

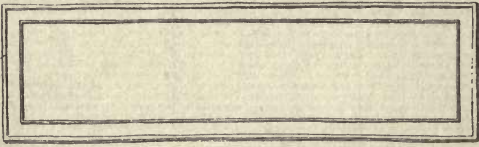
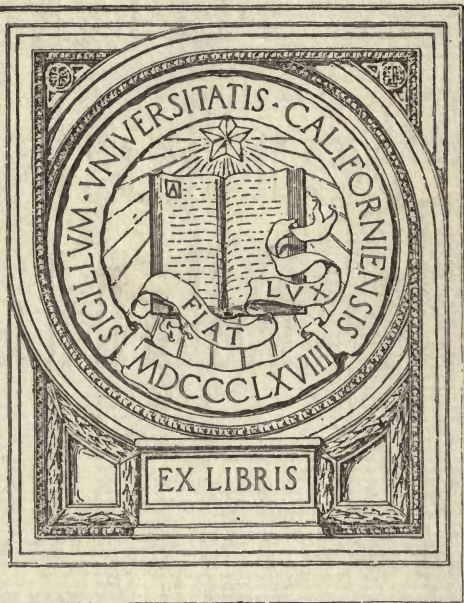
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IN MEMORIAM
George Davidson
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THE RUMFORD FUND

OF THE

AMERICAN ACADEMY OF ARTS AND SCIENCES.



THE RUMFORD MEDAL

THE
RUMFORD FUND
OF THE
AMERICAN ACADEMY OF ARTS AND SCIENCES.



BOSTON:
PUBLISHED BY THE ACADEMY.
1905.

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THE RUMFORD FUND

BENJAMIN THOMPSON, Count Rumford, was born at Woburn, Massachusetts, March 26, 1753, and died at Auteuil, France, August 21, 1814. During his boyhood he showed an intense interest in scientific matters and attended scientific lectures at Harvard College. Afterwards he studied medicine, though he never practised, and taught school at Concord, New Hampshire. He was suspected of being unfriendly to the cause of liberty in the War of the Revolution, and on the evacuation of Boston by the British — in March, 1776 — he went to England.

Here he prosecuted various scientific researches, and was elected a Fellow of the Royal Society in 1779. He subsequently entered the employ of Prince Maximilian of Bavaria, to whom he was of great service, reorganizing the army, instituting important social reforms, and at the same time prosecuting valuable scientific researches. Of these the most noteworthy was his well-known investigation into the cause of the heat produced by friction, by which he conclusively disproved the hypothesis of the fluid nature of heat, and laid an important stone in the foundation of the doctrine of the conservation of energy. He was created a count by Prince Maximilian, and chose the title Count

Rumford, after the New Hampshire town from which the family of his wife had come.

In 1799 he returned to England, and soon after projected the Royal Institution of Great Britain. He went to France in 1804, subsequently married the widow of Lavoisier, and died in 1814. By a bequest in his will he founded the Rumford Professorship of the Application of Science to the Useful Arts in Harvard University.

The Rumford Fund had its origin in the gift by Count Rumford to the American Academy of Arts and Sciences of the sum of \$5000; which was simultaneous with the gift of a like sum, £1000, to the Royal Society of Great Britain. The purpose of the fund was the same in each case, the award of a suitable premium for discoveries or improvements in Heat and Light.

The intention of the donor was announced to the Academy in the following letter:—

LONDON, July 12, 1796.

To the Hon. JOHN ADAMS, *President of the American Academy of Arts and Sciences.*

SIR,— Desirous of contributing efficaciously to the advancement of a branch of science which has long employed my attention, and which appears to me to be of the highest importance to mankind, and wishing at the same time to leave a lasting testimony of my respect for the American Academy of Arts and Sciences, I take the liberty to request that the Academy would do me the honour to accept of Five Thousand Dollars, three per cent stock in the funds of the United States of North America, which Stock I have actually

purchased, and which I beg leave to transfer to the Fellows of the Academy, to the end that the interest of the same may be by them, and by their successors, received from time to time, forever, and the amount of the same applied and given once every second year, as a premium, to the author of the most important discovery or useful improvement, which shall be made and published by printing, or in any way made known to the public, in any part of the Continent of America, or in any of the American Islands during the preceding two years, on Heat, or on Light; the preference always being given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind.

With regard to the formalities to be observed by the Academy in their decisions upon the comparative merits of those discoveries which in the opinion of the Academy may entitle their Authors to be considered as competitors for this biennial premium, the Academy will be pleased to adopt such regulations as they in their wisdom may judge to be proper and necessary.

But in regard to the form in which this Premium is conferred, I take the liberty to request that it may always be given in two medals, struck in the same die, the one of gold and the other of silver, and of such dimensions that both of them together may be just equal in intrinsic value to the amount of interest of the aforesaid Five Thousand Dollars stock during two years: that is to say, that they may together be of the value of Three Hundred Dollars.

The Academy will be pleased to order such device or inscription to be engraved on the die they shall cause to be prepared for striking these medals, as they may judge proper.

If during any term of two years, reckoning from the last adjudication, or from the period for the adjudication of this Premium by the Academy, no new discovery or improvement should be made in any part of America, relative to either of the subjects in question (Heat or Light), which, in the opinion of the Academy shall be of sufficient importance to deserve this Premium, in that case,

it is my desire that the Premium may not be given, but that the value of it may be reserved, and by laying out in the purchase of additional stock in the American funds may be applied to augment the capital of this Premium ; and that the interest of the sums by which the capital may, from time to time, be so augmented, may regularly be given in money with the two medals, and as an addition to the original Premium at each succeeding adjudication of it. And it is further my particular request that those additions to the value of the Premium arising from its occasional non-adjudication may be suffered to increase without limitation.

With the highest respect for the American Academy of Arts and Sciences, and the most earnest wishes for their success in their labours for the good of mankind,

I have the honour to be, with much Esteem and Regard, Sir,
Your most Obedient, Humble Servant,

RUMFORD.

The gift was accepted by the Academy, but for many years no award of the premium was made, as no claimant appeared whose merit was such in its opinion as to justify this. Meanwhile the fund had accumulated to the amount of \$20,000, and in view of the fact that there was no possibility of expending the income in the precise manner contemplated by Count Rumford, application was made in 1831 to the Supreme Court of the Commonwealth of Massachusetts for relief, if such should be possible.

The Court issued a decree which modified the possible disposition of the income of the fund in such a manner as to increase its usefulness while keeping entirely within the spirit of the original gift, saying in part as follows:—

“It further appears that the said donation was made to the American Academy for a general purpose of charity, that, namely, of promoting a useful branch of science for the benefit of mankind ; that the Academy accepted the same, upon the terms stated, and for the purposes contemplated by said donation, and are now under obligation to carry the general intent of the donor into effect, as far as it is practicable to do so. It further appears, that, in consequence of the impediments set forth in the Bill, it is impracticable for the Academy to carry the general charitable intent of the donor into effect in the exact and precise mode specified by him ; but, considering the general and primary intent of Count Rumford to have been to awaken and stimulate the ingenuity, and encourage the researches and experiments of individuals on the continent or the islands of America to make important discoveries or useful improvements upon the subjects of Light and Heat, and to cause them speedily to be published for the good of mankind, it does appear to the Court that it is quite practicable for the Academy to accomplish and carry into effect the general charitable intent and purpose of Count Rumford by some slight alterations in the mode particularly prescribed by him for carrying the same into effect.

“It is therefore by the court ordered, adjudged, and decreed, for the reasons set forth in the bill, that the plaintiffs be, and they are by the authority of this court, empowered to make from the income of said fund, as it now exists, at any annual meeting of the Academy, instead of biennially, as directed by the said Benjamin Count Rumford, award of a gold and silver medal, being together of the intrinsic value of three hundred dollars, as a premium to the author of any important discovery or useful improvement on heat or on light which shall have been made and published by printing, or in any way made known to the public, in any part of the Continent of America, or any of the American Islands, preference being always given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind ; and to add to such medals as a further reward and premium of such dis-

covery or improvement, if the plaintiffs see fit so to do, a sum of money not exceeding three hundred dollars.

“And it is further ordered, adjudged, and decreed, that the plaintiffs may appropriate from time to time, as the same can advantageously be done, the residue of the income of said fund hereafter to be received, and not so as aforesaid awarded in premiums, to the purchase of such books and papers and philosophical apparatus (to be the property of said Academy) and in making such publications or procuring such lectures, experiments, or investigations, as shall in their opinion best facilitate and encourage the making of discoveries and improvements which may merit the premium so as aforesaid to be by them awarded. And that the books, papers, and apparatus so purchased shall be used, and such lectures, experiments, and investigations be delivered and made, either in the said Academy or elsewhere, as the plaintiffs shall think best adapted to promote such discoveries and improvements as aforesaid, and either by the Rumford Professor of Harvard University or by any other person or persons, as to the plaintiffs shall from time to time seem best.”

In considering this action of the Court, Dr. George E. Ellis, the biographer of Count Rumford, makes the following comment :—

“It is easy to express the obvious suggestion, that the enlargement and direction thus allowed by judicial decision to the use of the trust fund committed by Count Rumford to the Academy, for one specified and well-defined object, exceed any possible construction that can be put upon the liberal terms of his deed of gift. But it is just as easy to meet the suggestion by affirming that the judicial decree has in view, and aims, it may even be said, most conscientiously to fulfil, the intent of the donor. Under its decision the Academy may make the munificence of Count Rumford most serviceable at the fountain-head and sources of that scientific development which alone can secure biennially, or at longer or shorter

intervals, a signal result marking a point in the flow of the stream. Books and lectures presenting the last discoveries, or methods for discovery, in the Count's favorite subjects of experiment, may be regarded as even something better than an alternative in the improvement of his fund, to the use of it for a medal or premium under the pressure of a supposed obligation to bestow it with chief reference to the lapse of two years.

“In view of all the circumstances and of the difficulties which the case presented, one may reasonably affirm that when the honored and venerated chief-justice gave validity to the decree of the court, he might have felt the full assurance that Count Rumford himself would have dictated its terms.”

At the close of the last fiscal year of the Academy (1904-05) the Rumford Fund amounted to \$58,722.16, the income for that year having been \$2550.73.

A standing committee of the Academy known as the Rumford Committee, consisting of seven Fellows, is charged with the supervision of the trust created by Count Rumford, and considers all applications and claims for the Rumford Premium, and all applications made for grants from the income of the fund in aid of research or for other purposes.

The Rumford Committee was first constituted a standing committee in 1833. Its members were nominated annually by the President of the Academy until 1863, since which time they have been chosen in the same manner as the other officers.

The following is a list of those who have been members of the Committee.

MEMBERS OF THE RUMFORD COMMITTEE.

1833-1905.

1833-1838, Nathaniel Bowditch	1864-1894, Wolcott Gibbs
1833-1837, Francis C. Gray	1864-1871, Francis H. Storer
1833-1848, Daniel Treadwell	1866-1877, Josiah P. Cooke
1833-1846, Jacob Bigelow	1868-1878, James B. Francis
1833-1849, John Ware	1869-1890, Edward C. Pickering
1837-1846, John Pickering	1871-1885, John M. Ordway
1838-1839, James Jackson	1871-1880, Stephen P. Ruggles
1839-1840, Benjamin Peirce	1877-1897, John Trowbridge
1840-1843, George B. Emerson	1878-1892, Josiah P. Cooke
1843-1849, Benjamin Peirce	1878-1892, Joseph Lovering
1846-1850, Francis C. Lowell	1880-1891, George B. Clark
1846-1847, James Hayward	1885- Erasmus D. Leavitt
1847-1868, Joseph Lovering	1890-1896, Benjamin O. Peirce
1848-1863, Eben N. Horsford	1892- Edward C. Pickering
1849-1863, Daniel Treadwell	1892- Amos E. Dolbear
1849-1878, Morrill Wyman	1892- Charles R. Cross
1850-1862, Henry L. Eustis	1894-1896, Benjamin A. Gould
1862-1871, Joseph Winlock	1896- Arthur G. Webster
1863-1869, William B. Rogers	1897-1902, Thomas C. Mendenhall
1863-1864, Charles W. Eliot	1897- Theodore W. Richards
1863-1864, Theophilus Parsons	1902- Elihu Thomson
1863-1866, Cyrus M. Warren	

The successive chairmen of the Rumford Committee up to the present time have been the following:— Messrs. Nathaniel Bowditch (1833-1838), James Jackson (1838-1839), John Pickering (1839-1846), Daniel Treadwell (1846-1848), Eben N. Horsford (1848-1863), Joseph Lovering (1863-1868), Joseph Winlock (1868-1871), Josiah P. Cooke (1871-1876), Morrill Wyman

(1876-1878), Joseph Lovering (1878-1892), John Trowbridge (1892-1897), Charles R. Cross (1897-).

The Rumford Premium is awarded by the Academy upon the recommendation of the Rumford Committee. It has been given to the following persons and on the ground stated.

AWARDS OF THE RUMFORD PREMIUM OF THE
AMERICAN ACADEMY.

1839. ROBERT HARE, of Philadelphia, for his invention of the compound or oxyhydrogen blowpipe.
1862. JOHN ERICSSON, of New York, for his improvements in the management of heat, particularly as shown in his caloric engine of 1855.
1865. DANIEL TREADWELL, of Cambridge, for improvements in the management of heat, embodied in his investigations and inventions relating to the construction of cannon of large calibre, and of great strength and endurance.
1866. ALVAN CLARK, of Cambridge, for his improvements in the manufacture of refracting telescopes, as exhibited in his method of local correction.
1869. GEORGE HENRY CORLISS, of Providence, for his improvement in the steam-engine.
1871. JOSEPH HARRISON, JR., of Philadelphia, for his mode of constructing steam-boilers, by which great safety has been secured.
1873. LEWIS MORRIS RUTHERFURD, of New York, for his improvements in the processes and methods of astronomical photography.
1875. JOHN WILLIAM DRAPER, of New York, for his researches on radiant energy.
1880. JOSIAH WILLARD GIBBS, of New Haven, for his researches in thermodynamics.

1883. HENRY AUGUSTUS ROWLAND, of Baltimore, for his researches in light and heat.
1886. SAMUEL PIERPONT LANGLEY, of Allegheny, for his researches in radiant energy.
1888. ALBERT ABRAHAM MICHELSON, of Cleveland, for his determination of the velocity of light, for his researches upon the motion of the luminiferous ether, and for his work on the absolute determination of the wave-lengths of light.
1891. EDWARD CHARLES PICKERING, of Cambridge, for his work on the photometry of the stars and upon stellar spectra.
1895. THOMAS ALVA EDISON, of Orange, N. J., for his investigations in electric lighting.
1898. JAMES EDWARD KEELER, of Allegheny, for his application of the spectroscope to astronomical problems, and especially for his investigations of the proper motions of the nebulae, and the physical constitution of the rings of the planet Saturn, by the use of that instrument.
1899. CHARLES FRANCIS BRUSH, of Cleveland, for the practical development of electric arc-lighting.
1900. CARL BARUS, of Providence, for his various researches in heat.
1901. ELIHU THOMSON, of Lynn, for his inventions in electric welding and lighting.
1902. GEORGE ELLERY HALE, of Chicago, for his investigations in solar and stellar physics and in particular for the invention and perfection of the spectro-heliograph.
1904. ERNEST FOX NICHOLS, of New York, for his researches on radiation, particularly on the pressure due to radiation, the heat of the stars, and the infra-red spectrum.

The Rumford Fund of the Royal Society has been devoted solely to the award of the premium according to the original provisions of that trust. For purposes of com-

parison with the foregoing the following list of grantees of the Royal Society's Rumford Premium is given : —

AWARDS OF THE RUMFORD PREMIUM OF THE ROYAL SOCIETY.

1802. BENJAMIN COUNT RUMFORD. For his various Discoveries respecting Light and Heat.
1804. JOHN LESLIE. Experiments on Heat.
1806. WILLIAM MURDOCK. Publication on the Employment of Gas from Coal for the Purpose of Illumination.
1810. ÉTIENNE LOUIS MALUS. Discovery of Certain Properties of Reflected Light.
1814. WILLIAM CHARLES WELLS. Essay on Dew.
1816. HUMPHRY DAVY. Papers on Combustion and Flame.
1818. DAVID BREWSTER. Discoveries relating to the Polarization of Light.
1824. AUGUSTIN JEAN FRESNEL. Development of the Undulatory Theory, as applied to the Phenomena of Polarized Light: and various Important Discoveries in Physical Optics.
1832. JOHN FREDERIC DANIELL. Experiments with a new Register Pyrometer for measuring the Expansion of Solids.
1834. MACEDONIO MELLONI. Discoveries relative to Radiant Heat.
1838. JAMES DAVID FORBES. Experiments on the Polarization of Heat.
1840. JEAN BAPTISTE BIOT. Researches in and connected with the Circular Polarization of Light.
1842. HENRY FOX TALBOT. Discoveries and Improvements in Photography.
1846. MICHAEL FARADAY. Discovery of the Optical Phenomena developed by the Action of Magnets and Electric Currents in Certain Transparent Media.
1848. HENRI VICTOR REGNAULT. Experiments on Expansion and Density of Air, different Gases, and Mercury.

1850. FRANÇOIS JEAN DOMINIQUE ARAGO. Experimental Investigation on Polarized Light.
1852. GEORGE GABRIEL STOKES. On the Change of Refrangibility of Light.
1854. NEIL ARNOTT. A new Smoke-Consuming and Fuel-Saving Fireplace.
1856. LOUIS PASTEUR. Discovery of the Nature of Racemic Acid, and its Relations to Polarized Light.
1858. JULES CÉLESTIN JAMIN. Various Experimental Researches on Light.
1860. JAMES CLERK MAXWELL. Researches on the Composition of Colors, and other Optical Papers.
1862. GUSTAV ROBERT KIRCHHOFF. Researches on the Fixed Lines of the Solar Spectrum, and on the Inversion of the Bright Lines in the Spectra of Artificial Light.
1864. JOHN TYNDALL. Researches on the Absorption and Radiation of Heat by Gases and Vapors.
1866. ARMAND HIPPOLYTE LOUIS FIZEAU. Optical Researches and Investigations into the Effect of Heat on the Refractive Power of Transparent Bodies.
1868. BALFOUR STEWART. Researches on the Qualitative as well as Quantitative Relations between the Powers of Emission and Absorption of Bodies for Heat and Light.
1870. ALFRED OLIVIER DES CLOIZEAUX. Researches in Mineralogical Optics.
1872. ANDERS JONAS ÅNGSTRÖM. Researches on Spectral Analysis.
1874. JOSEPH NORMAN LOCKYER. Spectroscopic Researches on the Sun and on the Chemical Elements.
1876. PIERRE JULES CÉSAR JANSSEN. Researches on the Radiation and Absorption of Light, carried on chiefly by means of the Spectroscope.
1878. ALFRED CORNU. Optical Researches, and especially his recent redetermination of the Velocity of Propagation of Light.
1880. WILLIAM HUGGINS. Astronomical Researches.

1882. WILLIAM DE WIVELESIE ABNEY. Contributions to the Advancement of the Theory and Practice of Photography.
1884. TOBIAS ROBERT THALÉN. Spectroscopic Researches.
1886. SAMUEL PIERPONT LANGLEY. Researches on the Spectrum by means of the Bolometer.
1888. PIETRO TACCHINI. Important and long-continued Investigations which have largely advanced our Knowledge of the Physics of the Sun.
1890. HEINRICH HERTZ. Work on Electro-magnetic Radiation.
1892. NILS CHRISTOFER DUNÉR. Astronomical Observations.
1894. JAMES DEWAR. Researches at very high and very low Temperatures, and on Spectroscopic Phenomena.
1896. PHILIPP LENARD AND WILHELM KONRAD RÖNTGEN. Researches on Phenomena which occur outside a highly exhausted Tube through which an Electrical Discharge is passing.
1898. OLIVER JOSEPH LODGE. Researches on Radiation and on the Relations between Matter and Ether.
1900. ANTOINE HENRI BECQUEREL. Discoveries in Radiation proceeding from Uranium.
1902. CHARLES ALGERNON PARSONS. Application of the Steam Turbine to Industrial Purposes and its recent Extension to Navigation.
1904. ERNEST RUTHERFORD. Researches on Radio-activity, and particularly his Discovery of the Existence and Properties of the Gaseous Emanations from Radio-active Bodies.

The following is a list of grants made from the income of the Rumford Fund of the American Academy in furtherance of research. In a few cases the appropriation has not been called for because the research in question has not proved feasible, because funds have

been provided from elsewhere, or for other reasons. When this is believed to be the case it is so stated.

GRANTS FROM THE RUMFORD FUND.

1832-1862.	Observatory at Cambridge, for telescope and other apparatus	\$3776
	ENOCH HALE. For rain gauges and sundry expenses for experiments and investigations relating to the fall of rain	1697
1862.	PHILANDER SHAW. Experiments relating to air-engines	600
1863.	OGDEN N. ROOD. Physical relations of iodized plate to light. (Appropriation subsequently transferred to another research, viz., photometry)	300
1864.	WOLCOTT GIBBS. For purchase of a Meyerstein spectrometer and Regnault's apparatus for measuring vapor-tension	600
	JOSIAH P. COOKE, JR. For purchase of glass prisms to be used in an investigation of metallic spectra. (These prisms were purchased from the Academy by Professor Cooke in 1871)	200
1866.	OGDEN N. ROOD. Photometry. (Appropriation of 1863 for relations of iodized plate to light, \$300, transferred to this purpose.)	
1867.	WOLCOTT GIBBS. For repairing Meyerstein spectrometer belonging to the Academy	100
1869.	JOSEPH WINLOCK. For purchase of spectroscopic instruments for observations of the solar eclipse of August, 1869	300
1870.	BENJAMIN APTHORP GOULD. For photometric and spectroscopic apparatus for the Observatory at Cordova. (Apparatus subsequently purchased by the Argentine Government)	500

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1875.	JOHN TROWBRIDGE. Improvement of magneto-electric machine and induction coil	\$500
1876.	HENRY A. ROWLAND. New determination of mechanical equivalent of heat	600
	SAMUEL P. LANGLEY. Researches on radiant energy	600
1877.	BENJAMIN O. PEIRCE, JR. Investigation of the conduction of heat in the interior of bodies. (\$60, only, called for)	200
	EDWARD C. PICKERING. Atmospheric refraction	520
1878.	WOLCOTT GIBBS, JOHN TROWBRIDGE, EDWARD C. PICKERING. Experiments on photometry and polarimetry. (A small portion only of this appropriation was called for)	500
	CHARLES A. YOUNG. In aid of observations on solar eclipse of July 29, 1878. (Appropriation not called for)	300
	NATHANIEL S. SHALER. Investigation on loss of internal heat of earth in the neighborhood of Boston. (Appropriation not called for)	200
	WILLIAM W. JACQUES. Experiments on the distribution of heat in the spectrum	100
	WOLCOTT GIBBS, EDWARD C. PICKERING, JOHN TROWBRIDGE. Determination of indices of refraction. (A small portion only of this appropriation was called for)	500
1879.	JOHN TROWBRIDGE. Heat developed by magnetization and demagnetization of magnetic metals	200
	WILLIAM W. JACQUES. Radiation at high temperatures	200
	WILLIAM A. ROGERS. To procure a metric standard of length	350
1880.	SILAS W. HOLMAN. Viscosity of gases	250
	WOLCOTT GIBBS. Construction of dynamo-electric machine of a new plan	150

	SAMUEL P. LANGLEY. Distribution of heat in diffraction spectrum	\$300
1882.	EDWARD C. PICKERING. Stellar photography, with a view of obtaining a method of estimating the brightness of stars	500
	JOHN TROWBRIDGE. Thomson effect and allied subjects	250
1883.	JOHN TROWBRIDGE. Addition to last preceding appropriation	100
	FRANK N. COLE. Experiments on Maxwell's theory of light	50
1884.	RUMFORD COMMITTEE, for purchase of Rowland grating	40
	WILLIAM H. PICKERING. Experiments in photography	200
	JOHN TROWBRIDGE, EDWARD C. PICKERING, CHARLES R. CROSS. Experiments on standard of light	300
	EDWARD C. PICKERING. Photometry	200
	WILLIAM A. ROGERS. Production of constant temperatures	100
	JOHN TROWBRIDGE. Effect of changes of temperature on magnetism	100
1885.	WILLIAM A. ROGERS. For Construction of constant temperature room. (Addition to former appropriation)	82
	EDWARD C. PICKERING. Photometry	300
	WILLIAM H. PICKERING. Photography and new standard of light	300
1886.	WILLIAM H. PICKERING. Observations of Solar Corona, Eclipse of August, 1886	500
	HENRY P. BOWDITCH. Calorimetric observations on the heat of the human body. (\$100, only, called for)	500
	JOHN TROWBRIDGE. Standard of light (Appropri-	

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	ation subsequently transferred to another research, viz., radiant energy)	\$250
	CHARLES R. CROSS. Thermo-electric effect in Munich shunt method. (Appropriation not called for)	75
1887.	JOHN TROWBRIDGE. Investigations on radiant energy. (Appropriation of 1886 for Standard of light, \$250, transferred to this purpose.) CHARLES R. CROSS and SILAS W. HOLMAN. Thermometry	250
	ERASMUS D. LEAVITT, JR. Investigations upon a pyrometer. (Appropriation not called for)	250
	JOHN TROWBRIDGE. Metallic spectra	250
1888.	JOHN TROWBRIDGE. Metallic spectra. (Addition to former appropriation)	500
	WILLIAM H. PICKERING. For observations on solar eclipse of Jan., 1889	500
1889.	CHARLES C. HUTCHINS. Investigation on lunar radiation	250
	EDWIN H. HALL. Heat developed in cylinder of steam-engine	100
	HENRY A. ROWLAND. Metallic spectra	500
1890.	EDWIN H. HALL. Investigations on cylinder tem- perature	100
	BENJAMIN O. PEIRCE. Temperature changes in in- terior of solids. (Appropriation not called for)	200
1892.	DANIEL W. SHEA. Velocity of light in magnetic field	250
	BENJAMIN O. PEIRCE. Propagation of heat within certain solid bodies	200
	HENRY A. ROWLAND. Investigations on solar spectrum	250
1893.	WILLIAM A. ROGERS. Investigation on the pul- sation of thermometers	175
	WILLIAM H. PICKERING. Observations in Arizona	

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	on transparency and steadiness of the air and on the changes in temperature on the planet Mars. (Appropriation not called for)	\$500
1894.	FRANK A. LAWS. Thermal conductivity of metals	300
	EDWARD L. NICHOLS. Radiation from carbon at different temperatures	250
1895.	EDWIN H. HALL. Thermal conductivity of metals	250
	ARTHUR G. WEBSTER. Velocity of electric waves .	250
	BENJAMIN O. PEIRCE. Thermal conductivities of poor conductors	250
1896.	HENRY CREW. Electric, chemical, and thermal effects of electric arc	400
	ROBERT O. KING. Thomson effect in metals. . .	100
1897.	ARTHUR G. WEBSTER. Velocity of light. (Appropriation not called for)	500
	GEORGE E. HALE. Construction of spectro-heliograph	400
	ARTHUR G. WEBSTER. Construction of revolving mirror	250
	ARTHUR G. WEBSTER and ROBERT R. TATNALL. The Zeeman effect	100
1898.	WALLACE C. SABINE. Researches on ultra-violet radiation	400
	ALBERT A. MICHELSON. New form of diffraction grating. (Echelon spectroscope)	500
	THEODORE W. RICHARDS. For the construction of a microkinetoscope, to be applied to a study of the birth and growth of crystals	200
1899.	WALLACE C. SABINE. Further researches on ultra-violet wave-length	200
	HENRY CREW. Spectrum of the electric arc . . .	200
	ARTHUR G. WEBSTER. Distribution of energy in various spectra studied by means of the Michelson interferometer and the radiometer. (Appropriation not called for)	200

	EDWIN B. FROST. To aid in construction of a spectrograph especially designed for the measurement of stellar velocities in the line of sight	\$500
1900.	EDWARD C. PICKERING. For constructing a new type of photometer to be used in an investigation on the brightness of faint stars, to be carried out by co-operation with certain observatories possessing large telescopes	500
	THEODORE W. RICHARDS. Transition temperatures of crystallized salts	100
	ARTHUR L. CLARK. Molecular properties of vapors in the neighborhood of the critical point . . .	250
	CHARLES E. MENDENHALL. Investigations on a hollow bolometer. (\$100, only, called for) . .	200
	GEORGE E. HALE. Application of the radiometer to the study of the infra-red spectrum of the chromosphere	500
	ARTHUR A. NOYES. Effect of high temperatures on the electrical conductivity of salt solutions.	300
1901.	THEODORE W. RICHARDS. Research on the expansion of gases	500
	HENRY CREW. Order of appearance of the different lines of the spark spectrum.	100
	ROBERT W. WOOD. Anomalous dispersion of sodium vapor	350
	ARTHUR G. WEBSTER. For purchase of fluorite plates	65
1902.	ERNEST F. NICHOLS. For the purchase of a spectrometer, in furtherance of a research on resonance in connection with heat radiations	300
	THEODORE W. RICHARDS. For the construction of a mercurial compression pump to be used in a research on the Joule-Thomson effect. (Appropriation subsequently transferred to another research, viz., the experimental study of chemical thermodynamics)	750

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	ARTHUR A. NOYES. Effect of high temperatures on the electrical conductivity of aqueous solutions	\$300
	RALPH S. MINOR. Dispersion and absorption of substances for ultra-violet radiation	150
1903.	THEODORE W. RICHARDS. The experimental study of chemical thermodynamics. (Appropriation of 1902 for compression pump, \$750, transferred to this purpose.)	
	SIDNEY D. TOWNLEY. For the construction of a stellar photometer	100
	EDWIN B. FROST. For the construction of a special lens for use in connection with the stellar spectrograph of the Yerkes Observatory for the study of radial velocities of faint stars	200
	ERNEST F. NICHOLS and GORDON F. HULL. In aid of the investigation of the relative motion of the earth and the ether by the method of "Fizeau's polarization experiment." (Appropriation transferred to another research, viz., effect of motion of earth on intensity of radiation)	250
	GEORGE E. HALE. For the purchase of a Rowland concave diffraction grating to be used in the photographic study of the brighter stars	300
	EDWARD C. PICKERING. For the construction of two stellar photometers to be placed at the disposal of the Rumford Committee	150
	ERNEST F. NICHOLS and GORDON F. HULL. Effect of the motion of the earth on the intensity of radiation. (Appropriation for Fizeau's polarization experiment, \$250, transferred to this purpose.)	
	FREDERIC L. BISHOP. Thermal conductivity of lead	75
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	CARL BARUS. Optical method of study of radioactively produced condensation nuclei. (Appropriation not yet called for)	200
	DEWITT B. BRACE. Double refraction in gases in an electrical field	200
	ROBERT W. WOOD. Optical and other physical properties of sodium vapor	350
	NORTON A. KENT (Addition to former appropriation). Circuit conditions influencing electric spark lines	100
	ARTHUR L. CLARK (Addition to former appropriation). Molecular properties of vapors in the neighborhood of the critical point	150
1905.	DEWITT B. BRACE (Addition to former appropriation). Double refraction in gases in an electrical field	200
	CHARLES B. THWING. Thermo-electric force of metals and alloys	150
	HARRY W. MORSE. Fluorescence	500
	JOHN TROWBRIDGE. Electric double refraction of light	200
	EDWIN H. HALL. Thermal and thermo-electric properties of iron and other metals	200

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