management, and a writer and inventor withal. From this background of heredity and fine family tradition, the distinguished career of the son, Lewis M. Haupt, follows as a not unnatural outcome. After some earlier training at the Lawrence Scientific School (Harvard) he entered West Point as a cadet September 9, 1863 and graduated June 17, 1867. His record at the Academy was "distinguished" in the West Point sense of the term and won for him an immediate commission as Second Lieutenant in the U. S. Corps of Engineers. From August 9, 1867 to January 31, 1869, he served as Assistant Engineer on the geodetic survey of the Great Lakes, and from February 15 to June 25, 1869, as Engineer on the staff of the Commanding General of the Fifth Military District (Texas) following which he took leave until the following September 20, when he resigned to take up civilian practice.

His first position was as topographer on the survey of Fairmount Park, Philadelphia, followed by similar work in connection with surveys in Craig, Giles and Monroe Counties, Va. This was followed by an appointment as First Assistant Examiner in the U. S. Patent Office which position he held for a short time, resigning to become Assistant Professor of Civil and Dynamical Engineering in the University of Pennsylvania, which position he held from 1872 to 1874, following which he became Professor of Civil Engineering in the Towne Scientific School of that University, assuming also in 1874 the post of Director of the Franklin Institute Drawing School which he held until 1879.

He continued in these various educational activities and responsibilities as his major line of work until 1892 when he retired, following which he continued in consulting and general engineering practice for many years, serving on several important governmental and public commissions. Among such mention may be made of his service as President of the Colombia-Cauca Arbitration Commission in 1897, of his membership on the Nicarauga Canal Commission and also on the Canal Commission of Pennsylvania, 1897–99. He served also as member of a commission appointed in June 1899 to report on a route for a canal across the Isthmus of Panama, resigning from this commission in 1902.

In 1873, and while still carrying on his work in the University of Pennsylvania, he acted as engineer in charge of a hydrographic survey of the Delaware River. Later, in 1894 he served as chief engineer of a survey for a ship canal across New Jersey and again as consulting engineer on the Lake Erie and Ohio River Ship Canal.

Between the years 1894–1902, he served as Construction Engineer for the Reaction Jetty at Arkansas Pass, Texas, when it was taken over by Congress and completed in 1906.

Haupt diversified his work as teacher and engineer in

the field with a very considerable amount of technical writing. He published a work on *Engineering Specifications* in 1878, a text on working drawings in 1881, and a text entitled *The Topographer* in 1884. He was Editor of *The American Engineering Register* in 1885, author of a work entitled *A Move for Better Roads* in 1891, as well as numerous papers dealing for the most part with Hydraulic Structures relating to river control, improvement of channels and the protection of lake and ocean shore lines, as well as papers on transportation and allied engineering topics. Among these note may be made of his American Philosophical Society prize[1] essay of 1887 entitled "Physical Phenomena of Harbor Entrances."

He likewise took out a number of patents growing out of his experiences in the field, and dealing with current deflectors, automatic channel breakwaters, jetties for the protection and reclamation of riparian properties.

Haupt was the recipient of many awards and distinctions in recognition of his outstanding public service; among such, the Magellanic Premium of the American Philosophical Society in 1887, the Elliot Cresson Gold Medal of the Franklin Institute in 1901, Medals of award from the National Export Exposition, 1899, the Paris International Exposition of 1900 and the Louisiana Purchase Exposition of 1904.

He was also the recipient of the degree of A.M. in 1883 from the University of Pennsylvania, the degree of Sc.D. from Muhlenberg College in 1905 and the degree of LL.D. from the Pennsylvania College, Gettysburg, in 1915.

He was an honorary member of the American Philosophical Society (elected May 3, 1878), a Fellow of the American Association for the Advancement of Science, and held membership in the American Society of Civil Engineers, The Franklin Institute and the Engineers Club of Philadelphia, organized in 1877, and of which he was a charter member and its first president.

[1] Magellanic Premium.

As a teacher, Professor Haupt was popular with his students and inspired their respect, admiration and affection. He was keenly interested in their work after graduation and in keeping in touch with them in their future careers. In his work as a teacher he gained and merited the reputation of an able and conscientious educator.

In his professional work, Haupt was untiring. He was always occupied with problems or with work relating to his many interests, in all of which he consistently maintained the highest professional standards. It is related of him, when a member of the Panama Canal Commission, that the members of the Commission generally were well content to follow the custom in tropical countries, of a siesta during the heat of the day with working periods earlier and later. Not so Haupt, who would take these opportunities for excursions by himself for direct personal study of matters bearing on the questions involved in their studies.

In personality Haupt was energetic, keen, with a quick grasp of the essential factors in matters under investigation or study. He was, at the same time, genial, full of human interest and a favorite of those with whom he came in contact. He retained through a long life his youthful spirits with wide and sympathetic interests in friends, family and surroundings. He was, moreover, imbued with deep religious feeling, and was a deacon of St. Stephens Lutheran Church in Philadelphia, and for forty years superintendent of its Sunday School. Outside of his professional work, he was, among other things, keenly interested in music and, for himself and friends, was a pianist of no mean attainments.

The life of Professor Haupt furnishes a fine example of unusual native talents splendidly developed by early training, and generously devoted to education and to public service. His memory and his example form a precious heritage for the generations which follow him.

W. F. Durand.

BARTON COOKE HIRST

(1862–1935)

Dr. Barton Cooke Hirst, a distinguished obstetrician and gynecologist of Philadelphia, was highly esteemed by his associates and colleagues. He enjoyed a large and lucrative practice and for many years was a member of the faculty of the medical department of the University of Pennsylvania in which capacity he occupied the chair of obstetrics and gynecology.

Dr. Hirst was born in Chestnut Hill, July 20, 1862, the son of William Lucas Hirst, a leader of the Philadelphia Bar and Lydia Barton Hirst. His father was the fourth in descent from John Hirst who came to America in 1759 from Mirfield, Yorkshire, England.

Dr. Hirst received his early education in part in Faires Classical Academy. At the end of one year, however, he left the Academy and entered the college department of the University of Pennsylvania with the class of 1882. At the end of the freshman year he entered the medical department and graduated with the class of 1883. After serving as an intern in the University Hospital for one year, he left for Europe and for eighteen months he was deeply interested in the study of obstetrics in Heidelberg, Berlin, Vienna and Munich. In the hospital of this latter city he became an intern with teaching duties. Here it was that he acquired by observation and practical experience a knowledge which in the years to come enabled him to become one of the first obstetricians of his age. It was here also that the necessity for the development of a practical school of obstetrics entered his mind—a school in which each medical student should be trained prior to his graduation in medicine. On returning to Philadelphia he became an assistant to Professor R. A. F. Penrose in the University. At that time practical instruction for the training of medical students for obstetric work was practically unknown and even the hospital was lacking in beds for maternity service.

In the course of a year or more Dr. Hirst was elected to the chair of obstetrics made vacant by the retirement of Professor Penrose. Very shortly thereafter Dr. Hirst, moved by his cherished ambition, succeeded in developing a maternity department in connection with the hospital and in addition a home maternity service conducted by senior students under the observation and assistance of trained obstetricians. Both of these methods of instruction have grown with the years until they have become recognized as an integral part of medical education. For this great advance in medical education the profession is largely indebted to Dr. Hirst.

With the passing of the years Dr. Hirst's attention was attracted to the pelvis, its form, its variations in size and the functions which its individual structures played in the act of parturition. So convinced was he of their importance that he contributed materially to the science of gynecology.

By reason of his achievements in the science of obstetrics and gynecology, Professor Hirst was honored by many learned medical associations at home and abroad. He was chosen chairman of the Section on Obstetrics, Gynecology and Abdominal Surgery of the American Medical Association. He was made a corresponding member of the Society of Obstetricians and Gynecologists of the Paris Society of Foreign Surgeons, an honorary member of the Obstetrical Society of Edinburgh, an honorary member of the Belgian Society of Obstetrics and Gynecology. He was a member of the Obstetrical Society of Philadelphia, to the Presidency of which he was elected on three occasions; he was also a member of the College of Physicians and was elected to the American Philosophical Society on December 15, 1899.

Professor Hirst was a prolific writer and among his contributions to medical literature may be mentioned *The American System of Obstetrics*, edited by him, his *Atlas of Gynecology, Human Monstrosities* of which he was co-ed-

itor with Professor George M. Piersol and his own two volumes, one on *Obstetrics*, the other on *Gynecology*.

He was elected to the Chair of Obstetrics in the University of Pennsylvania in 1889 and occupied it for thirty-eight years. Retiring for age in 1927 he was given the honorary degree of Doctor of Science and was made Emeritus Professor of Obstetrics.

Dr. Hirst married Elizabeth Haskins du Puy Graham of Philadelphia in 1890. A daughter, Mrs. Elizabeth du Puy Graham Lippincott, and two sons, Barton Jr., and Dr. John Cooke Hirst survive him. A third son, Thomas, died in the World War.

He died at his home in Philadelphia on September 2, 1935, from acute dilatation of the heart.

ALBERT P. BRUBAKER.

FREDERIC EUGENE IVES [1]

(1856–1937)

Frederic Eugene Ives, inventor, investigator, scientist, died on May 27, 1937, at his home in Philadelphia. His achievements were many and important, and were all the more remarkable in that he was essentially a self-educated man; he never attended a formal school after he was twelve years of age.

He was born on February 17, 1856, on a farm near Litchfield, Connecticut. His parents were descendants of the early New England settlers. From his father, Hubert Leverit Ives, a hard-working farmer, he inherited a capacity for concentrated application to which may be credited much of his success; from his mother, Ellen Amelia Beach, he derived a love of the artistic which doubtless stimulated his interest in the field of investigation which he chose for his own.

When he was twelve his father died, which interrupted his schooling and forced him to earn his living. After a

[1] Reprinted from *Science*, October 15, 1937, 86, 2233, 340–341.

brief and unsatisfactory experience as clerk in a country store he became apprentice in the printing office of the Litchfield *Enquirer*. The years spent in this newspaper office formed an excellent substitute for the schooling which he had missed and also gave him valuable training in preparation for his future career.

At this time he became interested in picture making both by the process of wood engraving and the art of photography. The limitations of the former method impressed him with the advantage of the photographic process and led him later to attack the problem of photo-engraving. His spare time, which was little, was spent in experiments in photography, his first camera being made, as he tells us, of a cigar box and a spectacle lens.

After completing his apprenticeship he worked for some time as a printer but soon turned to photography as his vocation. This led to his employment in 1874 by Cornell University, where he remained for four years in charge of the photographic laboratory. His contact with this institution doubtless stimulated his interest in the scientific aspect of his work and inspired his inventive genius. It is to these years that we refer his first notable achievement, the invention and the development of the first commercially successful half-tone process of photo-engraving.

The success of this invention, which has revolutionized the art of illustration, led him to connect himself with a printing establishment in Philadelphia in which he worked as a photo-engraver, maintaining at his home a private laboratory where he busied himself incessantly in numerous investigations which many times led to important inventions. Here in 1886 he developed the cross-line screen method of half-tone reproduction which is now universally used, superseding his earlier process. Here also he carried out the extensive experiments in color photography and color reproduction by the trichromatic process. His brilliant success in the solution of this problem by the invention in 1892 of the photochromoscope, or, as he called it,

Kromskop, won for him recognition in the scientific world. This was perhaps his greatest achievement, and one in which he continued to work throughout his life, developing improved methods and new applications; as for instance to the moving picture industry, where the colored films shown at the present time are largely due to his inventions.

In addition to these accomplishments the work of Ives bore fruit in many other ways. Numerous devices, mostly in the field of optics, are due to his ingenuity. Among these may be mentioned an improvement in the binocular microscope, the parallax stereogram, diffraction grating replicas, a diffraction photochromoscope and a trichromatic colorimeter. Over seventy patents were taken out for his inventions, and as many more could easily have been obtained.

With exception of a few years in London and in New York spent in exploiting his inventions, the remainder of his life was passed in Philadelphia. He was an active member of The Franklin Institute for over fifty years and frequently reported his investigations before that body. He was also a member of the American Philosophical Society, to which he was elected on April 22, 1922, and of many other scientific organizations.

While a number of medals were awarded him for his inventions and while his work was appreciated by those who were best able to judge, still it did not receive in his lifetime the recognition which it deserved. After his death the city in which he had dwelt so long made partial amends. The 22d of July, 1937, was designated officially as "Ives Day," and a public tribute was paid to him at The Franklin Institute at which the pioneer nature of his inventions on half-tone and color photo-engraving was appropriately commemorated. On this occasion the son of the inventor, Herbert E. Ives, of the Bell Telephone Laboratories, presented to the institute the original patent in color photography and other memorials of his father.

The chief characteristic of Ives's method of work is that

it was firmly based on true scientific principles and not upon a haphazard seeking for results. His cross-line half-tone process was worked out with a thorough understanding of the optical principles involved in lens aperture, line spacing, etc. Again his work in color reproduction shows a complete grasp of the trichromatic theory of Young, Helmholtz and Maxwell which was completely lacking with most of the other experimenters in this field; with the result that all subsequent work in color printing and color photography is based upon his fundamental investigations. Moreover, he possessed the skill of utilizing these scientific principles to obtain practical results with the maximum of simplicity. In consequence, much of his work has a completeness and one might say an artistic quality which left little room for improvement by his successors.

Unfortunately he did not reap the proper material reward for his ingenuity. Some of his inventions (notably his half-tone process) were unprotected by patents. Others were the subject of costly litigation or were infringed upon by his competitors. Fortunately for himself and for the world he was a type of man who—to use his own words—"will pursue his course through any amount of poverty and hardship and indifference, thinking much more about his work than about any material reward which it may bring." And he closes his autobiography with the words "I am thankful that I could find contentment in the pleasure of accomplishment."

Horace C. Richards.

A. V. WILLIAMS JACKSON

(1862–1937)

Abraham Valentine Williams Jackson was born in New York City on February 9, 1862, and died on August 8, 1937. He had his education at Columbia University, receiving his A.B. in 1883, his Ph.D. in 1886 and later an honorary degree of Doctor of Laws.

He studied at the University of Halle from 1887 to 1889. He began teaching at Columbia in 1886 where he was assistant in English and instructor in Zend and also in Anglo-Saxon and Indo-Iranian languages.

By 1891 he began to specialize in Indo-Iranian. He travelled for research in India in 1911, and in Persia and Central Asia in 1903, 1907 and 1910. In 1918 he revisited India and Persia as a member of the American Persian Relief Commission. He was decorated by the Shah and received an honorary degree from Dar ul-Funun University at Teheran in 1918. In 1926 he made a journey of research in India, Afghanistan, Baluchistan and eastern Persia.

His was a very full teaching career, covering fifty years, with the interruptions mentioned, on the campus of Columbia University.

As far as I know no bibliography of his works has been published but from an examination of the index in the catalogue of the Library of Congress and in other places I find at least thirty-eight titles. He was entirely consistent in his studies, never turning to the right or to the left. It was always Indo-Iranian subjects. There can be alluded to here only a few of his publications, and those of a more general nature.

One of his important works was *Zoroaster, The Prophet of Ancient Iran*, 1899, Macmillan. In 1906 he published *Persia Past and Present*. The Grolier Society issued his *History of India* in 1906–07. In 1911 he published *From Constantinople to the Home of Omar Khayyam, Travels in Trans-Caucasia and Northern Persia for Historical and Literary Research*, a work with over two hundred illustrations. In 1920 he published *Early Persian Poetry from the Beginnings Down to the Time of Firdausi*.

He contributed magazine articles, always on his favorite subject, to the old *Forum*, *Nation*, *Outlook*, *Independent*, *Century* and many articles in the *Journal of the American Oriental Society*.

He held numerous offices in the American Oriental Society to whose work he was very much devoted. He served for a long time as secretary and for a year as president.

Jackson was elected a member of the American Philosophical Society on April 24, 1909, and as long as his health was good was a regular attendant at its annual meetings, and occasionally read papers.

He was a gentleman who belonged to what would be called the old school, both in his manner and in his attire. He was a handsome man; he never gave up the tall, stiff collar of a couple of decades ago. He always affected the ascot scarf and certainly when in academic circles never permitted himself the informal dress which has become almost, though not quite, universal. He did not customarily use the telephone but wrote letters or notes and no matter how much he was engaged in research work always welcomed a friend or even a casual visitor to his study.

He is a distinct loss to the American Philosophical Society, to Columbia University, to his own department of learning and to cultivated human society.

CYRUS ADLER.

LEROY WILEY McCAY

(1857–1937)

We record with sorrow the death on April 13, 1937, of Leroy Wiley McCay, Emeritus Professor of Chemistry, Princeton University, Member of the American Philosophical Society for forty years, elected to membership on December 17, 1897.

Born at Rome, Georgia, on August 9, 1857, he spent his early years on one of his family's plantations in Alabama, and, after the Civil War, was sent to school in the North. From 1873 to 1875 he continued his schooling in Dresden, Germany, and there became so fond of music that he returned to Baltimore filled with the idea of becoming a professional musician. This idea was frowned upon by his

father, a disciplinarian of strong Scottish heredity, and the boy was sent to Princeton College in 1875. Here he pursued a classical course, which he praised to the end of his days, and graduated A.B. in 1878 with distinction, delivering the modern language oration of that year.

The next four years he spent again in Germany, first at Freiberg in Saxony where he came under the influence of the famous chemist Winkler, and later at Heidelberg under Bunsen. Here he acquired his training in and love for analysis.

He graduated A.M. Princeton in 1881 and Sc.D. in 1883, was appointed to his first teaching position at Princeton in the same year, and became Professor of Inorganic Chemistry in 1892. His active service to Princeton as a teacher and investigator thus extended over forty-five years, 1883 to 1928 when he retired; his association with Princeton, first as a student and last as a professor emeritus covered a period of nearly 60 years.

Until the final years, when his health failed, he was indefatigably active in investigative work, chiefly in the fields of inorganic and analytical chemistry. In these fields he was universally recognized as an outstanding worker, both at home and abroad. The chemistry of arsenic, antimony, tin, platinum, molybdenum and tungsten are only a few of the fields which he enriched by his contributions. Each of his more than fifty articles, published in American, English and German scientific journals, demanded hundreds of hours of careful work in the laboratory. From this exacting work he found relaxation in literature, both classical and modern, and in music. As a student he had founded and conducted a student orchestra, and, as a faculty member, a faculty orchestra. He was appreciative of art as well as of science. Thus he embodied ideal qualities for membership in a society for promoting useful knowledge. His analytical work made him an exact man, his extensive reading made him what Bacon called a full man,

while his extraordinary facility in conversation made him a ready man.

From 1914 to 1922 he served as chairman of the Department of Chemistry at Princeton. In this capacity he kept the affection of students and colleagues alike by his constant accessibility. During this period his brilliant oratory was often requisitioned by the university in placing before the alumni and others the crying need for a new chemical laboratory, a project which has since been realized and in whose planning he took an important part. Most appropriately, he became the first incumbent of a new chair of chemistry at Princeton endowed in memory of his old friend, Princeton alumnus and trustee, Russell Wellman Moore.

Among his assets as a teacher were a resonant voice, a faculty for visualization and dramatization, boundless enthusiasm, a philosophy of optimism and a strong sense of humor. He endeared himself to those who knew him because, as a man, he was modest, loyal, and full of friendliness.

He did honor to Princeton, to science and to life while he lived; now that he is dead, we hold him in honorable memory.

George A. Hulett,
Hugh S. Taylor.

GUGLIELMO MARCONI

(1874–1937)

In the past it has been the rule that the discoveries of one generation must await the advent of another before their fruit is yielded; and, it is seldom that we find a pioneer who, in his own active lifetime, has seen the birth of his discoveries and also their growth to full maturity. The death of the Marchese Marconi comes at the epoch of his greatest triumph, at the time when radio transmission has developed to a perfection in which man could be content

with it as a finality in perfection, and yet in which it has been so recently invigorated with new richness and power, that in its maturity it yet carries the bloom of youth upon it.

It frequently happens that inventors are endowed with enthusiasm and courage out of proportion to their formal knowledge of the structure of the fields in which their inventions lie; and, for this reason it often happens that, the invention having been completed, its further development passes into the hands of others more fitted by their training to nurture it to maturity. It is characteristic of real genius in an inventor that he should possess that intuitive grasp of the essential elements which can surmount the formalities of routine knowledge and pierce the veil of the unknown in the spots which are vital. It is characteristic of such a man that he is able to keep in touch with the growth and development of his invention and to return again from time to time as a pioneer in the course of that growth. Such powers have characterized the Marchese Marconi.

Only those whose scientific history goes back to the early days of experimentation in wireless and to the use of those uncertain devices—induction coils, iron filing coherers, and the like, which tormented the souls of the experimenters of the day—can realize the courage which, at that time, was necessary to visualize a development for wireless telegraphy which could ever take it beyond a phenomenon of purely academic interest. It is, moreover, characteristic of that courage of the inventor that at a time when, according to the normal interpretations of phenomena, it would have seemed impossible to transmit radio waves around the spherical earth, Marconi, nevertheless, went ahead with his experiments, even though this uncertain adventure entailed great cost and labor which might reasonably have been expected to court failure in any attempt to transmit wireless waves across the Atlantic Ocean.

Guglielmo Marconi was born on April 25, 1874, in Bologna. His father was an Italian country gentleman, and

his mother was the daughter of Mr. Andrew Jamieson, of Daphne Castle, County Wexford, Ireland. He received his early education from private tutors, except for his attendance at the lectures of Professor Rosa. His interest in Hertzian waves and in the possibilities of wireless transmission began in his student days. His first experiments were made before he was twenty-one years of age; and these experiments were performed with an induction coil, a Righi oscillator, and a Bramley coherer, improved according to his own design. His sending and receiving antennae were metal cylinders mounted on the top of poles. In 1895 he continued his experiments, increasing the distance of transmission, mainly by increase of the heights of the antennae, until he reached a distance of a mile and a half. In 1896 Marconi went to England and took out a patent for his invention. Through the facilities afforded by the Engineer-in-Chief of the British Post Office, he continued his experiments, increased their effectiveness, and gained the interest of the public by transmitting signals over a distance of eight miles on Salisbury Plain. A year later, "The Wireless Telegraph and Signal Company, Ltd." was formed to take over Marconi's patents. The name of this company was subsequently changed to "Marconi's Wireless Telegraph Company, Ltd." His experiments continued and, in 1898, a transmitting apparatus was installed at Ballycastle and Kathlin Island in the north of Ireland. In 1898, Marconi introduced some improvements which encouraged him to attempt communication across the English Channel. His effort was crowned with success when signals were transmitted between Chelmsford, England, and Wimereux, France, over a distance of 85 miles across the Channel.

The success which had been obtained in increasing the distance of transmission gave Marconi further confidence to attempt the spectacular feat of bridging the Atlantic Ocean. Undaunted by preliminary discouragement, he finally, on December 12, 1901, heard successfully the famous

three clicks which established transmission by electromagnectic waves over a distance of 1800 miles between England and Newfoundland. From that time onward, the development of wireless was a matter of continual improvement in design, taking advantage of new developments in various appliances as they appeared. The arrival of the thermionic vacuum tube upon the scene of action increased enormously the potentialities of wireless transmission, and, indeed, revolutionized much of the original form of equipment.

Until near the end of the war, it was generally assumed that long distance transmission could only be realized by the use of long electromagnetic waves. In 1916, however, Marconi began his experiments on short-wave transmission, and again became a pioneer in a new field of activity which has extended enormously the potentialities and effectiveness of radio waves for long distances.

Marconi was twice married, his first wife being the Honorable Beatrice O'Brien, daughter of Lord Inchiquin. In 1927 he married the Countess Bezzi-Scali of Rome. His family comprises two daughters and one son by his first wife, and one daughter by his second. He received many honors and distinctions throughout his life, among them being the Nobel Prize for physics, which he was awarded in 1909. He was decorated by the Tzar of Russia with the Order of St. Anne. He was Commander of the Order of St. Maurice and St. Lazarus, and received the Grand Cross of the Order of the Crown of Italy, as well as the Grand Cross Order of Alphonso XII. In 1903 he received the freedom of the City of Rome. He was elected a foreign member of the American Philosophical Society on February 15, 1901.

A tireless worker, he maintained his scientific enthusiasm and activity to the end of his life. He died on July 20, 1937, at the height of his fame. There will be many monuments to his memory, but none greater than the monu-

ment of his own work, which will live for ever, or as long as man shall have tongue to utter his thoughts to the world.

W. F. G. Swann.

WILLIAM PITT MASON

(1853–1937)

For many years at the close of the nineteenth and beginning of the twentieth centuries, William Pitt Mason was the leading authority in the United States on the methods of water analysis and on the standards to be used in deciding on the purity and suitability for use of potable waters.

He was the son of James and Emma (Wheatly) Mason and was born in New York City, October 12, 1853. He graduated at Rensselaer Polytechnic Institute with the degree of C.E. in 1874. After another year of study he was appointed assistant in chemistry in 1875. He received the degree of B.S. in 1877. While still an assistant at the Institute he studied medicine at Union College and graduated with the degree of M.D. in 1881. He furnishes an excellent illustration of a man who gained an advantage from combining teaching with work for a higher degree. He was recognized as an unusually effective teacher and was much beloved by his students. He held the rank of Assistant Professor of Analytical Chemistry at Rensselaer Polytechnic Institute from 1882 to 1893 and was given the full Professorship of Chemistry in 1893. He held this till he retired as emeritus Professor in 1931 at the age of seventy-eight. Besides his work as a teacher Professor Mason contributed very much to the development of the institute as a whole. There was no phase of its activities with which he was not concerned.

He was largely responsible for the development of the library. This owes to him its collection on water analysis and its reports on test cases. He secured the files of many American and foreign journals in the field of chemistry and

a complete set of chemical abstracts. More notable, however, is the fact that he recognized the place of the library in every phase of research and instruction and supported every request for books and periodicals. Even after his retirement he continued the gifts to which he had been accustomed.

Socially, in the city of Troy, Professor Mason occupied a large place. His reputation as a wit and as a raconteur became one of the traditions of the city. He served on many important Boards and in many organizations devoted to the public welfare. No citizen has been more generally popular.

Professor Mason was often called upon to report as an expert on public water supplies and also as a toxicologist. He once said to me that in legal cases experts should be employed by the court and questioned by the judge instead of by the prosecuting attorney. He cited one instance when the prosecuting attorney would not permit him to state facts which he had discovered in his study of the case because they might have been construed as in favor of the defendant. I am not sure that the result of the trial caused an injustice in that case.

When bacteriological determinations became necessary for deciding the character of a potable water he went to Paris and studied bacteriology at the Pasteur Institute.

He published his book on *Water Supply* in 1896. The fourth edition appeared in 1916. His book on *Examination of Water* was published in 1899. The sixth edition was issued in 1931. Professor A. M. Bussell assisted in the revision for this edition.

Professor Mason was chairman of the Chemical Section of the American Association for the Advancement of Science in 1897. He was President of the American Water Works Association in 1909. He was a member of the American Chemical Society, American Philosophical Society (elected February 28, 1896), American Water Works Association, New England Water Works Association,

American Public Health Association, American Society of Civil Engineers, American Institute of Construction Engineers, Franklin Institute, Royal Sanitary Institute (Great Britain), Washington Academy of Sciences and the American Institute of Chemical Engineers. He was an honorary member of the Association des Ingenieurs Architects et Hygienistes Municipaux de France.

He married Emile E. Harding of Philadelphia in 1886. Their children were George Harding (dec.) and William Pitt Mason, Jr. He married Margaret D. Betts in 1908.

Professor Mason died January 26, 1937.

William A. Noyes.

ARTHUR AMOS NOYES

(1866–1936)

Dr. Arthur Amos Noyes graduated from the Massachusetts Institute of Technology in 1886 in chemistry, took his doctorate under Oswalt in Leipzig in physical chemistry in 1890, and for the next twenty years after his return to M. I. T. in 1892 was the most potent influence in the development of physical chemistry in that institution and through it in the United States.

In 1913, through his intimacy with George E. Hale, a trustee of the then Throop College of Technology, he came to that institution on appointment for the winter quarter, only, and was instrumental in getting Charles W. and Peter G. Gates to provide $70,000 for the erection of the Gates Chemical Laboratory, the first building after Throop Hall to rise on the campus of "The Institute." Upon completion of this building in 1917 it began to become, under Dr. Noyes' leadership, an active center of chemical productivity. In 1919, after the cessation of his war service, Dr. Noyes resigned his professorship at the Massachusetts Institute of Technology and devoted his whole energies to the upbuilding of the new institution, which from 1920 began to be known as the California Institute of Technology. From

that time until his death in 1936 Dr. Noyes was the most constructive influence in the development of the educational policies of the California Institute and in shaping its ideals and its program.

The effect of his work had a very wide sweep. There has been no more significant figure in the development of chemistry in the United States than Arthur A. Noyes. The imprint which he left on both of the two institutions with which he spent his life, the Massachusetts Institute of Technology and the California Institute of Technology, has been far-reaching and lasting. These two institutions as they exist today are in a very real sense the living memorial of the life, character, and ideals of Dr. Noyes. His extraordinary soundness of judgment, unselfish devotion to science, sweetness of character, thoroughness of analysis, and objectivity of approach, made him an unmatched leader in every undertaking to which he devoted his energies.

He was elected a member of the American Philosophical Society on April 22, 1911.

ROBERT A. MILLIKAN.

FREDERICK LESLIE RANSOME

(1868–1935)

Frederick Leslie Ransome, eminent geologist, a great investigator of ore deposits and other branches of economic geology, passed away at his home in Pasadena on October 6, 1935. He was born in Greenwich, England, December 8, 1868, of an old family, all of them members of the Society of the Friends. The end came unexpectedly; many of his associates had met him not long before, apparently in good health.

In 1870 his father brought him to San Francisco. Later on he entered the University at Berkeley, where he received his Ph.D. degree in 1896. He was appointed to the U. S. Geological Survey in 1897 where he remained as Assistant Geologist, Geologist, and Geologist in Charge until 1924.

From 1924 to 1927 he was Professor of Economic Geology at the University of Arizona; then, Professor of Economic Geology at the California Institute of Technology, Pasadena, from 1927 to his death. His last years were mainly devoted to a study of reservoirs and high dams, particularly in regard to the Boulder (Hoover) Dam on the Colorado River.

Ransome was a member of many geological and technical societies, among them the National Academy of Sciences, Geological Society of America, Society of Economic Geologists and the American Institute of Mining and Metallurgical Engineers. He was a foreign correspondent of the Belgian Geological Society and of the Geological Society of London. He was elected a member of the American Philosophical Society on April 19, 1935. For many years he was associate editor of the *American Journal of Science* and of *Economic Geology*.

Ransome's geological work covers four decades, from 1893 to 1934; he published about one hundred papers and books, the latter mainly appearing as professional papers of the U. S. Geological Survey. They embrace a wide scope of petrography, mineralogy and economical geology. Among the latter are to be noted descriptions of the Globe, Bisbee, Ray and Miami mining districts in Arizona, Cripple Creek in Colorado, Coeur d'Alene, Idaho, Goldfield, Nevada and many others, all dealing with deposits of copper, gold, silver, lead and zinc. He also wrote many short papers on mineralogy, petrography, geological structure and engineering geology. In all, more than enough to occupy the life work of two men.

Ransome's work in geology entitles him to a place as one of our most eminent economic geologists whose work will be long remembered. All of his publications are distinguished by most excellent English; in fact he was a master of scientific writing. He was an exact observer more interested in the exact recording than in advancing new theories except on the most solid foundations.

His nature was essentially reserved but his friends—and they were many—were continually amazed at his interest in music, poetry and the arts. They had hoped that he would have been permitted to remain in this life for many more years, but their consolation is that he built a firm foundation on which geology can safely erect its future structures.

In 1899 Ransome married Amy Cordova Rock, daughter of Miles Rock, Astronomer.

WALDEMAR LINDGREN.

EDWIN WILBUR RICE, JR.

(1862–1935)

Edwin Wilbur Rice, Jr., who was born at La Crosse, Wisconsin, May 6, 1862, moved to Philadelphia when very young. Even as a boy his record for brilliant technical scholarship attracted the admiration of Elihu Thomson, then a young teacher in Boys' Central High School. Under the inspiration of Professor Thomson, the lad's phenomenal aptitude for mechanical and electrical problems rapidly developed, and he was selected by his master as associate in the newly formed American Electric Company. At the age of twenty-two, the young pioneer was made plant superintendent of the Thomson-Houston Company. On its merger with the General Electric Company, he was appointed technical director and, in 1896, was elected vice president in charge of manufacturing and engineering. In 1913 he succeeded Charles A. Coffin as president and served the company in this capacity for nine years. As honorary chairman of the board, he continued his active interest in electrical design and manufacture until his death, November 25, 1935.

While Dr. Rice was an inventor of note—his patents number more than one hundred—he was preëminently an engineer. As one of the outstanding pioneers of the whole electrical industry, he brought to this new field a skill in

design and a genius for application that played a brilliant part in the spectacular advance of technical knowledge and electrical service. He was the first to promote the General Electric Research Laboratory, now an institution of international authority. These faculties were accompanied by integrity of character, fineness of appreciation, and business judgment, together with a gift of vision that was almost prophetic and that contributed much to the advance and prestige of the company whose trusted counsellor he was for so many years.

Dr. Rice held honorary degrees from Harvard and Union Universities, the University of Pennsylvania, and Rensselaer Polytechnic Institute. He was a Chevalier of the Legion of Honor and was decorated by the Emperor of Japan with the Third Order of the Rising Sun. He was also recipient, from the American Institute of Electrical Engineers, of the Edison Medal "For his contributions to the development of electrical systems and his encouragement of scientific research in industry." He became a member of the American Philosophical Society on April 21, 1928.

Not the least of his gifts was his ability to inspire young men to their best endeavors; through their accomplishments the electrical industry still feels the stimulating influence that is an abiding heritage from one of its great founders and leaders.

Willis R. Whitney.

PALMER CHAMBERLAINE RICKETTS

(1856–1934)

Dr. Palmer Chamberlaine Ricketts, who served for more than thirty years as president of Rensselaer Polytechnic Institute, was at his death in December, 1934, one of the four great figures in the history of the oldest scientific and engineering school in the country.

He was a member of the faculty of the institute for

fifty-nine years, or from his graduation as a civil engineer in 1875. His progress as an educator brought him from the post of instructor to assistant professor from 1882 to 1884, Professor of Technical Mechanics in 1884, director of Rensselaer Polytechnic Institute from 1892 to 1901 and president and director until his death.

When the main buildings of Rensselaer Polytechnic Institute were destroyed by fire in 1904, it was largely through his personal efforts that they were rebuilt and enlarged so that the enrollment increased from less than 250 to more than 1,500 in two decades thereafter.

The institution under him developed to its present high standing, with more than a score of buildings and laboratories, including gymnasium and dormitories, located on a twenty-acre campus and valued at more than $10,000,000.

Several months before his death the city of Troy, N. Y., where Rensselaer Polytechnic Institute is situated, designated Dr. Ricketts as its most distinguished citizen, and in a public ceremony he was presented a plaque denoting the honor.

Upon Dr. Ricketts' death, Dr. Ray Palmer Baker, assistant director of the Institute, said:

> "President Ricketts was one of the four great figures in the history of Rensselaer Polytechnic Institute, ranking in distinction and influence with Stephen Van Rensselaer, its founder, Amos Eaton, its first academic head, and Benjamin Franklin Greene, who first reorganized the curricula in 1850."

Dr. Ricketts was born in Elkton, Md., and attended a private school at Princeton, N. J. He was graduated from Rensselaer Polytechnic Institute in 1875. In 1905, Stevens Institute of Technology conferred on him the honorary degree of E.D., and in 1911 he was given an honorary LL.D. by New York University.

One of his latest projects was the establishment of an aeronautical division, with the construction of a $500,000 building housing an aeronautical laboratory.

Dr. Ricketts was married on November 12, 1902, to Vjera Renshaw of Baltimore. There were no children.

He was a beloved figure on the campus, where everyone referred to him as "P. C." He was always accompanied by his wife at all functions, and they were a familiar sight driving to the Institute daily, always in an open car with top down, even during the severest weather. Incidentally, Mrs. Ricketts had been ill, confined to Albany Hospital, during the Director's sickness, but had recovered and gone to Baltimore to be with him.

He was an honorary member of the American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers, the Institution of Civil Engineers of Great Britain, the American Philosophical Society (elected April 25, 1914), a Fellow of the American Association for the Advancement of Science, a commander of the Legion of Honor of France, commander of the Order of the Crown of Italy, trustee of the Troy Public Library, the Albany Medical College, the Albany Academy and the Dudley Observatory; member of the board of directors of Samaritan Hospital and National City Bank of Troy; member of Theta Xi Fraternity and the Society of Sigma Xi, the Union Club of New York, Schuyler Meadows Club, Albany; Troy Country Club and the Troy Club.

Dr. William Otis Hotchkiss, noted educator, geologist and engineer, was called from the presidency of the Michigan College of Mining and Technology at Houghton to succeed Dr. Ricketts as president of Rensselaer Polytechnic Institute.

Floyd Tifft.

ELIHU ROOT

(1845–1937)

The American Philosophical Society for Promoting Useful Knowledge—of which Elihu Root was for thirty-one years a member (elected April 18, 1906)—has had a

long and honorable career from the date of its foundation in 1727 by Benjamin Franklin (then a youngster of twenty-one) and some of his friends and associates. The founder of the society must be numbered among that small group of our greatest Americans, a group to which Elihu Root also belongs. A word or two concerning certain aspects of greatness in the one may help us to understand the greatness of the other.

Nobody would question that Franklin was both a philosopher and a scientist and that he was much addicted to society. Yet no more practical man ever existed in the Western Continent—if, indeed, elsewhere—than Benjamin Franklin. We know from his subsequent career that neither philosophy nor science—unless it appeared to be useful—made any great claim upon him. But we know also that he was a seeker of knowledge and that he tried in many ways to promote it, with the proviso, however, that it too should be useful.

It is not too much to say that almost every boy and girl in this country of ours thinks of Benjamin Franklin in terms of kite flying, but in their mature years they become aware that Franklin in his later years was connected with science in a very intimate way, proving by the simplest of demonstrations that natural lightning and handmade lightning—to be more scientific, electricity—were one and the same thing, and that of this and his other discoveries every man, woman and child in the civilized world is a beneficiary.

But throughout his lifetime Franklin was much more concerned with matters political than with science—though science remained always his first love. He represented his constituency in the Colonial assembly of Pennsylvania, his adopted state (as a witty and distinguished Philadelphian once said: He was "born," not in Boston, but in Philadelphia at seventeen years of age), besides being Deputy Postmaster General of the Colonies for many years. Later he repaired to England, representing

Pennsylvania as a diplomatic agent—or, as we might say today, Envoy Extraordinary and Minister Plenipotentiary, and representing at the same time other Colonies, until the rumbling of revolution in the far-off homeland caused him to leave the philosophical, scientific and political society which he enjoyed that he might share the lot of his fellow citizens of Pennsylvania whom he had not seen for years. A member of the Second Continental Congress, he drafted, before the Declaration of Independence, a plan of government for the Colonies in their relations with the mother country. He was a member of the committee which drafted the Declaration of Independence and he suggested to Jefferson—a member of the American Philosophical Society and later its President—the advisability of not implicating the Parliament of the mother country but only King George and his friends as the causes of the American discontent. Jefferson wisely and happily adopted Franklin's suggestion.

But Franklin was not merely interested in the English-speaking Colonies of America. He looked to the north, to the Canada of his day, which vast domain was, through Franklin's insistence, ceded by France to Great Britain instead of the little island of Guadeloupe which the British had thought of taking in the West Indies for use as a naval station. So interested was he in Canada during the days of the Revolution that he was chairman of the committee asking Canada to join the English Colonies to the south; but unfortunately for the Americans a denunciation of the Catholic religion (which was the faith of French Canada) by the New England Colonies prevented then a union of the Canadians with the Colonies to the south. Moreover, it appears that the Canadians felt, as they themselves stated, that they had no grievance against Great Britain. Franklin, however, was set on the acquisition of Canada and, before leaving for his post as Minister to France representing the struggling Colonies, he offered to what we today would call the Foreign Relations

Committee of the Senate a plan by which Canada should be purchased by the Colonies, and in his first discussion of the treaty of peace and of independence of the "United States of America," with the British representatives, he proposed the cession by Great Britain of Canada to the then United States. But notwithstanding his repeated interventions, Canada today, although not wholly British in blood, and to all intents an independent country, is nevertheless a member of the British Commonwealth of Nations.

The vision of Franklin, however, was not limited to the New World of his birth. His outlook, indeed, seemed to broaden with age and in his eighty-first year, after having taken a leading part in the Federal Convention of 1787, he revealed his conception of a unity which should apply not only to the United States but to Europe and indeed to the world. Writing to his friend M. Grand in Paris, under date of October 22, 1787, he said:

> "I send you enclos'd the propos'd new Federal Constitution for these States. I was engag'd 4 Months of the last Summer in the Convention that form'd it. It is now sent by Congress to the several States for their Confirmation. If it succeeds, I do not see why you might not in Europe carry the Project of good Henry the 4th into Execution, by forming a Federal Union and one Grand Republick of all its different States & Kingdoms; by means of a like Convention, for we had many interests to reconcile."

* *

Elihu Root was of the Franklin school and, as Franklin was in favor not only of self-government but of union on the part of the Dominion and former dominions of the mother country, so Mr. Root was greatly impressed by the union of the American States called the Pan American Union—of which, I may add, Franklin, if living today, would be enamored. Indeed he would also have favored the Peace Conferences at The Hague, brought into being in 1899 by the then Czar of all the Russias, although he would doubtless have wished for the participation not only

of the United States of America but of all of the republics of the Western World. Franklin, although a printer, was interested in matters international, and Mr. Root, a lawyer, was likewise interested not merely in his own nation but in the world beyond its borders. It is not too much to say that Mr. Root was covered with Franklin's mantle.

At the request of the first President Roosevelt, Mr. Root accepted the Secretaryship of State in 1905, succeeding John Hay, with whom Mr. Root, as Secretary of War, had previously had close relations.

Secretary Root was greatly interested in two organizations of an international character, one destined, as we believe, to be permanent (although its scope may be enlarged)—the Pan American Union, called into being by James G. Blaine when Secretary of State in the administration of the second President Harrison; the other, the second of the Czar's Peace Conferences, which met at The Hague in 1907. The first of the Peace Conferences was an experiment, and a very successful one; the second, even more successful, has unfortunately had no successor, for although the third Conference was in course of preparation at the outbreak of the World War, it did not meet because of the second shot "heard 'round the world" in 1914; and after the war the Czar of all the Russias was to be succeeded in his rôle of peacemaker by a President of the United States, Woodrow Wilson, who substituted for periodic Conferences at The Hague periodic Conferences of the League of Nations at Geneva.

But to return to Secretary of State Root, whose modesty, it may be said in passing, was as great as his capacity, for he never claimed anything which he had not done personally and was always over-generous in commending his associates. For present purposes, it is sufficient to say that Mr. Root had started the movement for the second of the Hague Conferences. The Conference which Mr. Root had in mind, however, was to be not merely a Conference of the European States, with an American Republic here and

there, but a world Conference to which small states were to be invited upon a footing of equality with the larger states. Thus the invitation to the Conference should include, in Mr. Root's view, each of the American Republics.

When Russia, upon Secretary Root's initiative, sponsored the Second Conference, it was planned for the summer of 1906. As that was the year and likewise the season set for the meeting of the Third Pan American Conference, Mr. Root informed the Russian authorities that unless the Hague Conference were postponed, the American States would be unable to send duly qualified representatives to The Hague, inasmuch as arrangements had already been made for the Conference of American States in Rio de Janeiro.

Mr. Root knew what he was doing, and on one occasion he stated to the undersigned the reason for this action. He was not sure, he said, that the presence of delegates from all of the American States would advance the proceedings of the Conference at The Hague; but the presence there of delegates from the republics of the Americas would be greatly to their own advantage, so much so indeed that Mr. Root was unwilling to have the government of the United States participate in a world Conference for the preservation of peace unless all of the American Republics, including the smallest, should be invited.

In his early days, Mr. Root had been a schoolmaster and in matters international he was, we might say, a past master. He had decided views as to what rôle the delegation of the United States should play at the Second Hague Peace Conference, of which the best evidence is his classic instructions to the delegation, published in separate form in a slender volume by Andrew Carnegie's Endowment for International Peace, of which Elihu Root was the first President. Within the limited space at our disposal, but one part of Mr. Root's instructions can be considered. It was partially accepted by the Conference of 1907 and wholly accepted by a special and smaller Conference held in Mr.

Carnegie's Peace Palace at The Hague in the year 1920, on which occasion he outlined the procedure of the Permanent Court of International Justice. The decisions of that tribunal, handed down from time to time, in suits between states of the international community, are accepted by the parties concerned and carried into effect without a resort to force, or indeed a provision in the statute of the court suggesting force.

Now for the instruction of 1907 to the delegates attending the Second Hague Conference in the matter of a proposed international court of justice. The truth is that the entire text should be incorporated in any statement of Mr. Root's international activities, but it is impossible in an appreciation of a few pages to do more than lift a passage here and there. The first is appropriately numbered 1 in the text:

"In the discussions upon every question it is important to remember that the object of the Conference is agreement, and not compulsion. If such Conferences are to be made occasions for trying to force nations into positions which they consider against their interests, the Powers can not be expected to send representatives to them. It is important also that the agreements reached shall be genuine and not reluctant. Otherwise they will inevitably fail to receive approval when submitted for the ratification of the Powers represented. Comparison of views and frank and considerate explanation and discussion may frequently resolve doubts, obviate difficulties, and lead to real agreement upon matters which at the outset have appeared insurmountable. It is not wise, however, to carry this process to the point of irritation. After reasonable discussion, if no agreement is reached, it is better to lay the subject aside, or refer it to some future Conference in the hope that intermediate consideration may dispose of the objections. Upon some questions where an agreement by only a part of the Powers represented would in itself be useful, such an agreement may be made, but it should always be with the most unreserved recognition that the other Powers withhold their concurrence with equal propriety and right.

"The immediate results of such a Conference must always be limited to a small part of the field which the more sanguine have hoped to see covered; but each successive Conference will make

the positions reached in the preceding Conference its point of departure, and will bring to the consideration of further advances toward international agreements opinions affected by the acceptance and application of the previous agreements. Each Conference will inevitably make further progress and, by successive steps, results may be accomplished which have formerly appeared impossible."

So much for the duty of the American Delegation, a duty which Secretary of State Root hoped all other delegations to the Conference would assume.

A further passage contains words of wisdom dealing with two questions which have greatly puzzled the world at large, arbitration and judicial settlement:

". . . There can be no doubt that the principal objection to arbitration rests not upon the unwillingness of nations to submit their controversies to impartial arbitration, but upon an apprehension that the arbitrations to which they submit may not be impartial. It has been a very general practice for arbitrators to act, not as judges deciding questions of fact and law upon the record before them under a sense of judicial responsibility, but as negotiators effecting settlements of the questions brought before them in accordance with the traditions and usages and subject to all the considerations and influences which affect diplomatic agents. The two methods are radically different, proceed upon different standards of honorable obligation, and frequently lead to widely differing results. It very frequently happens that a nation which would be very willing to submit its differences to an impartial judicial determination is unwilling to subject them to this kind of diplomatic process. If there could be a tribunal which would pass upon questions between nations with the same impartial and impersonal judgment that the Supreme Court of the United States gives to questions arising between citizens of the different States, or between foreign citizens and the citizens of the United States, there can be no doubt that the nations would be much more ready to submit their controversies to its decision than they are now to take the chances of arbitration. It should be your effort to bring about in the Second Conference a development of the Hague tribunal into a permanent tribunal composed of judges who are judicial officers and nothing else, who are paid adequate salaries, who have no other occupation, and who will devote their entire time to the trial and decision of international causes by

judicial methods and under a sense of judicial responsibility. These judges should be so selected from the different countries that the different systems of law and procedure and the principal languages shall be fairly represented. The court should be made of such dignity, consideration, and rank that the best and ablest jurists will accept appointment to it, and that the whole world will have absolute confidence in its judgments."

It is proper—because it is fair—to say that a vast step was taken at the second of the Hague Conferences along the line of Mr. Root's instructions in the matter of judicial settlement. The statute of the so-called "Permanent Court of Arbitral Justice" was drafted, accepted by the Conference and submitted to the nations at large for decision as to the method of appointing its judges.

Immediately after the adjournment of the Second Conference with the draft of a statute for the Permanent Court of Arbitral Justice to its credit, Secretary of State Root proceeded to establish a court on a smaller scale, so that the nations of the world might see that an international court could be created and that its decisions would be accepted. The court in question was the Central American Court of Justice, which survived its first decade but was not continued, we are sorry to say, because, although the Government of the United States was not itself a member of the court, the President of the United States at the date of its expired term was not in favor of its continuation.

When, therefore, the commission for the creation of the Permanent Court of International Justice met at The Hague in the summer of 1920, there were two drafts for the commission to use as models, one, of the Second Hague Peace Conference; the other, of the Conference of the Central American States creating the Central American Court, held in the City of Washington in the autumn of 1907, both of which drafts Mr. Root had approved; and, as we often say in playing games, the third time was lucky, for the Permanent Court of International Justice established at The Hague was called into being because of the 1907 draft by

the Hague Conference and of the 1907 Central American Court of Justice.

Now for the Pan American Union. There had been two continental meetings of the Americas, the first in Washington in the winter of 1889–90; the second in the City of Mexico in 1901–02. The third, in 1906, Mr. Root attended in person and in order to do so caused the postponement of the Second Hague Peace Conference, as we have already said. As Secretary of State he made a tour of Latin America and the classic address which he delivered at Rio de Janeiro at the opening session of the Third International Conference of American States was followed by admirable addresses in the various capitals of Latin America which he visited on the homeward voyage. From the magnificent address at Rio, a masterpiece of public speaking—quoted also in the third project of a codification of international law by the American Institute of International Law, of which organization Mr. Root was President—we lift a passage or two, although we would like to insert the entire address or print it as an appendix:

> "We wish for no victories but those of peace; for no territory except our own; for no sovereignty except sovereignty over ourselves. We deem the independence and equal rights of the smallest and weakest member of the family of nations entitled to as much respect as those of the greatest empire; and we deem the observance of that respect the chief guaranty of the weak against the oppression of the strong. We neither claim nor desire any rights or privileges or powers that we do not freely concede to every American Republic. We wish to increase our prosperity, to expand our trade, to grow in wealth, in wisdom, and in spirit; but our conception of the true way to accomplish this is not to pull down others and profit by their ruin, but to help all friends to a common prosperity and a common growth, that we may all become greater and stronger together."

We need no further statement of Secretary of State Root's interest in Panamericanism.

But he felt—as did others—that Panamericanism should have a location and a building of its own. The location

acceptable to the Latin American countries was the City of Washington and Secretary Root therefore set himself to obtain from Congress the land upon which the Palace of the Americas should rise and upon which it did rise, to become today a haunt of visitors to the capital of the United States. Through Secretary Root's initiative, ways and means were procured for erecting this splendid meeting place of the diplomatic representatives from Latin America to the United States. It was therefore appropriate that Mr. Root should deliver the address on the laying of the cornerstone, and we quote a couple of sentences rivaling the passage from the address at Rio de Janeiro and worthy of the beauty of the Palace raised through his initiative, his energy and his conception of what such an international building should be. These sentences were also included in the codification project of the American Institute of International Law:

> "There are no international controversies so serious that they can not be settled peaceably if both parties really desire peaceable settlement, while there are few causes of dispute so trifling that they can not be made the occasion of war if either party really desires war. The matters in dispute between nations are nothing; the spirit which deals with them is everything."

Elihu Root was born in the year 1845 in the little town of Clinton, New York, was graduated from Hamilton College and studied law in the then struggling New York University. His mind, however, was continental—indeed worldwide, it would be proper to say—and when he died on the 7th day of February, 1937, there was a void in the Americas and in the world at large.

JAMES BROWN SCOTT.

GEORGE DAVID ROSENGARTEN

(1869–1936)

George David Rosengarten, the eldest son of Harry B. Rosengarten, was born in Philadelphia, February 12, 1869.

He was educated at The Faires Classical Institute, 1881; and the University of Pennsylvania, College, 1886; Science 1888, graduating B.S. 1890. In the fall of the same year he went to Germany to continue the study of chemistry and worked at the University of Jena under Ludwig Knorr, the discoverer of antipyrine, and received the degree of Doctor of Philosophy in 1892.

On his return to this country he entered the laboratories of Rosengarten and Sons founded by his grandfather in 1822 for the manufacture of medicinal chemicals. This company was among the first in the country to make the alkaloids of cinchona and of opium. To work of this sort Dr. Rosengarten devoted his life.

In 1901 he became vice-president of what was later Powers-Weightman-Rosengarten, Inc., and was connected with this corporation till he retired from active business in 1929.

Dr. Rosengarten was an active and valued member of many learned societies, among the more important of which may be mentioned: American Association for the Advancement of Science, Fellow; American Institute of Chemical Engineers (president 1915–17); American Chemical Society; American Philosophical Society (elected April 26, 1919); Philadelphia College of Pharmacy (trustee 1922); American Academy of Political and Social Science; American Electro-Chemical Society; American Institute of Mining Engineers; Franklin Institute (member of Board of Managers).

In 1927 the University of Pennsylvania conferred upon him the honorary degree of Doctor of Science.

He was a member of the Society of Chemical Industry of Great Britain and of the Deutsche Chemische Gesellshaft.

Dr. Rosengarten died February 24, 1936, at his home in Philadelphia after an illness of several months.

Arthur W. Goodspeed.

PAUL SHOREY

(1857–1934)

Paul Shorey, eldest child of New England parents resident in Davenport, Iowa, was born there August 3, 1857. At an early age he removed with his parents to Chicago where he received his early education and preparation for college. He was graduated from Harvard in 1878, and after a brief apprenticeship to the law, including admission to the bar, he went to Europe for classical study, and received the degree of doctor of philosophy at Munich in 1884. His dissertation on "The Platonic Doctrine of Ideas" foreshadowed his life-long devotion to Platonic studies. In 1885 he joined the faculty of Bryn Mawr College at its opening, teaching Latin as well as Greek. His course for advanced students in Horace early gained a wide reputation as a stimulating introduction to poetry in general. Its peculiar quality was an illustration of the Latin poet by an immense range of reading from all sources, and especially from English poetry. His edition of the Odes and Epodes still stands as a unique and unrivalled literary commentary upon an ancient author.

In 1892 he was invited to the new University of Chicago, where he remained in active service almost to the time of his death. He was a singularly brilliant and spirited teacher and attracted students from all parts of the United States and Canada.

Apart from his edition of Horace, to which allusion has been made, his larger publications were *The Unity of Plato's Thought* (Decennial Publications of the University of Chicago, 1903), *What Plato Said* (University of Chicago Press, 1933), and the edition and translation of *Plato's Republic* (Loeb Classical Library, 1930 and 1934). But these volumes, considerable as they are, give only a small conception of his ceaseless activity, which manifested itself in a continuous series of monographs, notes, and reviews, contributed chiefly to *Classical Philology,* of which he was ed-

itor for more than twenty-five years. He was in constant demand as a public speaker, and indeed one must regret that he gave so much time and strength to work which has left no permanent record of its originality and suggestiveness. At different times he held some of the most important lectureships in the country, the Lowell Lectures in Boston, the Turnbull (on poetry) in Baltimore, the Sather in Berkeley, and others less permanently established or less well known. In 1901–02 he was director of the American School in Athens, in 1913–14 Roosevelt Exchange Professor in Berlin, and in 1924–25 visiting lecturer to the four Belgian universities. He was a facile linguist, and in France and Belgium as well as in Germany he delivered his lectures in the native idiom. The long record of his honorary degrees and membership in American and foreign learned societies and Academies may be found elsewhere ("Who's Who" before 1934). He was elected to membership in the American Philosophical Society on April 24, 1920. Fuller notices of Shorey's life and activity will be found in *Classical Philology* for July 1934, and in the *American Dictionary of Biography*. A peculiarly sympathetic characterization of him as a teacher, contributed by a distinguished pupil (Dr. George Norlin, President of the University of Colorado), is to be found in the same number of *Classical Philology*.

G. L. Hendrickson.

CHARLES HENRY SMYTH, JR.

(1866–1937)

Professor Charles Henry Smyth, Jr., died April 4, 1937, at the Princeton Hospital, Princeton, N. J., from pneumonia and complications resulting from a fractured hip received in a fall two weeks previously. He was seventy-one years old.

Professor Smyth was born in Oswego, New York, in 1866. He married Ruth A. Phelps of Shreveport, Louisi-

ana, on July 30, 1891. Surviving are his widow and brother and his sons, Professor Charles Phelps Smyth of the Department of Chemistry of Princeton, and Professor Henry DeWolf Smyth, Chairman of the Department of Physics of Princeton. He was for twenty-nine years a member of the American Philosophical Society (elected April 25, 1908). His son, Charles Phelps Smyth, is also a member.

Professor Smyth received the Ph.B. and Ph.D. degrees from Columbia University, after which he studied petrography under Professor Rosenbusch at Heidelberg, who was the greatest master at that time in this field.

On his return from Germany in 1891 he was appointed Professor of Geology and Mineralogy at Hamilton College, where he remained for fourteen years. In 1905 he came to Princeton as Professor of Geology, and retired in 1934. He was the first man at Princeton to develop systematically the fields of petrology, economic geology, and chemical geology, and many advanced students received their training in these subjects under him.

The northwestern Adirondacks was an area in which practically no geologic work had been done for half a century previous to 1892. In the latter year Professor Smyth started work in this region, and continued it actively each summer from 1892 to 1903, and again in 1908. Much of this territory is a mountain wilderness and offers great physical difficulties. Many major elements of the very complex pre-Cambrian geology were worked out by Dr. Smyth, and subsequent studies have served to substantiate his conclusions with little modification. In addition to this work, his two outstanding contributions to science were his first and his last: the first a series of papers, starting with his doctoral thesis on the origin of the sedimentary iron ores, of which those at Clinton, N. Y., are accepted as the type as a result of his studies; and the last a monographic study on "The Genesis of the Alkaline Rocks." The latter paper was published in the Bicentenary Number of the American Philosophical Society's PROCEEDINGS at the solic-

itation of Dr. R. A. F. Penrose, Jr. Though published ten years ago, it is still a standard reference.

Professor Smyth was handicapped by ill health during the latter part of his life, due in part to overwork in the Adirondacks. Had he not had to labor under physical limitations, the science of geology would unquestionably have been further enriched by his work.

Professor Smyth stands out as a man of profound scholarship, and one who was held in high esteem by those in close contact with him for his clear, dispassionate, reasoned judgments. He was kindly in nature, a staunch and loyal friend, and one who made a lasting impression for good on those associated with him.

ARTHUR F. BUDDINGTON.

HERBERT WEIR SMYTH

(1857–1937)

In the appreciation of Professor Goodwin given in the account of "The Classics" contributed by Professor Smyth in the volume on "The Development of Harvard University" edited by Professor Morison in 1930, occur these words:

> "The intellectual spirit of scientific research in the field of grammar did not blunt his literary and artistic sense. But he did not allow the language of emotional appreciation to trouble the tranquil harmony of imagination and reason that gives to Greek literature its undying charm. Like the reticence of that literature, the reticence of its expositor marked his power. He laid no special emphasis on formal grammar; but he believed that without grammar there can be no true appreciation of literature."

These remarks might be added to the meagre statistics with which in the same volume Smyth described his own contribution to the teaching of the Classics at Harvard. Similar extracts could be made from the memoir on Goodwin that he contributed to the PROCEEDINGS seventeen years before.[1]

[1] Read on January 3, 1913. PROC. AMER. PHILOS. SOC. 52: iii.

Both little works have touches of the only kind of autobiography that Smyth could possibly have written—the description of ideals which he caught from other great men to make his own.

Herbert Weir Smyth was born on August 8, 1857, at Wilmington, Delaware, the son of well-to-do Quaker parents, Clement Biddle and Sarah Sellers Smyth. In both families there were men of distinction in the civic and financial life of his native town and Philadelphia; his grandfather's house, where he spent his boyhood summers, was built on the original grant given by William Penn to his maternal ancestor. He prepared for college at Taylor and Jackson's School, Wilmington, Delaware. He entered Swarthmore College at the age of fifteen and graduated with the degree of A.B. in 1876. The reading of Pope's *Iliad* in his junior year prompted him, like some watcher of the skies, to find the real Homer. He began the study of Greek, was admitted the next year to the junior class at Harvard, with a condition in Greek prose composition. A precious diary of that time, written in the fair hand, that, with a maturing beauty, he kept through life, records his devotion to his masters—Goodwin and Everett and Anderson above all—and his passion for Greek, for poetry, for grammar, for history, for knowledge of every sort. His spirit was engaged in a search for the highest in literature and in learning. Aeschylus even then was among his rare favorites. He speaks of an entertaining lecture given by Goodwin on Aeschylus, and again he writes, "I have at last found a passage in Virgil almost as fine as Aeschylus." Again, he is fascinated with grammar, especially with the interrelation of languages, as shown in a root like *vid;* he finds a charm in such studies, tempting him to an endless quest. "On derivation," he remarks with a pleasant dramatic irony, "I am generally as quick as any one, but on grammar I ain't much. It will come in time, I hope."

Thus in this youthful record of his pursuits, his daily

confession of hopes and failings and victories, we see foreshadowed the achievements of his later years.

After receiving the Harvard A.B. *cum laude* in 1878, he taught for a year at Child's School, Newport, Rhode Island. Knowing now that his was to be the life of a scholar, he turned for his advanced work, as was natural at the time, to Germany. The first doctorate at Harvard had been given only two years before his graduation to W. E. Byerley, and in that same year, 1876, The Johns Hopkins University had only just been organized. Smyth spent two years at the University of Leipzig, and then, following in the wake of Edward Everett and Goodwin, whom he knew not then as his precursors in the Eliot Professorship at Harvard, he went to Göttingen. He interrupted his training to fill a gap at Williams College for the year 1883–84 as instructor in Latin and Sanskrit, though he also taught German and Greek. In the summer of 1884 he returned to Germany and completed the requirements for the degree of Ph.D.

In 1885, Smyth accepted the position of lecturer and reader in Greek Literature at The Johns Hopkins University, Gildersleeve attending a course on Epigraphy which at the latter's suggestion, Smyth gave to his advanced students. At Baltimore, he met his future wife, Eleanor Adt. Her father, Jean Baptiste Adt from Alsace-Lorraine, was a manufacturer and inventor and her grandfather, William Raine from Hanover, of English descent, founded a German newspaper which advocated the election of Henry Clay. Their marriage took place on December 20, 1887. She, the faithful and understanding companion in the progress of his career, survives him with their three daughters, Gladys, Evelyn and Eirene; their son, Raymond Weir Smyth, died during the War, September 18, 1918.

In 1888, after the professorship of Greek at the University of Pennsylvania, for which he was a candidate, had fallen to another, Smyth was called to the chair of Greek Literature at Bryn Mawr. Here the opportunities for

scholarly leisure were so plentifully given him by its enlightened President, Miss Thomas, that he refused attractive offers from the Californian universities at Berkeley and Stanford. In 1899–1900 he served as Professor of Greek Literature at the American School of Classical Studies at Athens. While there he received a call from Cornell University, but felt it inappropriate to accept it during his Sabbatical Year. On his return the invitation was renewed in 1901 but, before his decision was made, there came a call from Harvard upon the retirement of Professor Goodwin. Smyth accepted this offer and the next year he succeeded his old teacher as Eliot Professor of Greek Literature. In 1908–09 he served as acting-dean of the Harvard Graduate School, and became *emeritus* in 1925. During his last years he bore bravely a painful illness from which he seemed to be making a slow recovery. In the month preceding his death he went to a Harvard baseball game with two friends, who will ever cherish the knowing comments and the kindly quips that his frailness could not repress. But after his withdrawal to his country place at Seal Harbor, Mt. Desert, an operation was found necessary, from the effects of which he died, at Bar Harbor, on July 16, 1937.

Smyth was one of those members of the American Philosophical Society (elected, April 25, 1908) who deserve the title of philosopher. He probably would have declined that title. When he accepted the call to become in a special sense the successor of Goodwin at Harvard, he expressed a desire not to give the course on Plato and Aristotle that had long been identified with Goodwin's name. Smyth's approach to philosophy was indirect, or, rather, philosophy was on the way to his ultimate goal in life and thought. On examining the titles of Smyth's works,[1] one might be tempted to find traces of that old quarrel, of which Plato

[1] A complete bibliography of Smyth's works, and an estimate of his scholarly productions will be published by Professor C. N. Jackson, in Vol. 49 of the *Harvard Studies in Classical Philology*.

speaks, between poetry and philosophy and to trace a development, the reverse of that of a Plato, or a Boccaccio, from science to poetry. His doctor's dissertation, written in excellent German—his German fellow-students at Göttingen often used to borrow his lecture-notes—is *Der Diphthong ει im griechischen, unter Berücksichtigung seiner Entsprechungen in verwandten Sprachen.* In his Johns Hopkins and Bryn Mawr days numerous scholarly articles and reviews attest his occupation with grammar, and in 1894 appeared the first volume of a comprehensive work on *The Sounds and Inflections of the Greek Dialect.* It is dedicated to Ahrens, who half a century before had completed two volumes of his *De Graecae Linguae Dialectis,* which comprised the Aeolic and the Doric dialects. Smyth for the first time depicted Ionic as a whole[1] and meant eventually to revise and complete the account of the other dialects given by Ahrens. His work contains an amazing amount of "*Kleinarbeit.*" He took pains to examine the variants given in the manuscripts as well as those selected for the printed texts. Among other accomplishments, he disproved the statement that Herodotus had used the Homeric dialect as such. Besides Homer and Herodotus, he examines the philosophers and Hippocrates, Iambic, Trochaic, Elegiac and Melic poetry, Ionism in Tragedy and Comedy, and the Pseudo-Ionism of imitators. This is no mere settling of the business of ὅτι and of οὖν, though ὅτι and οὖν find their business settled. It is no mere museum of specimens; the reader finds a history of one aspect—apparently a minor, but as Smyth treats it, a major aspect—of Greek literary art. This volume on the *Ionic Dialect,* which Gildersleeve declared himself incompetent to review, took its place forthwith beside Goodwin's *Greek Moods and Tenses* as one of our country's foremost contributions to Classical Studies; after forty-three years it remains the standard authority in its field.

[1] A special study of "The Vowel System of the Ionic Dialect" had appeared in the *Trans. of the American Philological Society,* 20 (1889), 5–138.

The culmination of this "grammatical period" might be marked by the paper read at the Congress of Arts and Sciences at the Universal Exposition held at St. Louis in 1904 (Vol. III, pp. 1–31) on "The Greek Language in its Relation to the Psychology of the Ancient Greeks." For here, through grammar, one enters even wider fields than those of which *The Ionic Dialect* had given glimpses. "We have indeed many Greek grammars," Smyth observes, "but no history of Greek speech as an index of Greek nationality." He seeks to show that the language of the Greeks is the most complete expression of their national psychology. He remarks that the Roman borrows exclamations of joy—*io, evoe, eu, euge, eia*, but that his exclamations of sorrow are his own. He calls for a study of expressions of emotion, the sense of duty, and the like, as giving a richer reward than "the output of our dissertation-factories." He avoids the usual technical terms, perhaps because they savor of these factories, and speaks not of phonetics, morphology and semasiology, but of sounds, form, and word-meaning.

Although an apotheosis of grammar might be noted in this work, Smyth's "literary period" had already begun with his edition of the *Greek Melic Poets* in 1900.[1] In fact the plan for such a work had been in his mind for some years; the preface is written, amid congenial surroundings, at Athens, November 27/15, 1899. The work fills a small but stout octavo volume of 564 pages, closely but neatly printed, with about a fifth given to an introduction, about a fifth to the texts and the rest to pithy descriptions of the poets and comments on their poems. Few better instances of *multum in parvo* can be cited. The book can be slipped into a pocket—a good strong pocket—and carried into the country where

> propter aquae rivum, sub ramis arboris altae

one can in short order make friends with a score of dif-

[1] Published by Macmillan, with reprintings in 1904 and 1906.

ferent sorts of what we call lyric poetry and with two score lyric poets of ancients Greece. Of each mere fragments are preserved, shattered jewels without their setting, but in the light of them, and in the light of their interpreter, one enters into communion with the folk-poetry and the studied modes of lyric verse of many lands and ages. Poetry, not grammar, is of course his prime concern, and yet his mastery of dialectal forms lays the firm base for his interpretation of poetry. Nothing worth note has been passed by. Smyth has the art, not common among learned men, of writing exhaustively without exhausting. Like his *Ionic Dialect*, the work is an abiding monument of genius.

Two years later, Smyth delivered as President of the American Philological Association, an address on *Aspects of Greek Conservatism.*[1] Here, Smyth the philosopher first conspicuously appears, though from the start his tendency to connect small matters with large issues, that is to see the one in the many, is essentially philosophic. Despite the ordinary conception of the Greek spirit as free, independent, original, he points, for instance, to imitative practices in literary form that characterize the Greeks themselves no less than the authors of other literatures that borrowed from the Greeks. Both progress and conservatism, he finds, are in reality concords; "for the contrarieties unite in a higher unity—the unity of the Greek spirit."

In 1912 he set forth his views on Epic Poetry in an essay contributed to a Columbia volume on Greek Literature. It was Homer, through Pope, that had awakened his passion for Greek in his Swarthmore days. To the language of Homer he had devoted much attention since his studies in Germany. He had written at Johns Hopkins reviews of the works of Jebb and Leaf. He was ready now to examine Homer's poems, which he treats as literary units. It means much when no casual man of letters, but an authority on the Greek dialects can declare that the Homeric question is, in the language of Johnson to Bos-

[1] *Harvard Studies in Classical Philology*, 17 (1906), 49–73.

well, "one of the questions that would cause a man to hang himself." He treats Homer as the prophet and guide of the free Greek mind through all its history. He follows the principle declared by Pope:

> "Still with himself compared, his thought peruse,
> And let your comment be the Mantuan Muse."

And not only Virgil, but Dante, Tasso and Ariosto, Milton and Gray and Tolstoy are called on for like comment. It was impossible for the mind of Smyth to keep to a small tract at the centre of a circle of thought; it was forever shooting out to break through the circumference. And again in that same year, *The Harvard Essays on Classical Subjects,* a volume of which he was the editor, contains his observations, formed throughout the years, on "Greek Conceptions on Immortality from Homer to Plato." Here indeed, despite his resolve to give no courses on philosophy, is an important utterance on Greek religion and philosophic thought.

Although all high poetry appealed to Smyth, he centred his attention more and more in his later years on Aeschylus, who had fascinated him even in his college days, and whose sublimity of feeling and nobility of style had become his own. His thoughts were turning towards an edition of the plays at least as early as 1913, when he expresses the wish[1] that Goodwin, who prepared the text of the *Agamemnon* for the performance of that play at Harvard, had edited the entire text of Aeschylus. Smyth edited the plays, with a translation into his own majestic prose, in the Loeb Classical Library in 1922. This work is cited in the recent text-edition of Aeschylus by Gilbert Murray, who refers to Smyth as ἀνὴρ Ἑλληνικώτατος. Smyth's volume includes certain fragments not hitherto recognized as Aeschylean, which partly, but not entirely, with the help of recent publications, he had brought together from an-

[1] Memoir of Goodwin, p. vii.

cient grammarians, scholiasts and lexicographers.[1] Two years later, 1924, he published the lectures on Aeschylean Tragedy that he had delivered as Sather Professor at the University of California; and as ever, the study of his hero in his contemporary setting leads to the comparison of his type of poetry with its manifestations in other times and countries. He had amassed a wealth of material, including many photographs of manuscripts, for a critical edition of Aeschylus, but he felt that a necessary preliminary was a study of the diction of his poet. This had been partly put into shape, and in fact had grown into a far-reaching examination of the nature of poetry in general. But the work had not been given the finishing touches that only he could give.

Although the scholarly productions of Smyth may be roughly grouped in the fashion suggested, we must not imagine that his mind was a battle-ground for two opposing incentives; like the diverse elements in the Greek spirit of which he wrote, these were but parts of one harmonious purpose. He may have expressed the wish that he had devoted all his time to literature, but he never turned his back on grammar. In a series of editions of Greek authors and of books on Greek letters and art that came out in twenty volumes under his guidance from 1902 to 1920, he himself, in 1906, brought out with Benner of Andover a masterly *Beginners Greek Book*, and in 1916, with a larger edition in 1920, his own *Greek Grammar*, the peer of Goodwin's. Grammar, the exact study of words, their forms, their meanings, was the rock whence he was hewing his final studies of poetic diction. To him grammar was beauty, beauty—something more than grammar.

For all his ardor in scholarly pursuits, Smyth's was no life of cloistered study. His Greek series indicates his desire to disseminate knowledge as well as to discover it. He doubtless had some thought of those who like himself

[1] "Unlisted Fragments of Aeschylus," *American Journal of Philology*, 41 (1920), 101–114.

must struggle into Greek; the series includes a volume on Greek prose composition. He likewise put his whole heart into his teaching. He was among the best, if not the best, teacher of the Classics that Harvard had ever seen. His majesty of bearing, the poetry in his mind and in his language, his judgments, oracular on men and letters, inspired his pupils' devotion and their awe. Both at Harvard and at Bryn Mawr he was called familiarly—but not too familiarly—"the Olympian Zeus." But yet, as one remarked, he little knew the admiration he inspired.[1]

Despite the demands of academic duties and scholarly labors, Smyth seemed never in a hurry. He possessed that spirit of leisure that creates spare time. From his undergraduate days he had formed the habit of wide reading in good literature, whether a book related to his immediate task or not. He began early to collect rare books. In his *Ionic Grammar* (p. xi) he speaks of the *Thesaurus Cornucopiae et Horti Adonidis*, edited by Aldus in 1496 as "a book that has recently come into my possession after a long search." His library, kept in a spacious room of comfortable elegance, was one of the delights of Cambridge. It was pleasant to talk with him amongst his books: for his mind, as well as his shelves, was stocked with them. This notable collection has been presented by his widow to Harvard College Library, where, appropriately housed, it will abide as a memorial of a great scholar's urbanity.

It is strange that with his distinction no honorary academic letters were ever appended to the Ph.D. that follows the name of Herbert Weir Smyth. Besides being a member of this Society, he was a Fellow of the American Academy of Arts and Sciences, Vice-President of the Egypt Exploration Society, secretary and treasurer of the American

[1] See the *Postscriptum* in Professor Morison's volume (p. 63), written by a well-known man of letters, Smyth's pupil Lucien Price (Harvard 1907). His words have been echoed in various forms by numerous other pupils. They unite in declaring that Smyth inspired them with a love of hard work. In 1929 many of them joined in raising a fund for the painting of his portrait by Mrs. Carl Piutti-Barth.

Philological Association from 1889 to 1904, and its president in 1904–05. Among his contemporaries and their teachers, four men stand out as the greatest Hellenists that our country has produced—Gildersleeve and Goodwin, Shorey and Smyth. And if the delicate choice had to be made, not a few would put Smyth first among the four.

There was perhaps something in his reticence that prevented others besides himself from recognizing his greatness. Still waters run deep, and run invisible, sometimes, even to those standing on the bank. In the Report of the Class of 1878 prepared for the Fiftieth Anniversary of the Class, the Secretary speaks of Smyth's class-mate Paul Shorey as "easily at the head of the Greek scholars in this country." So he was, with Smyth, as he would have been the first to proclaim, at his right hand. Smyth, in his contribution to that volume, enumerates the dates of his appointments in a scant half-page, and adds: "There is nothing else worthy of record save perhaps the publication of numerous articles and books on philological subjects." Few poets and philosophers have so referred to the creatures of their fancy and their art. Smyth's only achievement of which he has been known to speak with pride was playing on the baseball team at Swarthmore.

And yet despite his indifference to outer decoration, he was building unawares a monument to himself in character and in aspect as though an invisible artist were at work upon a statue, a statue of bronze, ever just finished and ever showing some new trait. Noble in his speech, noble in his silence, deeply religious though simple in his creed, never hilarious in the company of his friends but ever genial, fond of nature, of walks and wholesome sports, easy and sympathetic with high and low, with old and young, he made of life his highest art, in which his learning merged naturally in his poetry and his poetry in the goodness of his soul.

E. K. Rand.

JULIUS STIEGLITZ

(1867–1937)

Julius Stieglitz was the son of Edward and Hedwig (Werner) Stieglitz, and was three years younger than his brother Alfred Stieglitz, who became the well-known editor and artist in photography. He was born, as one of twin boys, on May 26, 1867, at Hoboken, New Jersey. His grammar school education he received in the public schools of New York City, and the rest of his training in Germany. There he attended the real-gymnasium in Karlsruhe and graduated in 1886; the next three years were spent for the most part in the University of Berlin, where in 1889 he obtained the Doctor's degree in chemistry, with a dissertation under Thiemann.

After his return to America Stieglitz was connected with the firm of Parke, Davis and Company in Detroit, but after a trial of some two years in industrial chemical work he became convinced that his predeliction was definitely for the academic field. In those days openings in that line were at best scarce, and so we find him going in 1892 to the newly established University of Chicago, on a gamble for some kind of prospective teaching position in the near future. His high hopes that the new Chemistry Department, just being organized, might offer a favorable abode for the development of his scientific urge were not in vain. The young Director of the Laboratory, J. U. Nef, a man of recognized scientific achievement, brilliant and indefatigable, himself trained under Baeyer in Munich, brought with him to the Chicago institution a driving, restless spirit of research, driving as regards both himself and his associates. It is difficult to conceive a greater contrast than that between the two young chemists—contrast in temperament, contrast in the choosing of chemical problems and in the approach to their solution—one the omnipotent "Director" and the other a "Docent," without salary. Stieglitz remained all his life in the Chicago school, passing all

the hurdles usually placed in the path of the academic career—assistant, instructor, assistant professor, associate professor, and at last, in 1905, the coveted professorship. Following the death of J. U. Nef in 1915, Stieglitz was made Chairman of the Department of Chemistry, and in this capacity he served until his retirement in 1933 as *professor emeritus*. He continued, however, to direct research, and to lecture until within a few weeks of his death.

The usually unruffled calmness of Mr. Stieglitz is the characteristic mentioned in the various obituaries of the man. The following quotation from a sympathetic sketch by his colleague (H. I. Schlesinger) gives, however, a truer picture of him, the more certainly true as the sketch was written five years previous to Stieglitz's death.

> "Let us approach Julius Stieglitz, as so many have done, through the contacts of the classroom, the laboratory, and the consultation office. We have, perhaps, been told that he is an unusually fine lecturer and teacher, and we may possibly be surprised to observe his low voice and deliberate, unemotional manner of speech. There is no attempt to be picturesque or emphatic; there is nothing approaching the theatrical. In spite of the apparent slowness of speech, a surprising amount of ground is covered within the hour, for not a word is wasted, and repetition is unnecessary because of the perfect logic of presentation. . . . In his casual and personal contacts, Professor Stieglitz displays an almost austere manner which hides from most people his deeper human qualities. But one need only enter his office with some problem, personal or professional, to see that side of the man which accounts for the confidence placed in him and for the high regard with which he is held by all who know him well. The preoccupied, absent-minded air which usually envelops him disappears, and his whole knowledge, experience, and sound judgment are at the visitor's disposal. He has the ability to be at the same time an unimpassioned critic and a sympathetic friend; he is always ready to aid not only with advice but with active support, or with understanding sympathy."

For a time, 1909–15, Stieglitz served as Director of Analytical Chemistry, but his abiding interests were in the field of organic chemistry. He was, in the words of Charles A. Kraus, "The academician of the continental type; his genius found outlet in initiating research in numerous di-

rections, which researches he carried out extensively through collaboration with many graduate students." His publications dealt with Beckmann molecular rearrangements, catalysis, stereoisomerism of nitrogen derivatives, theory of indicators, electron theory of valence in organic chemistry, theory of color production, and many other phases of theoretical organic chemistry.

Outside of the University Mr. Stieglitz' main interests lay in the application of chemistry to medical problems. He was vice-chairman of the Council on Pharmacy and Chemistry of the American Medical Association for over twenty years, 1902–24; president of the Chicago Institute of Medicine in 1918; editor of that well-known and valuable volume, "Chemistry and Medicine," published under the auspices of the Chemical Foundation. These interests must have knit the family close together, as his twin brother became a physician and both of his children, son and daughter, are physicians.

He held membership in many societies, professional and honorary; to mention but few: American Chemical Society (president, 1917; Willard Gibbs Medal, 1923); American Association for Advancement of Science (vice-president, 1917); National Academy of Sciences; the American Philosophical Society (elected April 26, 1919), and many other Societies.

He died on January 10, 1937, "in the calm imperturbability that many will always recall as impressively characteristic of him."

Moses Gomberg.

ELIHU THOMSON *

(1853–1937)

It is with regret and sorrow that I speak of the death of Elihu Thomson. I am sure that all members of the American Philosophical Society join in the regret and sorrow for

* Dinner Address, April 24, 1937.

the loss of this great man. Science has lost a great creative mind; electrical engineering has lost a giant in invention; the nation has lost a great citizen; and we have lost a friend and loved colleague.

He was elected a member of this Society sixty-one years ago (April 21, 1876) when he was twenty-three years of age, and continued in enthusiastic membership until his death near the end of the eighty-fourth year of his life. He served as a Councillor of the Society from 1917 to 1919, and as a Vice-president from 1928 to 1934. At the date of his death on March 13, 1937, he was by several years the senior in term of membership among all the members of the Society. He had been active in the interests of the Society during six decades. Association with the members of this Society and attendance on its meetings seemed to charm and satisfy an appetite of his broadly intellectual character. When, during the latter years of his life, he and Mrs. Thomson made a practice of going south to avoid the rigors of the New England climate in February and March, he made it a matter of primary satisfaction and pleasure to determine their return journey so as to bring them to Philadelphia at the time of the annual meeting of this Society.

Thomson was a cherished member of many other distinguished scientific and professional academies and societies at home and abroad. He was a charter member of the American Institute of Electrical Engineers, its fifth president and its first recipient of the greatly respected Edison Medal. Of medals, honorary memberships in dignified societies at home and abroad, honorary academic degrees and other distinctions, his number was legion. His central interest was in the development of electrical engineering industries but his many-sided mind touched many collateral fields.

He was one of that group of giants (of which exemplars are Edison, Thomson, Bell, Weston, Sprague and their like in our country and the great Werner Siemens and his compeers in Europe) who ornamented the generation bridging

a gap in time and electrical engineering achievement between the generation of one hundred years ago containing such men as Faraday and Ampère and the generation of younger men who have fruitfully carried forward in the field. Thomson was one of the most creative and one of the last of those giants in applied electricity who adorned the bridging generation and brought us to our modern achievements in the serviceable and comforting uses of electrical apparatus and electricity.

Let me emphasize that in here speaking of these achievements, I refer to them as having proved to be serviceable and comforting. Later I refer to them as having contributed to the comfort and thus the happiness of men. Persons of distinguished name sometimes unreservedly state that the broad results of scientific discovery and invention have been causes of increased human disparity or even of war. This I deny. Such allegations are the outcome of incomplete observation. Our powerful and convenient processes of transporting men, animals and goods, associated with extended means for quickly transmitting intelligence, have been impressed into service by sovereign agencies for the purpose of widening the fierce conflicts of war and deepening the opportunities for bloodshed, thereby momentarily converting these processes from blessings into a curse. Similar misuse has been made of other products of inventive genius; and such products are not always used to the greatest humane advantage in peace. But no men have more deeply deplored this incomplete use or even grave misuse of their discoveries and engineering inventions than such men as Thomson.

The practice of engineering, and the prosecution of scientific discovery and invention within the field of engineering, lead to an intellectual richness which encourages a pacific attitude associated with complete patriotism and love of country. Such was the case with Professor Thomson. Unhappily such men are a minority in the world's population. The touch of jealousy, love of revenge and

joy of combat are so ingrained in most human natures that the reluctance of scientific-minded inventors to allow their works to be applied in warfare or in other misuse has had little influence in restraining such applications. Here is one of those problems for statesmanship that are universally human and spread far beyond the fields occupied by those men who are devoted to scientific discovery, invention and professional engineering practice. We therefore cannot put on our Faradays, Edisons, Thomsons and the like the onus for the misuse of their works. Such men stand in support of the greatest beneficial use of their discoveries and inventions.

Thomson's activities were widely extended, reaching from observations in various fields which he cultivated for intellectual interest and recreation (such as descriptive astronomy) to experimental discoveries leading into inventions relating to applied electricity that cover the range from devices of minor character to the bases of a new and valuable industry. The United States Patent Office has borne witness to his productivity in invention by issuing to him patents for inventions which are said to exceed seven hundred in number. I will not enumerate the list, significant as it might be made. To this Society it is particularly of interest to dwell upon his intimate relations with Philadelphia, his employment at the youthful age of seventeen on the staff of his alma mater (the Central High School), his early interest in experimental science and invention while yet a teacher, his active part in the laboratory and lectures of the famous Franklin Institute, and his lively participations in the functions of this distinguished Society. It was in this Philadelphia period that he made, or laid the foundations for, a number of his most important inventions. To his last days, he held a strong affection for the Franklin Institute—for, in its laboratories in the old quarters, he obtained the opportunities to carry on much experimental work in addition to that which he carried on at the Central High School.

I first met Elihu Thomson in 1886, when he was thirty-three years of age and I was twenty-one. Twelve years make the difference between youth and maturity at those ages and I was fascinated by Thomson's constructive activity of mind and his mature processes of analysis which were exhibited in conversation. He delivered a lecture at Cornell University and, as one of the very few graduate students who chose electrical engineering in those days, it was my fortune to be thrown in considerable personal contact with him while he was there. His descriptions of his methods of work, which showed his foresight in planning experiments and his fertility in filling up by empiricism the gaps in rigorous science applicable to problems of engineering design, were significant and inspiring in high degree. This was a half-dozen years after he had relinquished his posts in Philadelphia to go to New England to take up the heavy burdens of chief technical guide in a commercial development of the uses of the electric current. It was also some years before his achievements had assumed that notable international aspect which led to a great flow toward him of distinguished medals and official honors. In later years I have been impressed again and again by the unconscious manifestation by him of those same rich qualities of mind in his scientific work, his business affairs, his social relations, and in his happy family relations. In those qualities, so unusually developed, lay not only the foundation for his personal achievements, but also a good deal of the basis for that attraction with which he drew others to him.

When Thomson was eighty years of age, in 1933, he had been officially associated with Massachusetts Institute of Technology (as a member of the corporation) for forty-five years, during which period he had been called upon frequently for committee duties including membership in the executive committee of the corporation and in the Visiting Committee of the Electrical Engineering Department. Of the latter department I had been in charge for twenty-

six years at that date and (from time to time) had seen much of Thomson. His interest in the institute and active solicitude for the welfare of its work had led to his choice as acting president during an interregnum in 1920–23. When a formal celebration of his eightieth birthday was proposed, the institute gladly undertook to sponsor it, the chairmanship of the planning committee falling to me. The celebration took the form of a scientific conference in the afternoon and a formal dinner in the evening of March 29, 1933, which was his birthday. The affair is recorded in a printed booklet of eighty pages.

I speak of this birthday celebration because the interest expressed in it by societies and individuals throughout the world was very great and was crowded with spontaneous tributes of affection and respect for Thomson and his works. Such expressions flowed in in great numbers by mail and by wire, in formal and in informal garb. A gracious tribute (among very many) came from this distinguished society, another from alumni of the Central High School and another from the Franklin Institute. I will quote a paragraph from that of the Franklin Institute. After reciting certain of Thomson's activities in the Franklin Institute the tribute uses these beautiful words:

> "The Franklin Institute is proud of Dr. Thomson's affiliation with it; it is grateful for the scientific spirit which he instilled into it; it has been eager to pay honor to him because of his contributions to the advancement of mankind; and it is today filled with affection for him because of his agreeable personality and his rugged nobility of character."

Elihu Thomson was a man who worked to better the conveniences available to his fellow men, for the very joy of it. His works are known from East to West and from the zone of the Pole Star to that of the Southern Cross. His achievements have contributed so much to the comfort and happiness of men that the world owes him an inextinguishable debt. In his death, our Society's loss is great.

Death has erased from our list a great and creative soul of uniquely brilliant parts.

Dugald C. Jackson.

SAMUEL WAGNER

(1842–1937)

Samuel Wagner was born in Philadelphia on December 28, 1842, and died on May 17, 1937, in his 95th year.

He was graduated A.B. from the University of Pennsylvania in 1861, and was appointed Master in Mathematics at the Episcopal Academy from 1861 to 1863. He served in the Civil War as sergeant in the First Regiment, Pennsylvania Militia.

In 1864 he received his M. A. degree from the University of Pennsylvania, studied law and was admitted to the Bar in 1865. He was admitted to practice before the Supreme Court of Pennsylvania in 1868, and before the Supreme Court of the United States in 1881.

On January 16, 1885, he was elected a member of the American Philosophical Society and served as a councillor of the Society from 1889 to 1897.

The profession of law was only one of his very numerous activities. Probably the most important was his presidency of the Wagner Free Institute of Science from 1884 to 1921. This institution, which was founded and endowed by his uncle, William Wagner, and bore his name, was a notable development in Philadelphia, devoted to the diffusion of knowledge of the natural sciences, free to the people of Philadelphia, and in this way carried to the people generally the researches which were being undertaken by the American Philosophical Society and the Academy of Natural Sciences of Philadelphia. Some of the notable scientific men of Philadelphia regularly gave courses of public lectures in this institute and among the lecturers were the distinguished names of Angelo Heilprin, Henry Leffman, Dr. Joseph Leidy and Dr. William B. Scott.

Under Mr. Wagner's presidency there was established a museum, the collection of which were arranged by Dr. Leidy, and a reference library free for the use of persons attending the lectures given by the institute. Mr. Wagner arranged for the Wagner Free Institute of Science to provide for library purposes a considerable portion of the ground floor of their commodious premises at Seventeenth Street and Montgomery Avenue, which later became the Wagner Institute Branch of the Free Library of Philadelphia. This branch proved so popular that later it was necessary to build a separate wing, which is still used for this purpose.

As part of the diffusion of knowledge Mr. Wagner was greatly interested in the Free Library System of Philadelphia. He was elected a charter member of the board of directors of the Free Library in 1891 and vice-president in 1892, an office which he held for two years. In 1895 he was appointed a member of the board of trustees of the Free Library of Philadelphia by ordinance of City Council, dated January 9, 1895.

Others of his public activities were in connection with a journal called the *Penn Monthly*, a very distinguished journal published in Philadelphia for a number of years, but now out of existence. It was founded by Wharton Barker, a well-known banker of his time, who in politics was far ahead of his day, and would now be called a progressive. Samuel Wagner was chief of the editorial staff of this magazine from 1881 to 1883. Simon A. Stern, a well-known printer, and afterwards treasurer of the Finance Company of Philadelphia, was the publisher of this magazine for a number of years, and after Mr. Wagner retired Robert Ellis Thompson became editor.

Beside the organizations mentioned above he was a fellow of the American Association for the Advancement of Science, one of the founders of the Pennsylvania Museum and School of Industrial Art, of the Medical Jurisprudence Society, of the American Society for the Extension of Uni-

versity Teaching, and of the Penn, Rittenhouse, University and Philobiblon Clubs.

Mr. Wagner was an active member of the Protestant Episcopal Church, and founder of the Free and Open Church Society. He was vice-president of the Bishop White Prayer Book Society, and the Advancement Society of the Protestant Episcopal Church.

Aside from his deafness, Mr. Wagner enjoyed good health, and his mind remained clear and active until his death.

His publications include, "Advantages of a National Bankrupt Law," read before the Fourth Annual Meeting of the American Bar Association, 1885; and "Staten Island Bridge Question Considered from Pennsylvania Point of View."

It is difficult to recall the name of any other citizen of Philadelphia who lived so long a life and made so many contributions to the welfare of the city, to the progress of science, and to the diffusion of knowledge.

CYRUS ADLER.

ETHELBERT D. WARFIELD

(1861–1936)

On July 6, 1936, Ethelbert Dudley Warfield departed this life at the age of seventy-five. Dr. Warfield had for the past twenty-one years been president of Wilson College and for a still longer period had previously served as president of Lafayette, while during his young manhood for a few years he had filled a similar position at Miami University. Thus for nearly half a century he directed higher education in an institution for men or women, or both sexes. He began as the youngest and ended as one of the oldest college presidents.

While conservative, austere, and Puritanical in outlook, President Warfield possessed an attractive personality and was peculiarly fitted to win the admiration and confidence

of his students. He gave them wise counsel and guidance in meeting the problems of life and in choosing a vocation. He was profoundly religious and furnished them an admirable example of fidelity to duty and of beautiful home life. As a whole he was a commanding figure in the world of education and the humanities.

Ethelbert D. Warfield was elected to membership in the American Philosophical Society on December 17, 1897, on the strength of his contributions to constitutional history and law. His interest in these subjects was partly the heritage from vigorous and patriotic ancestors, who participated in many of our conventions and national wars, and partly a development from his own studies, which he pursued at Oxford, as well as in leading American universities. His mind was as sharp as a sword and was replete with deep and accurate knowledge. Throughout a long public life he was engaged in some form of historical and legal research or of pedagogical and theological controversy. In thought and deed he was a twentieth century Calvin.

Frank P. Graves.

WILLIAM MORTON WHEELER

(1865–1937)

William Morton Wheeler, one of the most distinguished of American entomologists, was born in Milwaukee, Wisconsin, March 19, 1865, and died suddenly of heart failure in Cambridge, Massachusetts, April 19, 1937. Professor Wheeler's long career as investigator, administrator, and teacher extended well over fifty years. During this period he held offices of distinction and responsibility in the Public Museum of Milwaukee, Clark University, the University of Chicago, the University of Texas, the American Museum of Natural History and finally Harvard University. Here he spent the last thirty years of his life and here the unusual promise of his early youth came to full realization

and fruition. His early schooling had been in the German-American Normal College of his native town where a rigorous scholarly training was enforced. Equipped with an unusual mastery of ancient and modern languages and with unbounded enthusiasm for biology, Wheeler began a career of unexampled activity. In his early youth his scientific interests were directed toward the insects and though his subsequent studies led him in many other directions, this group of animals retained his lasting attention. Of the three hundred and more scientific contributions that came from his pen, the majority were entomological and most of these had to do with ants. His study of these minute creatures touched every side of their lives and his investigations into their social habits led him to reflect and write on insect societies in contrast with human civilization. This subject aroused him to some of his rarest efforts where with his unusual literary ability and his keen sense of humor he exposed the failings of his own species.

Wheeler's genius was universally recognized and he was the recipient of many honors and distinctions. These added greatly to his pleasure and yet they never changed him from what he always had been, a modest and very unassuming man. He was a thoroughly social being full of wit and of anecdote. His sincerity was beyond reproach and his friendship most loyal. He was elected to membership in the American Philosophical Society, April 15, 1916, and served as a councillor from 1925 to 1928. His death is a grievous loss.

G. H. Parker.

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