

TRANSACTIONS

OF THE

AMERICAN

PHILOSOPHICAL SOCIETY,

HELD AT

PHILADELPHIA,

FOR PROMOTING

USEFUL KNOWLEDGE.

VOLUME III.

*Reprinted with the permission of the
American Philosophical Society*

KRAUS REPRINT CORPORATION
New York
1966

Printed in U.S.A.

TRANSACTIONS

OF THE

A M E R I C A N

PHILOSOPHICAL SOCIETY,

HELD AT

P H I L A D E L P H I A,

FOR PROMOTING

USEFUL KNOWLEDGE.

VOLUME III.

P H I L A D E L P H I A

PRINTED AND SOLD BY *ROBERT AITKEN & SON*, No. 22,
MARKET STREET.

M.DCC.XCIII.

LIST OF THE OFFICERS
OF THE
AMERICAN PHILOSOPHICAL SOCIETY,

Held at PHILADELPHIA for promoting Useful Knowledge.

For the Year 1793.

PATRON. The GOVERNOR of the COMMONWEALTH for the time being.—
Thomas Mifflin.

PRESIDENT. David Rittenhouse, L. L. D.

VICE-PRESIDENTS. { Thomas Jefferon, Secretary of State to the
United States.
Rev. John Ewing, D. D. Provost of the Uni-
versity of Pennsylvania.
Rev. William Smith, D. D.

TREASURER. John Vaughan.

CURATORS. { Benjamin Smith Barton, M. D. Correspondent
Member of the Society of the Antiquaries of
Scotland, and Professor of Natural History, and
Botany in the University of Pennsylvania.
Casper Wistar, M. D. adjunct Professor of Ana-
tomy, Surgery and Midwifery in the University
of Pennsylvania.
Charles W. Peale.

COUNSELLORS.

- Adam Kuhn, M. D. Professor of the Practice of Physic in the University of Pennsylvania.
- Jared Ingerfoll, Attorney General of Pennsylvania.
- Andrew Ellicot.
- Samuel Powell Griffiths, M. D. Professor of Materia Medica, in the University of Pennsylvania.
- Charles Petit.
- Rev. Nicholas Collin, D. D.
- Benjamin Rush, M. D. Professor of the Institutes and Clinic Medicine, in the University of Pennsylvania.
- Rev. William White, D. D.
- William Thornton, M. D.
- Thomas M'Kean, L. L. D. Chief Justice of Pennsylvania.
- William Barton.
- Rev. Robert Blackwell, D. D.

SECRETARIES.

- James Hutchinson, M. D. Professor of Chemistry in the University of Pennsylvania.
- Jonathan Williams, Jun.
- Rev. Samuel Magaw, D. D.
- Robert Patterson, Professor of Mathematics in the University of Pennsylvania.

LIST of MEMBERS of the AMERICAN PHILOSOPHICAL SOCIETY elected since 1st January, 1786.

AMERICAN MEMBERS.

A

- REV. John Andrews, D. D. Vice Provost of the University of Pennsylvania.
- Alexander Addison.
- John Adams, L. L. D. Vice President of the United States.
- Alexander Anderson.

Benjamin

N. B. All those members whose places of abode are not specified are of Pennsylvania.

xxx LIST OF MEMBERS.

B

Benjamin Smith Barton, M. D.
Rev. Robert Blackwell, D. D.
William Barton.
Edward Burd, Prothonotary of the Supreme Court, Pennsylvania.
William Bingham.
John Bayard.
David Brearly, Chief Justice of New-Jersey.
John Bleakley.
George Buchanan, M. D. of Maryland.
Samuel Beach, of South-Carolina.
Abfalom Baird.
John Beckley, Clerk of the House of Representatives U. S.
Richard P. Barton, of Virginia.

C

Rev. Nicholas Collin, D. D.
George Clymer.
Benjamin Chew, Jun.
Isaac Craig.
John Coxe, of New-Jersey.

D

Dr. William Curry.
Benjamin Duffield, M. B.
Alexander J. Dallas, Secretary of the Commonwealth of Pennsylvania.

E

Dr. Enoch Edwards.

F

William Temple Franklin.
William Findley.
Major William Ferguson.

G

Albert Gallatin.
Robert Goldborough, of Maryland.

H

Jonathan Hoge.
Jothua Humphrys.
Alexander Hamilton, Secretary for the Department of the Treasury of the U. S.

I

John Hoge.
Francis Johnston, Receiver General of the Land-Office, Pennsylvania.
Joseph

LIST OF MEMBERS. xxxii

Joseph James.
John Jay, Chief Justice of the United States.
Dr. David Jackson.

K

Henry Knox, Secretary for the Department of War in the U. S.
John W. Kittera.

L

John Lowell, Judge of the District Court U. S. of Boston.
Peter Legaux.
George Logan, M. D.

M

Robert Morris.
John Morris, M. B.
Robert Milligan.
George Monro, M. D. of Delaware.
S. L. Mitchel, M. D. of New-York.
James Maddifon, of Virginia.

N

John Nicholson, Comptroller General of the Commonwealth of Pennsylvania.
Dr. David Naffy.

P

Charles W. Peale.
John Pennington, M. D.
Stephen Du Ponceau.

R

William Rawle, Attorney U. S. for Pennsylvania.
Thomas Rufston, M. D.
John R. B. Rogers, M. D.
David Reddick.
James Rumfay of Virginia.
Edmund Randolph, Attorney General U. S.
James Rofs.
Andrew Rofs, M. D.
John Rouelle, M. D. of Virginia.

S

Dr. William W. Smith.
John Stephens, of New-Jersey.

xxxii L I S T O F M E M B E R S .

Winthrop Sergent, Secretary of the Western Territory.
John Smilie.
Thomas Lee Shippen.

T

William Thornton, M. D.
George Turner, Judge of the Western Territory.
John Trumbull, of Connecticut, Painter in History, &c.

W

Jonathan Williams, Jun.
Charles W. Wharton, D. D. of Delaware.
Simon de Wit, of New-York.
Caspar Wister, M. D.
Nicholas B. Waters, M. D.
William Waring.
Benjamin Waterhouse, M. D. Professor of Natural History in the University of Cambridge in Massachusetts.

F O R E I G N M E M B E R S .

A

James Anderfon, M. D. of Madrafs.
Count Paul, Andreani of Milan.

B

Rev. Samuel Beattie, D. D. of Aberdeen, Prof: Moral Philosophy.
Robert Barclay, of London.
Sir Joseph Banks Bart. P. R. S. of London.
William Baker, of Herefordshire in England.
Rev. Thomas Barnes, of Manchester in England.
Dr. Charles Blagden, of London, Sec. R. S.
Palifot de Beauvois, Member of the Academies of Arts and Sciences at Paris, and Cape-Francois.
Nicholas L. Burmann, M. D. Prof. Nat. Hist. in Amsterdam.

C

The Marquis of Condorcet, Secretary perpetual of the Academy of Arts and Sciences at Paris.
M. Charles, of Paris, Lecturer in Experimental Philosophy and one of the first Aeronauts,
Cabanis, M. D. of Paris. Lorewz

Lorenz Crill, M. D. of Helmstedt in Brunfwick.
 Count de Castillon, of Milan.
 De Vaux Cadet, { Both of Paris, and members of several Academies
 M. Cadet, { in Europe.
 Hector St. John de Crevecoeur, Consul of France, at New-York.
 Petrus Camper, of Friesland F. R. S. and Member of Academies at
 Paris, Petersburg, and Edinburgh.
 Joseph Ceracchi, Statuary of Rome.
 M. Coupigny, of Cape-Francois.

D

The Princess Catharine Romanowna Dátschkaw, Chevaliere of the order
 of St. Anne, Directress of the Imperial Academy of Arts and Sci-
 ences at Petersburg, and Maid of Honor to her Imperial Majesty.
 Erasmus Darwin, M. D. F. R. S. of Darby in England.

F

M. Feutry, of Paris.
 Anthony Fothergill, M. D. of Bath in England.
 Antoine R. C. M. de la Forest, Consul General of France, to the Unit-
 ed States.
 John Reinhold Foster, of Halle in Saxony, and F. R. S. of London.

G

Don Francis de Gardoqui, Auditor for the Rota, for the Crown of Cas-
 tile at the Court of Rome.
 ———Gastilleir, M. D. of Montarges.
 M. Grivel, of Paris.
 Hubert de Garbier, M. D. of Paris.
 M. M. de Grauchain, Major General of the French Navy.
 Don Diego Gardoqui, Envoy from the Court of Spain, to the United
 States.
 Benjamin Gloxin, M. D. of Colmar in Alface.
 John Grofche, M. D. Prof. Nat. Hist. in the University of Mittau, in
 Courland.

H

Dr. Thomas Henry, of Manchester in England.
 John Hunter, of London, Surgeon.
 Baron de Heinitz, of Berlin, Minister of the Mineral Department.
 Baron de Hupfch, of Cologne.

xxxiv LIST OF MEMBERS.

I

John Ingenhoufz.: M. D. F. R. S. of Vienna, Physician to his Imperial Majesty.

K

Richard Kirwan, F. R. S. of London.

L

John Coakley Letfom, M. D. and F. R. S. of London.

John Lufac, of Leyden, Professor of Greek.

M

Andrew Murray, M. D. Professor of Botany in the University of Göttingen.

N

M. Noel, M. D. of Paris.

Sir Edward Newenham, Bart. of Dublin.

O

Lewis William Otto, late Chargé des affaires of France, to the United States.

P

Thomas Purcival, M. D. of Manchester in England.

Thomas Pennant of Flintshire.

Peter Simon Pallas, M. D. Professor of Nat. Hist. at Petersburg.

R

The Duke of Richmond, of England.

M. Alphonfus le Roy, of the Academy of Arts and Sciences at Paris.

S

The Abbé de Soulavie of Paris.

George Spence, of Jamaica.

M. Stainby, of Prague Prof. Nat. Philosophy.

Dr. Andrew Sparrman, Prof. Nat. History and Botany, at Stockholm.

Dugald Stewart, Prof. Moral Philosophy, at Edinburgh.

T

Charles Peter Thunburg, Prof. Nat. History, at Upsal.

Rev. Uno. von Troil, Arch Bishop of Sweden.

V

Samuel Vaughan, Jun. of Jamaica.

M. Le Veillard, of Paris.

Benjamin Vaughan, of London.

George Vaux, Surgeon of London.

Rodolph

L I S T O F M E M B E R S. x x x v

Rodolph Valtravers, F. R. S.

Louis Valentin, M. D. Cape-Francois.

W

John Whithurst, F. R. S. London.

Thomas White, of Manchester England.

Caleb Whitford, of London.

John Walker, D. D. and M. D. Prof. Nat. History in the Univerfity of
Edinburgh.

C O N T E N T S

O F

V O L U M E III.

| N ^o . | Page |
|--|------|
| I. <i>CONJECTURES concerning the formation of the Earth, &c. in a Letter from Dr. B. Franklin, to the Abbé Soulavie.</i> | 1 |
| II. <i>A new and curious Theory of Light and Heat ; in a Letter from Dr. B. Franklin to David Rittenhouse, Esq.</i> | 5 |
| III. <i>Description of the process to be observed in making large sheets of paper in the Chinese manner, with one smooth surface. Communicated by Dr. B. Franklin.</i> | 8 |
| IV. <i>Queries and Conjectures relative to Magnetism, and the Theory of the Earth, in a Letter from Dr. B. Franklin to Mr. Bodoin.</i> | 10 |
| V. <i>Explanation of a singular phenomenon, first observed by Dr. Franklin, and not hitherto satisfactorily accounted for. In a Letter from Mr. R. Patterfon, to Dr. B. Rush.</i> | 13 |
| VI. <i>An Account of an Earthly Substance found near the Falls of Niagara and vulgarly called the Spray of the Falls : together with some remarks on the Falls. By Robert M'Caufflin, M. D. communicated by Benjamin Smith Barton, M. D.</i> | 17 |
| VII. <i>Observations on the probabilities of the Duration of Human Life, and the progress of Population, in the United States of America ; in a Letter from William Barton, Esq. to David Rittenhouse, L. L. D. President A. P. S.</i> | 25 |
| VIII. <i>Extract of a Letter from Andrew Ellicott to David Rittenhouse, Esq. dated at Pittsburg, November 5th, 1787, containing observations made at Lake-Erie, on that singular phenomenon, by seamen termed looming.</i> | 62 |
| IX. <i>An</i> | |

| N ^o . | Page |
|---|------|
| IX. <i>An Account of the Sugar Maple-Tree of the United States, and of the methods of obtaining Sugar from it, together with observations upon the advantages both public and private of this Sugar. In a Letter to Thomas Jefferson, Esq. Secretary of State to the United States, and one of the Vice Presidents of the American Philosophical Society; by Benjamin Rush, M. D. Professor of the Institutes and of Clinical Medicine in the University of Pennsylvania.</i> | 64 |
| X. <i>Memoir of Jonathan Williams, on the use of the Thermometer in discovering Banks, Soundings, &c.</i> | 82 |
| XI. <i>An Account of the most effectual means of preventing the deleterious consequences of the bite of the Crotalus Horridus, or Rattle-Snake. By Benjamin Smith Barton, M. D.</i> | 100 |
| XII. <i>Magnetic Observations, made at the University of Cambridge, (Massachusetts) in the year 1785. By Dr. S. Williams.</i> | 115 |
| XIII. <i>Accurate determination of the right ascension and declination of β. Bootes, and the Pole Star: in a Letter from Mr. Andrew Ellicott to Mr. R. Patterfon.</i> | 116 |
| XIV. <i>Account of several Houses in Philadelphia, struck with Lightning, on June 7th, 1789. By Mr. David Rittenhouse, and Dr. John Jones.</i> | 119 |
| XV. <i>An Account of the effects of a stroke of Lightning on a House furnished with two Conductors,—in a Letter from Messrs. David Rittenhouse, and Francis Hopkinson; to Mr. R. Patterfon,</i> | 122 |
| XVI. <i>Experiments and Observations on Evaporation in cold Air, by C. Wiflar, M. D.</i> | 125 |
| XVI. <i>Postscript to Mr. Barton's Letter, to Dr. Rittenhouse, of the 17th of March. 1791.</i> | 134 |
| XVII. <i>New Notation of Music, in a Letter to Francis Hopkinson, Esq. by Mr. R. Patterfon.</i> | 139 |
| XVIII. <i>Observations on the Theory of Water Mills, &c. by W. Waring,</i> | 144 |
| | XIX. |

| N ^o . | Page |
|--|------|
| XIX. <i>Astronomical Observations. Communicated by David Rittenhouse.</i> | 150 |
| XX. <i>A Letter from Dr. Rittenhouse to Mr. Patterfon, relative to a method of finding the sum of the several powers of the Sines, &c.</i> | 155 |
| XXI. <i>Index Florae Lancastriensis, auctore Henrico Muhlenberg, D. D.</i> | 157 |
| XXII. <i>Investigation of the Power of Dr. Barker's Mill, as improved by James Rumsey, with a description of the Mill, by W. Waring.</i> | 185 |
| XXIII. <i>A Thermometrical Journal of the temperature of the Atmosphere and Sea, on a voyage to and from Oporto, with explanatory observations thereon, to David Rittenhouse, L. L. D. President of the American Philosophical Society.</i> | 194 |
| XXIV. <i>First Memoir of Observations on the Plants denominated Cryptogamick. By M. De Beauvois.</i> | 202 |
| XXV. <i>A Letter from Major Jonathan Heart, to Benjamin Smith Barton, M. D. Containing observations on the Ancient Works of Art, the Native Inhabitants, &c. of the Western Country.</i> | 214 |
| XXVI. <i>An Account of some of the principal Dies employed by the North American Indians. Extracted from a paper, communicated by the late Mr. Hugh Martin.</i> | 222 |
| XXVII. <i>An Account of the beneficial effects of the Cassia Chamacrista in recruiting worn-out lands, and in enriching such as are naturally poor: together with a botanical description of the plant. By Dr. James Greenway, of Dinwiddie-County, in Virginia.</i> | 226 |
| XXVIII. <i>An Account of a Hill, on the borders of N. Carolina, supposed to have been a Volcano. In a Letter from a Continental Officer, residing in that neighbourhood, to Dr. J. Greenway, near Petersburg, in Virginia.</i> | 231 |
| XXIX. <i>An Account of a poisonous plant, growing spontaneously in the southern part of Virginia. Extracted from a paper, communicated by Dr. James Greenway, of Dinwiddie-County, in Virginia.</i> | 234 |

| No. | Page |
|--|------|
| XXX. <i>Description of a Machine for measuring a ship's way: in a Letter from Francis Hopkinson, Esq. to Mr. John Vaughan.</i> | 239 |
| XXXI. <i>An Inquiry into the Question, Whether the Apis Mellifica, or True-Honey-Bee, is a native of America. By Benjamin Smith Barton, M. D.</i> | 241 |
| XXXII. <i>An Account of a Comet, in a Letter to Mr. R. Patterfon, by David Rittenhouse, Esq.</i> | 261 |
| XXXIII. <i>Cadmus, or a Treatise on the Elements of Written Language, illustrating, by a Philosophical Divison of Speech, the Power of each Character, thereby mutually fixing the Orthography and Orthoe-py. With an Essay on the mode of teaching the Surd, or Deaf and consequently Dumb, to Speak. By Wm. Thornton, M. D. Honored with the Magellanic Gold Medal, by the Philosophical Society, in December, 1792.</i> | 262 |
| XXXIV. <i>Observations on the Theory of Water-Mills, (continued from page 193) by W. Waring.</i> | 319 |
| XXXV. <i>An Improvement on Metallic Conductors or Lightning-rods; in a Letter to Dr. David Rittenhouse, President of the Society, from Robert Patterfon of Philadelphia. Honored with the Magellanic Premium, by an Award of the Society in December 1792.</i> | 321 |
| XXXVI. <i>An easy and expeditious method of dissipating the noxious Vapour commonly found in Wells and other subterraneous places; by Ebenezer Robinson, of Philadelphia.</i> | 324 |
| XXXVII. <i>A method of draining Ponds in level grounds, by Jesse Higgins, of Delaware.</i> | 325 |
| XXXVIII. <i>Observations on the severity of the winter, 1779, 1780, by the Rev. Matthew Wilfon of Lewis, dated 22d June, 1780.</i> | 326 |
| XXXIX. <i>A Description of a new Standard for Weights and Measures; in a Letter from Mr. John Cooke, of Tipperary in Ireland, to Thomas Jefferson. Esq.</i> | 328 |

| N ^o . | Page |
|--|------|
| XL. <i>Description of a SPRING-BLOCK, designed to assist a Vessel in sailing. By Francis Hopkinson, Esq. of Philadelphia. Honored with the Magellanic Gold Medal, by an Award of the Society in December 1790.</i> | 331 |
| XLI. <i>A Botanical description of the PODOPHYLLUM DIPHYLLUM of Linnaeus, in a Letter to Charles Peter Thunberg, M. D. Knight of the Order of Wasa, Professor of Medicine and Botany in the University of Upsal, &c. &c.</i> | 334 |
| XLII. <i>Observations on the construction of Hospitals, by Mr. Le Roy. Member of the Royal Academy of Sciences.—(Extracted from an Essay on the subject, which, with several elegant plans, was transmitted by the author to the Society, but could not be inserted entire, as it contained many remarks of a local nature, respecting Paris only.</i> | 348 |

E R R A T A.

- Page 86 line 1 for 600^o read 60^o.
 88 at bottom for appendix N^o. iv. read N^o. v.
 89 line 1 dele for.
- Page 194. after the Title of the piece N^o. 23. read To David Rittenhouse, L. L. D. President of the American Philosophical Society.
 247, line 16 for spot, read pot. Page 251, line 4, for the, read they.

TRANS-