

Exhibition of
FIRST EDITIONS OF
EPOCHAL ACHIEVEMENTS
IN THE
HISTORY OF SCIENCE



PRICE, 30 CENTS

BERKELEY
UNIVERSITY OF CALIFORNIA PRESS
JUNE 1934

Exhibition of
FIRST EDITIONS OF
EPOCHAL ACHIEVEMENTS
IN THE
HISTORY OF SCIENCE



Sponsored by a committee of the History of Science Club of the University of California and arranged for the American Association for the Advancement of Science on the occasion of its ninety-fourth meeting, Berkeley, California, June 18-23, 1934.

On display at the University Library

UNIVERSITY OF CALIFORNIA PRESS
Berkeley, June, 1934

FIRST EDITIONS IN THE HISTORY OF SCIENCE

*Blessed is he who contemplates the
ageless order of immortal nature, how
it is constituted and when and why.*

EURIPIDES.

*is
history*

NO SINGLE FEATURE of man's past equals in importance his attempt to understand the forces of Nature and himself. It is a safe prediction that the historian of the future will be concerned increasingly with the chronicle of the intellectual acquisitions of man, for this deeper story includes not merely improvement in material comforts but mental enlargement which transcends every other feature of human evolution.

To commemorate the ninety-fourth meeting of the American Association for the Advancement of Science, at Berkeley, June 18-23, 1934, certain members of the faculty of the University of California interested in the history of science have prepared for exhibition in the University Library a group of portraits, books, pamphlets, and periodical articles which in their judgment have been epochal in the history of science. Three categories of achievement have been included: first, accounts of significant single discoveries; second, the formulation of laws; and third, the proposal of hypotheses which have been responsible either directly or indirectly for the advancement of science. Applied science is not here included, and the great fields of agriculture, engineering, and

medicine have, hence, been eliminated, together with the whole sphere of invention—even in its most notable triumphs (telegraphy, telephony, phonography, cinematography, radio communication, the steam and internal-combustion engines, aviation, photography, metallurgy, and illumination). To give examples from the field of medicine alone, the adoption of this policy has dictated the omission of any mention of the invention of percussion (Auenbrugger), or auscultation (Laennec), the kymograph (Ludwig), the microtome (His), the ophthalmoscope (Helmholtz), and the string galvanometer (Einthoven).

It is not claimed that this list is a comprehensive one. Its value lies in its selectiveness; nor is it claimed that every title in the selection would be readily accepted by other scholars. Furthermore, it must be clearly understood that the exhibition has been conditioned both by limits of space and availability of material, although the actual materials available locally could have more than doubled the size of the exhibition.

The list does not aim to cover contemporary or recent science; in physics, for instance, the discoveries of Röntgen, Becquerel, and the Curies clearly inaugurated a new era—the one in which we find ourselves—and are here represented only by Planck and Einstein, as is the case in chemistry, where Moseley stands almost alone.

The editor desires to state that the responsibility for the selection and characterization of these items rests with a group of his colleagues to whom major credit is due for whatever measure of success has been attained. He is especially grateful for the assistance of Professor Walter C. Blasdale, who made himself responsible not only for the section devoted to chemistry but reviewed carefully the choices made in some

other fields, of Professors Adolf Pabst, Alfred O. Woodford (Pomona College), and Perry Byerly (all in geology), Dr. Dewey C. Duncan (mathematics), Professors William F. Meyer (astronomy), Victor F. Lenzen (physics), Charles A. Kofoid (zoölogy), and William A. Setchell (botany), and finally of Professors Frederick O. Koenig (Stanford University) and James Westfall Thompson, who have reviewed the list as a whole.

The bibliographic citations are intended merely to be adequate for ready identification. Where descriptions of specific copies have been available in the catalogue of the University of California Library, or in the Library of Congress, the John Crerar Library, or other libraries, as represented in the union catalogue of library cards, these descriptions have been used without further reference to the works available for the exhibit. For papers appearing in scientific journals, an attempt has been made to give references sufficiently full as to avoid any possibility of confusion. It is hoped that the bibliographic inaccuracies certain to be here, due to haste in preparation, will be overlooked. It is greatly to be desired that bibliographers will ultimately do for the writings of some of the other pioneers of science what Geoffrey Keynes has done in *A Bibliography of the Writings of William Harvey* (Cambridge, 1928), or John F. Fulton in *A Bibliography of the Honourable Robert Boyle* (Oxford, 1932). The bibliographic citations have been supplied by Miss Christine Price and Mr. Herman F. Henkle of the staff of the University Library, assisted by Miss Helen R. Blasdale and Mr. Thomas Cowles. Especial thanks are due to Dr. Albert M. Bender and to an anonymous "Alumnus" of the University for material aid which made this project possible, and to Mr. Harold L. Leupp, University Librarian, for his coöperation.

The collection of first editions, one of the chief cults of bibliomania, is perhaps more justifiable in the realm of scientific "firsts" than in any other territory invaded by the hobby. The precise form of an achievement in *belles lettres* is of course the very reason for its being, and it is preserved in the abundant reprints by means of which man reverentially multiplies these ministers to his spirit. Now as Sarton has well said, knowledge as opposed to beauty, is cumulative and progressive. Reprints of scientific works, as originally enunciated, are rare. Yet it is only by consulting the first form of a scientific achievement that one can hope to observe the origin and change of ideas. But, more than this, it may be maintained that one cannot adequately understand any scientific subject without knowledge of the manner in which our present conceptions were established. Enriques* has said: "Si la signification même d'une théorie consiste dans les liens qui la rattachent au développement des théories qui la précèdent et de celles qui en vont sortir, on ne comprendra vraiment la science, en une acception élevée, que par son évolution historique."

HERBERT McLEAN EVANS.

* Enriques, Federigo: "La signification et l'importance de l'histoire de la science et l'oeuvre de Paul Tannery" (in Tannery, Paul: *Pour l'histoire de la science hellène . . . de Thalès à Empédocle* (2d éd. (par A. Diès), Paris, 1930), p. [xi]-xxi), p. xv.



Reproduced from the vignette on the title of Alexis Claude Clairaut:
Theorie de la figure de la terre (Paris, 1743)

MATHEMATICS

1. Euclides.

Elementa geometriæ. Venetiis [Venice], E. Ratdolt, 1482.
[137], l. 32 cm.

Gothic type. Initials. Woodcuts in text. First page within ornamental border.

Colophon: Opus elementorū euclidis megarensis in geometriā artē. In id quoq; Campani pspicacissimi Comentationes finiūt. Erhardus ratdolt Augustensis impressor solertissimus, Venetijs impressit. Anno salutis M.cccc.lxxxij. Octaviis, Calē. Jun.

“No work presumably except the Bible has had such a reign; and future generations will come back to it again and again as they tire of the variegated substitutes for it and the confusion arising from their bewildering multiplicity.”—Heath.

✓E102
English

2. Archimides.

Ἀρχιμήδους τοῦ Συρακούσιου, τὰ μεχρὶ νῦν σωζόμενα, ἅπαντα. Archimedis Syracusani philosophi ac geometrae excellentissimi opera, quae quidem extant, omnia, multis iam seculis desiderata, atq; à quàm paucissimis haecenus uisa, nuncq; primùm & graecè & latinè in lucem edita. Quorum catalogum uersa pagina reperies. Adiecta quoq; sunt Eutocii Ascalonitae in eosdem Archimedis libros commentaria, item graecè & latinè, nunquam antea excusa . . . Basileae [Basel], I. Heruagius, 1544. *

4 prelim. l., 139 p., 2 l., 65 p., 5 l. (1 blank), 163, 68 p., 2 l. diags. 32½ cm.

The collected works of one of the greatest geniuses who ever lived. Diels places no modern beside him in versatility "unless it be perhaps Gauss."

3. Cardano, Girolamo, 1501-1576.

. . . Artis magnae, sive De regulis algebraicis, lib. unus. Qui & totius operis de arithmetica, quod opus perfectum inscripsit, est in ordine decimus . . . [Norimbergae [Nürnberg], Ioh. Petreus, 1545] *

81 numb. l. diags. 31½ cm.

The celebrated publication of Tartaglia's solution of the cubic equation, which was hence wrongly called Cardan's solution. Cajori calls it "the greatest contribution to algebra made in the sixteenth century."

4. Napier, John, 1550-1617.

Mirifici logarithmorum canonis descriptio, ejusque usus, in utraque trigonometria; ut etiam in omni logistica mathematica, amplissimi, facillimi, & expeditissimi explicatio. . . . Edinbvrge [Edinburgh], ex officianâ A. Hart, 1614. *

4 prelim l., 57, [91] p. diags. 19 cm.

"The work which in the history of British science can be placed as second only to Newton's *Principia*."—Glaisher.

* Indicates items not in the University Library.

5. **Descartes, René**, 1596–1650.

Discours de la methode pour bien conduire sa raison, & chercher la verité dans les sciences. Plus La dioptrique. Les meteores. Et La geometrie. Qui sont des essais de cete methode. A Leyde [Leyden], de l'Imprimerie de I. Maire, 1637. *

78 p., 1 l., 413, [34] p. incl. illus., diags. front. (port.). 20½ cm.

The birth of coördinate geometry, designated by John Stuart Mill as "the greatest single step ever made in the progress of the exact sciences."

6. **Fermat, Pierre de**, 1601–1665.

Varia opera mathematica . . . Accesserunt selectae quaedam ejusdem epistolae, vel ad ipsum à plerisque doctissimis viris gallicè, latinè, vel italicè, de rebus ad mathematicas disciplinas, aut physicam pertinentibus scriptae. Tolosae [Toulouse], apud Johannem Pech, 1679. *

6 prelim. l., 210, [2] p., 1 l. 5 fold. pl., fold. port., diags. 35 cm.

Ed. by Samuel de Fermat.

The contribution of the "father of the modern theory of numbers," the greatest contributor to this doctrine since Diophantus. Fermat's great theorems— $x + y = z$; ($n > 2$); and $a = 1 \pmod{p}$ —are universally known. Fermat was also a noteworthy herald of the differential calculus and analytic geometry.

7. **Leibniz, Gottfried Wilhelm**, *Freiherr von*, 1646–1716.

Nova methodus pro maximis et minimis, itemque tangentibus, quae nec fractas, nec irrationales quantitates moratur, & singulare pro illis calculi genus . . .

(In: *Acta eruditorum*. Lipsiae [Leipzig], 1684. 21½ × 77 cm. 1684, p. 467–473; plate (diags.))

Discovery of the differential calculus.

8. **Bernoulli, Jacques**, 1654–1705.

Ars coniectandi; opus posthumum. Accedit Tractatus de seriebus infinitis et epistola gallicè scripta de ludo pilae re-ticularis. Basiliae [Basel], impensis Thurnisiorum fratrum, 1713.

306 p. 2 fold. tables, 1 fold diagr. 20 cm.

This work established the fundamental principles of the calculus of probabilities.

9. **Euler, Leonhard**, 1707–1783.

Methodus inveniendi lineas curvas maximi minimive propri-
tate gaudentes, sive Solutio problematis isoperimetrici
latissimo sensu accepti. . . . Lausannae & Genevae [Lau-
sanne & Geneva], apud Marcum-Michaelem Bousquet & so-
cios, 1744. *

1 prelim. l., 322 p., 1 l. diagrs. on 5 fold. pl. 25 cm.

"This work displays an amount of mathematical genius seldom ri-
valled."—Cajori. It may be said to have created the calculus of varia-
tions.

10. **Lagrange, Joseph Louis**, *Comte*, 1736–1813.

Mècanique analitique . . . Paris, Veuve Desaint, 1788. *
xii, 512 p. 26 × 20 cm.

Perhaps the most beautiful mathematical treatise in existence; called
by Hamilton "a kind of scientific poem." It contains the discovery of the
general equations of motion, the first epochal contribution to theoretical
dynamics after Newton's *Principia*, next which it has been ranked.

11. **Gauss, Karl Friedrich**, 1777–1855.

Disquisitiones arithmeticae . . . Lipsiae [Leipzig], in com-
missis G. Fleischer, 1801. *

xviii, 668 [10] p. incl. tables. 20 cm.

The immortal youthful work of this great genius, which created a new
epoch in the theory of numbers.

12. **Laplace, Pierre Simon, Marquis de**, 1749–1827.

Théorie analytique des probabilités . . . Paris, V. Courcier, 1812. *

2 prelim. l., 464 p., 1 l. 26½ em.

“Not much has been added to the subject of probability since the close of Laplace’s career. When such a genius has departed, the field of his labors seems exhausted for the time and little left to be gleaned by his successors.”—Crofton.

13. **Bólyai, János**, 1802–1860.

. . . Scientiam spatii absolute veram exhibens: a veritate aut falsitate axiomatis XI Euclidei (a priori haud unquam decidenda) independentem; adjecta ad casum falsitatis, quadratura circuli geometrica. . . [Maros Vásárhelyini, J. et S. Kali, 1832] *

2 prelim. l., [3]–26, [2] p. 23 diags. on 1 fold. pl. 23½ em.

“Appendix” to: Bólyai, Farkas. *Tentamen juventutem studiosam in elementa matheseos purae*. 1832–33. vol. 1.

This famous appendix created non-Euclidean geometry, which was independently achieved by Lobachevskii. Halsted speaks of it as “the most extraordinary two dozen pages in the history of thought.”

ASTRONOMY

✓ 14. **Mueller, Johannes**, *Regiomontanus*, 1436–1476.

Epytoma in Almagestum Ptolemei. [Venice, Herzog, 1496] *

[107] l. 29½ cm.

This celebrated work, the first published matter from the "Almagest," was begun by Purbach and completed by Regiomontanus.

✓ 15. **Copernicus, Nicolaus**, 1473–1543.

... De revolutionibus orbitum coelestium, libri VI ... Norimbergae [Nürnberg], apud Ioh. Petreium, 1543. *

7 prelim. l., 196 numb. l. tables, diags. 28½ cm.

The heliocentric view of our planetary system, which revolutionized astronomy.

✓ 16. **Brahe, Tyge**, 1546–1601.

... Astronomiae instauratae mechanica. Wandesbvrghi [Uraniborg], 1598.

1 prelim. l., [84] p. illus., mounted port., diags. 33 cm.

Colophon: Impressvm Wandesbvrghi in arce Ranzoviana prope Hamburgum sita, propria authoris typographia, opera Philippi de Ohr chalcographi Hamburgensis. Ineunte anno M.D.IIC.

The 24 full-page engravings, 7 smaller figures, and portrait are in water colors. A decorative border in red and silver frames each page.

This book contains the celebrated account of Brahe's instruments at Uraniborg, together with a short autobiography and an interesting account of his chief discoveries.

17. **Kepler, Johann**, 1571–1630. ✓

Astronomia nova 'Αιτιολογήτος, sev Physica coelestis, tradita commentariis de motibus stellae Martis, ex observationibus G. V. Tychoonis Brahe: jussu & sumptibus Rvdolphi II. Romanorum imperatoris &c: plurium annorum pertinaci studio elaborata Praegae . . . [Prague], 1609.

19 prelim. l., 337 p. fold. tab., diagrs. 37 cm.

Ornamented diagrams and initials.

Kepler's immortal work, containing the first two of his three laws of planetary motion. Its discoveries "swept away all epicycles, deferents, equants and other remnants of the Greek system and ushered in the dawn of modern astronomy" (Lodge).

18. **Galilei, Galileo**, 1564–1642.

Sidereus nuncius magna, longeque admirabilia spectacula pandens, suspiciendaque proponens vnicuique . . . Venetiis [Venice], T. Baglionus, 1610. *

28 (i.e., 30) numb. l. incl. illus., diagrs. 21 cm.

This book marks the birth of telescopic astronomy.

19. **Newton, Sir Isaac**, 1642–1727.

Philosophiae naturalis principia mathematica. . . . Imprimatur. S. Pepys, Reg. soc. praeses. Julii 5. 1686. Londini [London], jussu Societatis regiae ac typis Josephi Streater, 1687. ✓

4 prelim. l., 383, 400–510 p., 1 l. fold. pl., diagrs. 25 cm.

An immortal work. Laplace said it was assured a preëminence above all other productions of the human intellect.

— 20. **Halley, Edmond**, 1656–1742.

Astronomiae cometicae synopsis . . .

(In: Royal society of London. *Philosophical transactions*. London, 1706. 23 cm. vol. 24, p. 1882–1899)

The important discovery that the orbits are not necessarily parabolas, but may be elliptical. The prediction of the return in 1758 of what is now known as Halley's Comet, observed in 1531, 1607, and 1682.

— 21. **Bradley, James**, 1693?–1762.

A letter . . . to Dr. Edmond Halley . . . giving an account of a new discovered motion of the fix'd stars.

(In: Royal society of London. *Philosophical transactions*. London, 1729. 24 cm. vol. 35, 637–660, [2] p.)

The letter contained the discovery of the aberration of light; the explanation of the phenomenon placed Bradley among the great astronomers of the 18th century.

— 22. **Herschel, Sir William**, 1738–1822.

Account of a comet . . .

(In: Royal society of London. *Philosophical transactions*. London, 1781. 24 cm. vol. 71, p. 492–501; 3 fold. pl.)

Announcement of the discovery of the planet Uranus.

— 23. **Doppler, Christian**, 1803–1853.

Ueber das farbige Licht der Doppelsterne und einiger anderer Gestirne des Himmels. . . . *

(In: K. böhmische Gesellschaft der Wissenschaften. *Abhandlungen*. Prag, 1842. 26½ cm. V. Folge, Band 2, p. 467–482; diagrs.)

The first announcement of the principle by means of which the approach or recession of celestial objects has been determined spectroscopically.

24. **Adams, John Couch**, 1819-1892. ✓

An explanation of the observed irregularities in the motion of Uranus, on the hypothesis of disturbances caused by a more distant planet . . . (From the appendix to the Nautical almanac for the year 1851.) London, W. Clowes & sons, 1846. *

31, [1] p. 23 cm.

Report of the famous mathematical discovery of Neptune, a triumph of gravitational astronomy made coincidently and independently by Leverrier. The planet was found by Galle the first night it was sought. (See no. 25.)

25. **Leverrier, Urbain Jean Joseph**, 1811-1877. ✓

Recherches sur les mouvements d'Uranus.

(In: Académie des sciences, Paris. *Comptes rendus*. Paris, 1846. 28 cm. vol. 22, p. 907-918)

Description of the famous discovery of Neptune, made simultaneously by Adams. (See no. 24.)

PHYSICS

✓ 26. **Gilbert, William, 1540–1603.**

... De magnete, magneticisque corporibus, et de magno magnete tellure; physiologia noua, plurimis & argumentis, & experimentis demonstrata. Londini [London], escvdebat P. Short, 1600.

8 prelim. l., 240 p. illus., diags. (1 fold.). 30 cm.

The first scientific treatise on electricity and magnetism. One of the first important results of the use of experimental methods in the study of natural phenomena. It contains a prodigious number and variety of experiments and observations.

✓ 27. **Galilei, Galileo, 1564–1642.**

Discorsi e dimostrazioni matematiche, intorno à due nuoue scienze attenenti alla mecanica & i movimenti locali ... Con vna appendice del centro di grauità d'alcuni solidi. In Leida [Leyden], appresso gli Elsevirii, 1638.

4 prelim. l., 306 p. illus., diags. 21 cm.

Translated in Ostwald's *Klassiker* no. 11.

"The first modern textbook of physics" ... surely, Galileo's greatest work ... one of the most important foundation stones of the science of mechanics and virtually its rebirth after Archimedes.—Ostwald.

✓ 28. **Boyle, Hon. Robert, 1627–1691.**

A defence of the doctrine touching the spring and weight of the air, propos'd by Mr. R. Boyle in his New physico-mechanical experiments; against the objections of Franciscus Linus. Wherewith the objector's Funicular hypothesis

is also examin'd. By the author of those experiments. London, printed by J. G. for Thomas Robinson, 1662. *

6 prelim. l., 122 p. 20 × 16 cm.

The famous *Spring of the Air* was pub. in 1660. The 2d ed. (Oxford, 1662) has Boyle's answer to Linus appended, which announced the important law by which this experimenter is most generally known, namely, that the volume occupied by a gas is the reciprocal of its pressure.

29. **Newton, Sir Isaac, 1642–1727.**

A letter of Mr. Isaac Newton ... containing his new theory about light and colours ... ?

(In: Royal society of London. *Philosophical transactions*. London, 1671. 23 cm. vol. 6, p. 3075–3087; diags.)

The famous analysis of white light by dispersion into its colors.

30. **Guericke, Otto von, 1602–1686.**

... Experimenta nova (ut vocantur) magdeburgica de vacuo spatio primùm à R. P. Gaspare Schotto ... nunc verò ab ipso auctore perfectiùs edita, variisque aliis experimentis aucta ... Amstelodami [Amsterdam], apud J. Janssonium à Waesberge, 1672. ✓

8 prelim. l., 244, [4] p. front. (port.), illus., 2 double pl., diags. 33 cm.

Book III translated as Ostwald's *Klassiker* no. 59.

The most famous early experiments on air pressure, containing an account and naïve engraving of the Magdeburg hemispheres, needing sixteen horses to pull them apart in the test carried out before Ferdinand III. Robert Boyle heard of this through Schott's *Mechanica Hydraulica-pneumatica* (1657).

✓ 31. **Huygens, Christiaan, 1629–1695.**

... Horologivm oscillatorivm, sive De motv pendvlorvm ad horologia aptato demonstrationes geometricae. Parisiis [Paris], apud F. Muguet, 1673. *

[14], 161, [1] p. illus., diagrs. 34 cm.

Translated as Ostwald's *Klassiker* no. 192.

The first mathematical analysis of the pendulum, "a work that ranks second only to the *Principia* of Newton" (Cajori).

✓ 32. **Huygens, Christiaan, 1629–1695.**

Traité de lumiere. Où sont expliquées les causes de ce qui luy arrive dans la reflexion, & dans la refraction. Et particulièrement dans l'etrange refraction du cristal d'islande. ... Avec un discours de la cause de la pesanteur. Leide [Leyden], P. vander Aa, 1690. *

4 prelim. l., 180 p. incl. diagrs. 21½ × 18 cm.

A classical formulation of optical phenomena in terms of the wave theory of light; famous is the elegant derivation of Snell's Law and the explanation of the "strange refraction of Iceland crystal." Results of research presented at a session of the Paris Academy in 1678.

✓ 33. **Coulomb, Charles Augustin de, 1736–1806.**

Premier mémoire sur l'électricité et le magnétisme. ...

Second mémoire sur l'électricité et le magnétisme, où l'on détermine, suivant quelles loix le fluide magnétique, ainsi que le fluide électrique, agissent soit par répulsion, soit par attraction. ...

(In: Académie des sciences, Paris. *Histoire ... [et] mémoires*. Paris, 1788. 26 × 21½ cm. 1785, p. 569–577, 578–611; 2 pl.)

Translated in Ostwald's *Klassiker* no. 13.

The inauguration of mensuration in electricity. It contains proof of Coulomb's law, which states that the attraction between two bodies, one charged with positive and the other with negative electricity, varies inversely as the square of the distance between them.

34. **Galvani, Luigi**, 1737–1798.

... De viribus electricitatis in motu musculari commentarius. Bononiae [Bologna], ex typographia Instituti scientiarum, 1791. *

58 p. 3 fold. pl. 29½ × 21 cm.

The description of the production of "current electricity" by contact between two different metals and the legs of a frog (the latter acting as a galvanometer), which inaugurated the modern epoch in electricity.

35. **Volta, Alessandro Giuseppe Antonio Anastasio, Conte**, 1745–1827.

On the electricity excited by the mere contact of conducting substances of different kinds. In a letter ... to the Rt. Hon. Sir Joseph Banks ...

(In: Royal society of London. *Philosophical transactions*. London, 1800. 29 cm. vol. 19, pt. II, p. 403–431; fold. pl.)

Translated in Ostwald's *Klassiker* no. 118.

The famous first announcement of the "pile," actually discovered by Volta in 1796. It opened a new era in electricity, the first fruit in England being Nicholson's and Carlyle's electrolysis of water and the brilliant isolation of sodium and potassium by Sir Humphrey Davy.

36. **Oersted, Hans Christian**, 1777–1851.

Experimenta circa effectum conflictus electrici in acum magneticam.

(In: *Journal für Chemie und Physik*. Nürnberg, 1820. 8vo. vol. 29, p. 275–281)

Translation in: *Annals of philosophy*. 1820. vol. 16, p. 273–276.

Announcement of the epochal discovery of the relations between electricity and magnetism—that an electric current excites a magnetic field and therefore deflects a compass-needle.

37. **Fourier, Jean Baptiste Joseph**, 1768–1830.

Théorie analytique de la chaleur . . . Paris, F. Didot, père et fils, 1822. *

2 prelim. l., xxij, 639 p. 2 diagr. 27 cm.

This book "marks an epoch in the history of both pure and applied mathematics. It is the source of all modern methods in mathematical physics involving the integration of partial differential equations in problems where the boundary values are fixed, but the gem of the great book is Fourier's series; by this research a long controversy was brought to a close and the fact recognized that any arbitrary function of a real variable can be represented by a trigonometric series."—Cajori.

38. **Ampère, André Marie**, 1775–1836.

Mémoire sur la théorie mathématique des phénomènes électrodynamiques uniquement déduite de l'expérience, dans lequel se trouvent réunis les mémoires que M. Ampère a communiqués à l'Académie royale des sciences . . .

(In: Académie des sciences, Paris. *Mémoires*. Paris, 1827. 27 cm. ser. 2, vol. 6, [175]–387, [1] p.)

"The experimental investigation by which Ampère established the laws of the mechanical action between electric currents is one of the most brilliant achievements in science. The whole, theory and experiment, seems as if it had leaped, full grown and full armed, from the brain of the 'Newton of electricity.' It is perfect in form, and unassailable in accuracy, and it is summed up in a formula from which all the phenomena may be deduced, and which must always remain the cardinal formula of electro-dynamics."—Maxwell.

39. **Faraday, Michael**, 1791–1867.

Experimental researches in electricity ... 1. On the induction of electric currents. 2

(In: Royal society of London. *Philosophical transactions*. London, 1832. 29 cm. vol. 122, p. 125–131)

Translated in Ostwald's *Klassiker* no. 81.

This paper first showed that an electric current is induced in a coil of wire which is made to move in a magnetic field, the principle used in the construction of the dynamo.

40. **Joule, James Prescott**, 1818–1889.

On the calorific effects of magneto-electricity, and on the mechanical value of heat. Read before the British association, August 1843.

(In: *London, Edinburgh and Dublin philosophical magazine*. London, 1843. 22 cm. [3d ser.], vol. 23, p. 263–276, 347–355, 435–443; illus., tables, diags.) ?

Report of the first satisfactory determination of the mechanical equivalent of heat. This paper made Joule one of the originators of the principle of the conservation of energy.

41. **Helmholtz, Hermann Ludwig Ferdinand von**, 1821–1894. ✓

Über die Erhaltung der Kraft, eine physikalische Abhandlung, vorgetragen in der Sitzung der Physikalischen Gesellschaft zu Berlin am 23sten Juli 1847 ... Berlin, G. Reimer, 1847. *

[4], 72 p. 24 cm.

Reprinted as Ostwald's *Klassiker* no. 1.

The celebrated address which placed Helmholtz in the front list of those who had a part in establishing the doctrine of the conservation of energy.

42. **Clausius, Rudolf Julius Emmanueli**, 1822–1888.

Über die Art der Bewegung, welche wir Wärme nennen . . .

(In: *Annalen der Physik und Chemie*. Leipzig, 1857. 19½ cm. Band 101 (ganze Folge, Band 177), p. 253–380)

In this fundamental paper Clausius showed how the relations between the pressure, temperature, and volume of a gas can be calculated by means of the kinetic theory.

43. **Kirchhoff, Custav Robert**, 1824–1887.

Untersuchungen über das Sonnenspectrum und die Spectren der chemischen Elemente.

(In: K. Akademie der Wissenschaften zu Berlin. *Abhandlungen*. Berlin, 1861. 4to. Phys., p. 63–95)

The classic discoveries in spectrum analysis, which were destined to play a great rôle in the determination of the constitution of terrestrial and celestial bodies.

44. **Maxwell, James Clerk**, 1831–1879.

A dynamical theory of the electromagnetic field . . .

(In: Royal society of London. *Philosophical transactions*. London, 1865. 30 cm. vol. 155, pt. 1, p. 459–512)

Maxwell's greatest contribution; the first full development of his famous electro-magnetic theory of light.

45. **Hertz, Heinrich Rudolph**, 1857–1894.

Ueber sehr schnelle elektrische Schwingungen . . .

(In: *Annalen der Physik und Chemie*. Leipzig, 1887. 23 cm. neue Folge, Band 31, p. 421–448; fold. pl.)

Announcement of the discovery of the production by electric discharge of waves which have the properties of very long light waves. The birth of radio communication.

46. **Röntgen, Wilhelm Conrad**, 1845–1923.

... Ueber eine neue Art von Strahlen. *

(In: Würzburger physikalisch-medicinische Gesellschaft. *Sitzungsberichte*. Würzburg, 1895. 10 p.) ✓

Publication of the accidental discovery of rays capable of passing through substances heretofore considered opaque, produced by the passage of high-tension electric currents through evacuated glass tubes.

47. **Planck, Max Karl Ernst Ludwig**, 1858–

Zur Theorie des Gesetzes der Energievertheilung im normal Spectrum ... ?

(In: Deutsche physikalische Gesellschaft, Berlin. *Verhandlungen*. Leipzig, 1900. 23 cm. Jahrg. 2, p. 235–245)

The celebrated announcement of the quantum theory, in which Planck derived his radiation law based upon the assumption that energy is emitted and absorbed in discrete quanta.

48. **Einstein, Albert**, 1879–

Zur Elektrodynamik bewegter Körper ... ✓ ?

(In: *Annalen der Physik*. Leipzig, 1905. 23 cm. 4. Folge, Band 17, p. 891–921)

The famous generalization of the special theory of relativity.

CHEMISTRY

? 49. **Black, Joseph**, 1728–1799.

Experiments upon magnesia alba, quicklime, and some other alkaline substances . . . *

(In: *Essays and observations, physical and literary. Read before a society in Edinburgh and published by them.* Edinburgh, 1756. 21½ cm. vol. 2, p. 157–225)

Reprinted as *Alembic Club Reprints* no. 1.

The experiments announcing the discovery of carbon dioxide; they also showed the possibility of inducing compounds containing the elements magnesium and calcium to pass through a cycle of chemical transformations.

✓ 50. **Priestley, Joseph**, 1733–1804.

? Experiments and observations on different kinds of air. . . London, J. Johnson, 1774–81. *

5 vol. fronts., fold. pl. 21 cm.

Partially reprinted as *Alembic Club Reprints* no. 7.

In vol. 2, p. 29–103, is described the discovery of oxygen together with some of its properties.

✓ 51. **Scheele, Karl Wilhelm**, 1742–1786.

. . . Chemische Abhandlung von der Luft und dem Feuer. Nebst einem Vorbericht von Torbern Bergman. . . Upsala und Leipzig, verlegt von Magn. Swederus, Buchhändler; zu finden bey S. L. Crusius, 1777. *

6 prelim. l., 16, 155, [1] p. fold. pl. 19 cm.

Reprinted as *Ostwald's Klassiker* no. 58 and partially translated as *Alembic Club Reprints* no. 8.

Demonstration that air contains a gas which is necessary for combustion and which is absorbed by a number of solid substances, showing how a gas, which has all the properties of this component of the atmosphere, can be prepared artificially by a number of methods.

52. **Cavendish, Henry**, 1731–1810.

Experiments on air. . . .

(In: Royal society of London. *Philosophical transactions*. London, 1784–85. 24 cm. vol. 74, p. 119–153; vol. 75, p. 372–384; fold. pl.)

Reprinted as *Alembic Club Reprints* no. 3.

The first experimental proof of the fact that when inflammable air (hydrogen) is burned in ordinary air, water is produced.

53. **Lavoisier, Antoine Laurent**, 1743–1794.

Traité élémentaire de chimie, présenté dans un ordre nouveau et d'après les decouvertes modernes . . . Paris, Cuchet, 1789.

2 vol. XIII fold. pl., tables (1 fold.). 21 cm.

The famous overthrow of the phlogiston theory and the starting point of modern chemistry. The first attempt to enumerate a list of true chemical elements and their compounds. It assumes that all compounds are combinations of oxygen with certain acidic elements (acids), or of oxygen with certain basic elements (bases), or compounds of acids and bases (salts). It uses the system of nomenclature perfected by the author with the assistance of Guyton de Morveau, Antoine François de Foureroy, and Claude Berthollet.

54. **Dalton, John**, 1766–1844.

A new system of chemical philosophy . . . Manchester, printed by S. Russell for R. Bickerstaff, London, [etc.], 1808–27. *

2 vol. in 3. 8 pl., tables. 22 cm.

Translated in Ostwald's *Klassiker* no. 3 and partially reprinted in *Alembic Club Reprints* no. 2, 4.

In vol. 1 (1808) are the suggestion that "the ultimate particles of all homogeneous bodies are perfectly alike in weight, figure, etc.," the distinction between simple and compound particles, and the classification of the latter according to the number of simple particles (atoms) present. This theory was communicated to Dr. Thomas Thomson and pub. by him in the third vol. of his *History of Chemistry* (1807).

55. **Avogadro, Amedeo**, 1776–1856.

Essai d'une manière de déterminer les masses relatives des molécules élémentaires des corps, et les proportions selon lesquelles elles entrent dans ces combinaisons.

(In: *Journal de physique, de chimie et d'histoire naturelle*. Paris, 1811. 4to. vol. 73, p. 58–76)

Translated in Ostwald's *Klassiker* no. 8 and *Alembic Club Reprint* no. 4.

Discovery that the changes in volume which take place when gases combine are explained by assuming that the molecules of elementary gases may be composed of more than one atom.

56. **Liebig, Justin, Freiherr von**, 1803–1873.

Ueber einen neuen Apparat zur Analyse organischer Körper, und über die Zusammensetzung einiger organischen Substanzen . . .

(In: *Annalen der Physik und Chemie*. Leipzig, 1831. 8vo. vol. 21, p. 1–42)

Description in detail of the modern method used for the determination of carbon, hydrogen, and nitrogen in organic compounds.

57. **Kekulé von Stradonitz, August, i.e., Friedrich August**, 1829–1896.

Ueber die Constitution und die Metamorphosen der chemischen Verbindungen und über die chemische Natur des Kohlenstoffs . . .

(In: *Justus Liebig's Annalen der Chemie und Pharmazie*. Leipzig und Heidelberg, 1858. 21 cm. vol. 106, p. 129–159)

Reprinted in Ostwald's *Klassiker* no. 145.

Recognition of the tetravalency of the carbon atom in a large number of organic compounds and the presence of a carbon skeleton or nucleus which fixes the structural relations of the atoms in the molecule.

58. **Kirchhoff, Gustav Robert, 1824–1887, and Bunsen, Robert, 1811–1899.**

Chemische Analyse durch Spectralbeobachtungen . . . ?

(In: *Annalen der Physik und Chemie*. Leipzig, 1860–61. 8vo. vol. 110, p. 161–189; vol. 113, p. 337–425)

Reprinted as Ostwald's *Klassiker* no. 72.

Description of the use of the spectroscope and the discovery of the elements rubidium and caesium by its use.

59. **Mendelēev, Dmitrii Ivanovich, 1834–1907.**

Сootношение свойств с атомным вѣсом элементов. . . .

(In: Leningrad. Universitet. Russkoe fisiko-khimicheskoe obshchestvo. *Zhurnal Russkago khimicheskago obshchestva*. [Sanktpeterburg (Leningrad)], 1869. 24 cm. [tom] 1, p. 60–77) ?

German translation: Versuche eines Systems der Elemente nach ihren Atomgewichten und chemischen Functionen (in: *Journal für praktische Chemie*. Leipzig, 1869. 23 cm. vol. 106, p. 251). 1891

Translated in Ostwald's *Klassiker* no. 68.

In this immortal paper Mendelēev presented his discovery of the relations between the atomic weights of the elements and their chemical and physical properties, leading up to his announcement of the Periodic Law three years later.

60. **Gibbs, Josiah Willard, 1839–1903.**

On the equilibrium of heterogeneous substances. . . . ✓

(In: Connecticut academy of arts and sciences. *Transactions*. New Haven, 1874–78. 24 cm. vol. 3, p. 108–248, 343–524; illus.)

In this famous essay Gibbs showed by the use of mathematical processes how thermodynamics may be used in the interpretation of chemical processes, and gave the first demonstration of the Phase Rule. "Workers in the modern experimental science of physical chemistry have returned to it again and again to find their empirical principles forecasted in the light of pure theory and to derive fresh inspiration for new departures."

—Larmor.

61. **Hoff, Jacobus Henricus van't**, 1852-1911.

La chimie dans l'espace . . . Rotterdam, P. M. Bazendijk,
1875. *

43, [1] p. diags. 20 cm.

French translation of the author's Dutch dissertation (Utrecht):
Voorstel tot uitbreiding der tegenwoordig in de scheikunde gebruikte
structuurformules in de ruimte, benevens een daarmee samenhangende
opmerking omtrent het verband tusschen optisch actief vermogen en
chemische constitutie van organische verbindingen. Utrecht, J. Greven,
Sept. 1874.

Establishment of the fact that optically active substances contain at
least one "asymmetric" carbon atom, that is, a carbon atom linked with
four different kinds of atoms or radicals.

62. **Moseley, Henry Gwyn-Jeffreys**, 1887-1915.

The high frequency spectra of the elements.

(In: *London, Edinburgh, and Dublin philosophical magazine and
journal of science*. London, 1913-14. 22½ cm. ser. 6, vol. 26, p. 1024-
1034; vol. 27, p. 703-714; illus., diagr.)

Demonstration of the existence of a simple relation between the
atomic numbers of the elements and the positions of the groups of lines
which characterize their X-ray spectra. By the use of this principle it
first became possible to fix with certainty the true order of the elements
and the fact that only 92 elements exist.

GEOLOGY

63. **Steno, Nicolaus**, 1638–1686.

... De solido intra solidvm natyraliter contento disserta-
tionis prodromvs ad serenissimvm Ferdinandvm II ...
Florentiae [Florence], ex Typographia sub signo stellae,
1669. 7

1 prelim. l., 78 p., 1 l. fold. diagr. 26 cm.

The introduction of observational methods in geology; recognition of the constancy of interfacial angles of crystals; affirmation of the sedimentary origin of many rocks; recognition of mountain-making by faulting and erosion; containing the earliest crystal drawings and the earliest geological sections ever prepared.

64. **Werner, Abraham Gottlob**, 1750–1817.

Von den äusserlichen Kennzeichen der Fossilien ...
Leipzig, S. L. Crusius, 1774. L

302, [2] p. 8 fold. tables. 18 cm.

One of the few literary productions of this great teacher, known for an admirably orderly method and a clear marshalling and coördination of facts such as had never before been seen in mineralogical literature.

65. **Haüy, René Just**, 1743–1822.

Essai d'une théorie sur la structure des cristaux, appli-
quée à plusieurs genres de substances cristallisées. Paris,
Gogué & Née de la Rochelle, 1784. ✓ *

[8], 236 p. 8 pl. 20½ cm.

This work, which contains the first implied statement of the law of rational indices, is generally considered to mark the beginning of crystallography.

66. **Playfair, John**, 1748–1819.

Illustrations of the Huttonian theory of the earth. . . .
Edinburgh, printed for W. Creech; [etc., etc.], 1802.

xx, 528 p. 22 cm.

“Of this great classic it is impossible to speak too highly. For precision of statement and felicity of language it has no superior in English scientific literature.”—Geikie.

67. **Smith, William**, 1769–1839.

A delineation of the strata of England and Wales, with part of Scotland, exhibiting the collieries and mines, the marshes and fen lands originally overflowed by the sea, and the varieties of soil according to the variations in the strata, illustrated by the most descriptive names . . . London, J. Cary, 1815. *

mounted col. map. 257 × 180 cm. in 3 sections in slip-case. 34½ × 30 cm.

A memoir to the map and delineation of the strata of England and Wales, with part of Scotland. . . . London, printed for J. Cary, 1815.

ix p., 1 l., 51, [1] p. II fold. tables (1 col.). 26½ × 21½ cm.

The first attempt to represent on a large scale the geological relations of any extensive tract of ground in Europe. It was a magnificent achievement and was the model of all subsequent geological maps. Furthermore, along with Cuvier and Brongniart, Smith established here the principles of paleontological stratigraphy.

68. **Lyell, Sir Charles, *Bart.*, 1797–1875.**

Principles of geology, being an attempt to explain the former changes of the earth's surface, by reference to causes now in operation. . . . London, J. Murray, 1830–33. *

3 vol. fronts. (1 col.), illus., maps (part fold.), diagrs. 23 cm.

One of the great classics of geology. "It must form an early part of the reading of every man who would wish to make himself an accomplished geologist."—Geikie. It was carried by Charles Darwin on the voyage of the *Beagle*.

69. **Murchison, Sir Roderick Impey, *Bart.*, 1792–1871.**

The Silurian system, founded on geological researches in the counties of Salop, Hereford, Radnor, Montgomery, Caermarthen, Brecon, Pembroke, Monmouth, Gloucester, Worcester, and Stafford; with descriptions of the coalfields and overlying formations. . . . London, J. Murray, 1839.

2 vol. in 1. illus., plates (part fold., part col.), maps. 33 cm.

Pages continuously.

The extension of accurate stratigraphic work to rocks of pre-Devonian age, theretofore called transition rocks and generally thought not amenable to the sort of accurate paleontological and stratigraphic treatment accorded younger rocks. "The publication of this splendid monograph forms a notable epoch in the history of modern geology, and well entitles its author to be enrolled among the founders of the science."—Geikie.

70. **Agassiz, Louis, 1807–1873.**

Étude sur les glaciers . . . Neuchâtel, Jent et Gassmann, 1840.

3 prelim. l., v, 346 p., 1 l. 26 cm. and atlas of 18 pl. 49 cm.

"Agassiz's 'grand work.' His name is enshrined as the true founder of glacial geology."—Geikie.

71. **Sorby, Henry Clifton**, 1826–1908.

On the microscopic structure of crystals, indicating the origin of minerals and rocks.

(In: Geological society of London. *Quarterly journal*. London, 1858. 22 cm. vol. 14, p. 453–500)

This paper marked the introduction of microscopic methods into the study of rocks and initiated the science of petrography.

72. **Heim, Albert**, 1849–

Untersuchungen über den Mechanismus der Gebirgsbildung, im Anschluss an die geologische Monographie der Tödi-Windgällen-gruppe . . . Basel, B. Schwabe, 1878.

2 vol. in 1. 31 cm. and atlas of XVII double pl. (15 col.), incl. 2 maps. 32 cm.

This magnificent classic traced the plications of the Alps from minor to major stages and illustrated the remarkable foldings and overthrust faultings in numerous sections. It inspired Lapworth's brilliant work on the Scottish Highlands.

73. **Suess, Eduard**, 1831–1914.

Das Antlitz der Erde. . . . Prag, F. Tempsky; [etc., etc.], 1885–1909.

3 vol. in 4. front., illus., plates, maps (part fold.), diagrs. 28 cm.

A monumental treatise; easily the greatest single work on the evolution of the earth's surface features; to it Suess devoted his life.

74. **Wiechert, Emil**, 1861–

Theorie der automatischen Seismographen.

(In: K. Gesellschaft der Wissenschaften zu Göttingen. Mathematisch-physikalische Klasse. *Abhandlungen*. Berlin, 1903. 28 cm. neue Folge, Band 2, no. 1)

The basis of all later exact work in instrumental seismology.

BOTANY

75. **Theophrastus.**

... De historia et de causis plantarum libros ut latinos legeremus, Theodorus Gaza ... Tarvisii [Treviso], B. Consalonerius, 1483. **

155 l. folio.

The earliest notable effort at a philosophical treatise on plants from the point of view of the deductive method; it contains a vast amount of accurate and important information in spite of copious errors and superstitions.

76. **Grew, Nehemiah, 1641-1712.**

The anatomy of vegetables begun. With a general account of vegetation founded thereon. ... London, printed for S. Hickman, 1672. *

16 prelim. l., 198 (*i.e.*, 186) p., 1 l., [14] p., 1 l. 3 pl. 15½ cm.

The birth of the microscopic anatomy of plants. (See no. 77.)

77. **Malpighi, Marcello, 1628-1694.**

... Anatome plantarum. Cui subjungitur appendix, iteratas & auctas ejusdem authoris de ovo incubato observationes continens. Regiae societati, Londini ad scientiam naturalem promovendam institutae, dicata. Londini [London], impensis Johannis Martyn, 1675-79. *

2 vol. in 1. 91 pl. (incl. front.). 36 cm.

This treatise, along with Grew's (see no. 76), represents the first attempt to describe the more obvious anatomical and histological features of the stems, leaves, and fruits of plants.

** Indicates items not available for exhibition except in facsimile.

78. **Ray, John**, 1627–1705.

Historia plantarum; species haecenus editas aliasque in-
super multas noviter inventas & descriptas complectens. In
qua agitur primò de plantis in genere, earumque partibus, ac-
cidentibus & differentiis; deinde genera omnia tum summa
tum subalterna ad species usque infimas, notis suis certis &
characteristicis definita, methodo naturae vestigiis insistente
disponuntur . . . Londini [London], typis M. Clark, pro-
stant apud H. Faithorne, 1686–1704.

3 vol. 37 cm.

Volumes 1–2 paged continuously.

An encyclopedic work, in which are summarized not merely the prin-
cipal facts relating to the structure and function of plants as then
known, but also an enormous amount of original observation and philo-
sophic thought, including concise descriptions of 18,000 species of
plants.

79. **Camerarius, Rudolf Jakob**, 1665–1721.

. . . Ad Dn. D. Michaellem Bernardum Valentini . . . De
sexu plantarum epistola.

(In: Leopoldinische deutsche Akademie der Naturforscher. *Miscel-
lanea curiosa*. Lipsiae [Leipzig], Francofurti [Frankfurt], 1696. 21 ×
16½ cm. ser. 3, vol. 3, p. [3]–36)

The catalogue of the British Museum gives the imprint: Tubingae
[Tübingen], 1694. 8°.

Description of the first experimental proof that viable seeds can not
be formed without the coöperation of the pollen.

80. **Hales, Stephen**, 1677–1761.

Vegetable staticks: or, An account of some statical experi-
ments on the sap in vegetables: being an essay towards a nat-
ural history of vegetation. Also, a specimen of an attempt to
analyse the air, by a great variety of chymio-statical experi-

ments; which were read at several meetings before the Royal society . . . London, W. and J. Innys, [etc.], 1727. *

4 prelim. l., ii-vii, (2), 376 p. plates. 20 cm. ?

The first work devoted to a complete account of the nutrition of plants and of the movements of the sap in them; full of new experiments, observations, and measurements and calculations.

81. **Linné, Carl von, 1707-1778.**

. . . Systema naturae, sive Regna tria naturae systematice proposita per classes, ordines, genera, & species . . . Lugduni Batavorum [Leyden], T. Haak, 1735. ** ✓

[7] l. plate, tables. 58 cm.

Virtually the inauguration of the classification of plants and animals.

82. **Jung, Joachim, 1587-1657.**

. . . Opuscula botanico-physica ex recensione et distinctione Martini Fogelii . . . et Ioh. Vagetii . . . Cum eorundem annotationibus accedit Iosephi de Aromatariis . . . Ad Bartholomeum Nanti epistola de generatione plantarum ex seminibus omnia collecta, recognita et revisa novisque annotationiunculis illustrata cura Ioh. Sebast. Albrecht . . . Coburgi [Coburg], G. Ottonis, 1747. *

14 prelim. l., [5]-183, [1] p. $20\frac{1}{2} \times 16\frac{1}{2}$ cm.

"The *Isagoge phytoscopia* [included herein] contains the foundation of the terminology of the parts of plants subsequently established by Linnaeus; the matter of the *Isagoge* is produced in Ray's *Historia plantarum* in italics . . . No more profound or apt definitions were supplied till Schleiden and Nägeli introduced the history of development into the study of morphology."—Sachs.

83. **Kölreuter, Joseph Gottlieb, 1733-1806.**

. . . Vorläufige Nachricht von einigen das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen [mit 3 Fortsetzungen]. Leipzig, Gleditschische Handlung, 1761-66. *

4 vol. fold. table. $21\frac{1}{2}$ cm.

These four celebrated papers contain a large number of correct observations and conclusive experiments relating to the mechanism of pollination and the production of hybrids. In the opinion of Sachs "they contain the best knowledge which we possess on the question of sexuality [in plants] and have not become antiquated after the lapse of more than a hundred years."

84. **Sprengel, Christian Konrad, 1750–1816.**

Das entdeckte Geheimniss der Natur im Bau und in der Befruchtung der Blumen . . . Berlin, Vieweg, 1793. *

[6] p., 444 numb. col., [222, 4] p. 25 pl. 4to.

This quaint and beautiful treatise was first called to the attention of the world by Darwin. It was Sprengel who first showed the part played by insects in the fertilization of flowers.

85. **Humboldt, Alexander, *Freiherr von*, 1769–1859, and Bonpland, Aimé Jacques Alexandre Goujaud, *called*, 1773–1858.**

Ideen zu einer Geographie der Pflanzen nebst einem Naturgemälde der Tropenländer, auf Beobachtungen und Messungen gegründet, welche . . . in den Jahren 1799, 1800, 1801 und 1803 angestellt worden sind . . . Tübingen, F. G. Cotta; etc., etc., 1807.

2 prelim. l., xii, 182 p. front., fold. map. 33 cm. (Added title-page: A. von Humboldt und Aimée Bonpland's Reise. 1. Abt.: Allgemeine Physik und historischer Theil . . . Band I)

The virtual creation of vegetable geography; the remarkable adaptation of plants to their environment, the landscape-forming types, and the celebrated comparison of altitude and latitude.

86. **Brongniart, Adolphe Theodore, 1801–1876.**

Histoire des végétaux, fossiles, ou Recherches botaniques et géologiques sur les végétaux renfermés dans les diverses couches du globe . . . Paris et Amsterdam, chez G. Dufour et E. d'Ocagne, 1828–38.

2 vol. in 1. and atlas of 199 pl. (part fold.). 30 cm.

Volume 2 has imprint: Paris, Crochard et compie., 1837; the original paper cover of livr. 15 bears the date 1838.

By general agreement considered the foundation treatise on paleobotany.

87. **Mohl, Hugo von**, 1805–1872.

Vermischte Schriften botanischen Inhalts. . . . Tübingen, L. F. Fues, 1845.

viii, 442 p. XIII pl. (part col.). 28 cm.

Dissertations and papers from journals, 1830–42, reprinted with additional material.—*cf.* Author's preface.

The collected earlier works of the most important of the founders of plant cytology.

88. **Nägeli, Karl Wilhelm von**, 1817–1891.

Die Stärkekörner. Morphologische, physiologische, chemisch-physicalische und systematisch-botanische Monographie . . . Unter Mitwirkung von Dr. C. Cramer und Dr. B. Wartmann . . . Zürich, F. Schulthess, 1858.

2 prelim. l., x, 623, [1] p. illus., 16 pl., diagr. $28\frac{1}{2} \times 24$ cm. (Added title-page: Pflanzenphysiologische Untersuchungen, von Carl Nägeli und Carl Cramer. 2. Heft, von Carl Nägeli. Die Stärkekörner.)

This study of starch grains in Sachs's judgment formed an epoch not only in phytotomy but in the general knowledge of organized bodies.

89. **Hooker, Sir Joseph Dalton**, 1817–1911.

On the flora of Australia, its origin, affinities, and distribution; being an introductory essay to the Flora of Tasmania. . . . London, L. Reeve, 1859.

cxxvii p. $31\frac{1}{2} \times 25\frac{1}{2}$ cm.

“Reprinted from the Botany of the Antarctic expedition [London, 1844–60], Part III., Flora of Tasmania, Vol. I.”

Outlines of the distribution of Arctic plants. . . . Read June 21st, 1860.

(In: Linnean society of London. *Transactions*. London, 1862. 29 $\frac{1}{2}$ cm. vol. 23, p. 251–348; col. map, tables)

These two papers are perhaps the greatest, in a philosophical sense, from Hooker's pen. They represent the most scientific treatment hitherto

accorded a large area from the point of view of a plant geographer; the first one was completed before the *Origin of Species* appeared (the same year, 1859), and represented Hooker's independent reasoned statement, after most extensive and detailed study, that species are derivative and mutable.

89A. **Hofmeister, Wilhelm Friedrich Benedict**, 1824–1877.

On the germination, development, and fructification of the higher Cryptogamia, and on the fructification of the Coniferae. . . . Translated by Frederick Currey . . . London, pub. for the Ray society, by Robert Hardwicke, 1862.

xvii, 506 p. LXV pl., port. 22 cm.

"The results of these investigations were magnificent beyond all achieved before or since in the domain of descriptive botany. . . . When Darwin's theory was given to the world eight years after Hofmeister's investigations, the relations of affinity between the great divisions of the vegetable kingdom were so well established and so patent, that the theory of descent had only to accept what genetic morphology had actually brought to view."—Sachs.

90. **Vries, Hugo de**, 1848–

Die Mutationstheorie. Versuche und Beobachtungen über die Entstehung von Arten im Pflanzenreich . . . Leipzig, Veit & comp., 1901–03.

2 vol. illus., 12 col. pl. 25 cm.

The celebrated demonstration of discontinuous change in the characters of species.

ZOOLOGY

91. Vesalius, Andreas, 1514-1564.

... De humani corporis fabrica libri septem ... Basileae
[Basel], [I. Oporinus, 1543]. *

5 prelim. l., 312, 213-391, 492-661, 658-659, [37] p. incl. illus., diagrs.
pl., port. 44 cm.

With 23 full-page wood-cut illustrations as well as many smaller
wood-cut illustrations and initials, probably the work of Stephen Van
Calcar.

The information furnished in this epochal treatise by the unwearied
labors of its youthful author not only founded modern anatomy but es-
tablished the success of the method of independent observation and in-
terpretation as against authority.

92. Hooke, Robert, 1635-1703.

Micrographia: or, Some physiological descriptions of mi-
nute bodies made by magnifying glasses ... London, printed *later?*
by J. Martyn and J. Allestry, 1665.

18 prelim. l., 246, [10] p. XXXVIII pl. (part fold.). 31 cm.

Among the earliest landmarks in the history of microscopy stands
this memorable treatise, illustrated by figures remarkable for their ac-
curacy and beauty (probably by Sir Christopher Wren).

93. Redi, Francesco, 1626-1698.

Esperienze intorno alla generazione degl' insetti fatte da
Francesco Redi ... e da lui scritte in una lettera all' illus-
trissimo Signor Carlo Dati. Firenze [Florence], all' insegna
della Stella, 1668. *

3 prelim. l., 228 p. illus., plates (part fold.). 24 cm.

The first hard blow to the doctrine of spontaneous generation: Redi
confuted the idea, then prevalent, that grubs and maggots develop spon-
taneously in decaying matter.

✓ 94. **Leeuwenhoek, Anthony van, 1632–1723.**

Arcana naturae . . . Delphis Batavorum [Delft], apud Henricum a Krooneveld, 1695. *

3 prelim. l., 568 p., 6 l. front. (port.), illus., pl. (part fold.). 20 cm.

Latin translation, and much better known than the original Dutch editions, of Leeuwenhoek's pioneer observations. Leeuwenhoek allowed himself to wander through Nature with microscopes which he himself constructed, finding new wonders at every turn. Among other famous finds were the discoveries of bacteria and spermatozoa.

— 95. **Réaumur, René Antoine Ferchault de, 1683–1757.**

Mémoires pour servir à l'histoire des insectes. . . . Paris, de l'Imprimerie royale, 1734–42.

6 vol. fold. pl. 26 cm.

A later vol. (7) was pub., from manuscript left by the author, in 1928.

The one great classic on the life history and bionomics of insects.

96. **Swammerdam, Jan, 1637–1680.**

2 delen
Bybel der natuure . . . Of, Histoire der insecten, tot zekere soorten gebracht: door voorbeelden, ontleedkundige onderzoekingen van veelerhande kleine gediertens, als ook door kunstige kopere plaaten opgeheldert. Verrykt met ontelbaare waarnemingen van nooit ontdekte zeldzaamheden in de natuur. Alles in de Hollandsche, des auteurs moedertaale, beschreven. Hier by komt een voorreden waar in het leven van den avtevr beschreven is door Herman Boerhaave . . . de Latynsche overzetting heeft bezorgt Hieronimus David Gaubius . . . Leyden, I. Severinus, [etc.], 1737–38. *

2 vol. 53 fold. pl. 40 cm.

"The *Bybel der Natuure* is the finest collection of microscopical observations ever produced by one worker."—Singer.

97. **Buffon, Georges Louis Leclerc, Comte de, 1707–1788.**

Histoire naturelle, générale et particulière, avec la description du Cabinet du roy . . . [ser. 1–6] Paris, Imprimerie royale, [etc.], 1749–1804.

44 vol. in 45. front., ports., plates (part col., part fold.), maps (part col.). 29 cm.

Ser. 1, vol. 3, p. 1–297, Description du Cabinet du roy, by M. Daubenton; ser. 1, vol. 4–15, Quadrupèdes, by M. de Buffon and M. Daubenton. Ser. 2, by M. de Buffon and M. Gueneau de Montbeillard. Ser. 4–6, by M. le Comte de La Cépède.

Perhaps the most celebrated treatise on animals ever produced; embedded in its prolix and lavish volumes will be found an adequate answer to the charge that Buffon was a “talented dilettante,” and support for Nordenskiöld’s declaration that “in the purely theoretical sphere he was the foremost biologist of the eighteenth century, the one who possessed the greatest wealth of ideas, of real benefit to subsequent ages and exerting an influence stretching far into the future.”

98. **Morgagni, Giovanni Battista, 1682–1771.**

. . . De sedibus, et causis morborum per anatomen indagatis libri quinque. Dissectiones, et animadversiones, nunc primū editas, complectuntur propemodum innumeras, medicis, chirurgis, anatomicis profuturas. . . Venetiis [Venice], ex Typographia Remondiniana, 1761. *

2 vol. in 1. front. (port.). 37 cm.

Virtually the creation of pathological anatomy. “Upon this solid foundation the morbid anatomy of modern clinical medicine was built.” —Osler.

99. **Wolff, Caspar Friedrich, 1733–1794.**

De formatione intestinorum praecipue, tum et de amnio spurio, aliisque partibus embryonis gallinaei, nondum visis, observationes, in ovis incubatis institutae. . . .

(In: Akademiia nauk, Leningrad. *Nova commentarii Academiae scientiarum imperialis petropolitanae*. Petropoli [Leningrad], 1768–69, 25½ × 20 cm. tom. 12, p. 403–507; tom. 13, p. 478–530; 2 fold. pl.)

This work, rather than the *Theoria Generationis*, was Wolff's greatest contribution to embryology. It is a model of observation and deduction. It remained largely unknown until Meckel's translation, *Über die Bildung des Darmkanals im bebrüteten Hühnchen* (Halle, Renger, 1812), 263, [1] p., 2 fold. pl.

✓ 100. **Spallanzani, Lazzaro, 1729–1799.**

Dissertazioni di fisica animale, e vegetabile . . . Modena, La Societa' tipografica, 1780. *

2 vol. in 3. 3 fold. pl. 24 cm.

Extending the work of Réaumur, came these notable experiments on the solvent power of gastric juice and on its prevention of putrefaction.

✓ 101. **Jenner, Edward, 1749–1823.**

An inquiry into the causes and effects of the variolae vaccinae, a disease discovered in some of the western counties of England, particularly Gloucestershire, and known by the name of the cow pox. . . . London, printed for the author, by Samson Low, 1798. *

2 prelim. l., (iii)–iv p., 1 l., 75 p. 4 col. pl. 27½ × 22 cm.

The greatest discovery, with respect to its far-reaching beneficence, of any ever made in the realm of preventive medicine.

102. **Cuvier, Georges, Baron, 1769–1832.**

Leçons d'anatomie comparée de G. Cuvier ... Recueillies et publiées sous ses yeux par C. Duméril ... Paris, Baudouin, an VIII [1800]–an XIV, 1805. *

5 vol. LII pl., 7 fold. tables. 21 cm.

Volumes 3–5 ed. by G. L. Duvernoy.

The foundation treatise in comparative anatomy.

103. **Lamarck, Jean Baptiste Pierre Antoine de Monet de, 1744–1829.**

Philosophie zoologique, ou Exposition des considérations relatives à l'histoire naturelle des animaux ... Paris, Dentu; l'auteur, 1809. *

2 vol. 21 cm.

The classical account of Lamarck's theory of evolution, first adumbrated in his *Système des Animaux sans Vertèbres* (1801).

104. **Cuvier, Georges, Baron, 1769–1832.**

Recherches sur les ossemens fossiles de quadrupèdes, où l'on rétablit les caractères de plusieurs espèces d'animaux que les révolutions du globe paroissoient avoir détruites ... Paris, Deterville, 1812. *

4 vol. 154 pl. (22 fold.), fold. col. map. 30½ cm.

The foundation of vertebrate paleontology. "In the whole literature of comparative anatomy & paleontology there is scarcely any work that can rank with this great masterpiece of Cuvier."—Zittel.

105. **Baer, Karl Ernst von, 1792–1876.**

Über Entwicklungsgeschichte der Thiere. Beobachtung und Reflexion ... Königsberg, Gebrüder Bornträger, 1828–37.

2 vol. VII pl. (part col., fold.), fold. table. 26 cm.

"Through this book von Baer created modern embryology, not only as an independent field of research, but also as an important branch of comparative anatomy and a means of proving the affinity of different animal forms."—Nordenskiöld.

✓ 106. **Schwann, Theodor**, 1810–1882.

Mikroskopische Untersuchungen über die Uebereinstimmung in der Struktur und dem Wachsthum der Thiere und Pflanzen . . . Berlin, Sander'sche Buchhandlung (G. E. Reimer), 1839. *

xviii, 270 p. IV fold. pl. 20 cm.

The foundation of the cell theory for plants and animals. The cell theory ranks with the evolution theory in the far-reaching influence it has exerted on the growth of modern biology.

∩ 107. **Bernard, Claude**, 1813–1878.

Sur une nouvelle fonction du foie chez l'homme et les animaux . . . (Extrait par l'auteur.)

(In: Académie des sciences, Paris. *Comptes rendus*. Paris, 1850. 26 cm. vol. 31, p. 571–574)

The discovery of the glycogenic function of the liver.

∩ 108. **Pasteur, Louis**, 1822–1895.

Mémoire sur la fermentation appelée lactique. . .

(In: *Annales de chimie et de physique*. Paris, 1858. 21 cm. 3^e sér., tome 52, p. 404–418)

The isolation of the organisms which sour milk—a memorable landmark—the birth of bacteriology.

∩ 109. **Virchow, Rudolf Ludwig Karl**, 1821–1902.

Die Cellularpathologie in ihrer Begründung auf physiologische und pathologische Gewebelehre. . . Berlin, A. Hirschwald, 1858. *

xvi, 440 p. illus. 23 cm.

The classical application of the cell theory to diseased tissues, which may be said to have founded modern histo-pathology.

✓ 110. **Darwin, Charles Robert**, 1809–1882.

On the origin of species by means of natural selection, or, The preservation of favored races in the struggle for life. . . London, J. Murray, 1859.

ix, [1], 502 p. fold. diagr. 20 cm.

"The broad fact remains that, since the publication and by reason of the publication of *The Origin of Species* the fundamental conceptions and the aims of the student of living Nature have been completely changed."—Huxley.

111. **Helmholtz, Hermann Ludwig Ferdinand von, 1821–1894.**

Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik. . . Braunschweig, F. Vieweg und Sohn, 1863. *

xi, [1], 600 p. illus., diags. 22 cm.

The foundation treatise on audition, exhibiting unparalleled profundity of analysis and intellectual sweep.

112. **Mendel, Gregor Johann, 1822–1884.**

Versuche über Pflanzen-Hybriden. . .

(In: Naturforschender Verein in Brünn. *Verhandlungen*. Brünn, 1866. 24 cm. IV. Band, "Abhandlungen," p. [3]–47)

The memorable account of Mendel's experiments with peas in the monastery garden at Brünn, which founded the scientific study of heredity.

113. **Wundt, Wilhelm Max, 1832–1920.**

Grundzüge der physiologischen Psychologie . . . Leipzig, W. Engelmann, 1874.

xii, 870, [2] p. illus., diags. 24 cm.

The foundation of its subject; Wundt's book has been designated as "the most important book in the history of modern psychology."

114. **Koch, Robert, 1843–1910.**

Zur Untersuchung von pathogenen Organismen . . .

(In: Germany. Gesundheitsamt. *Mittheilungen*. Berlin, 1881. 31 cm. 1 Band, p. 1–48; XIV pl.)

The basis of modern bacteriological technique—the method of obtaining pure cultures of micro-organisms by "plating" nutrient media containing gelatin.

HEARST MEDICAL PAPYRUS

IN ADDITION to the books and portraits, there are on exhibit some portions of the Hearst Medical Papyrus, which is the subject of a symposium at a joint session of Sections L and N of the A.A.A.S. on Friday forenoon, June 22.

The Hearst Medical Papyrus was acquired in 1901 near Dêl-el-Ballâs by the Hearst Egyptian Expedition and is now in the Anthropological Museum of the University of California. "The roll had not been opened since antiquity as was manifest in the set of the turns, the fine dust, and the casts of insects. The beginning of the roll was inside. In the middle of the first page preserved, the papyrus had been torn in two in antiquity and rolled up with the torn page inside.

"The roll as preserved contains eighteen columns or parts of columns. The pages are not numbered. So it is impossible to estimate with any certainty the original size of the papyrus. Personally I doubt whether more than one or two pages are lost. . . .

"Judging by the script, the papyrus must be dated to about the same period as the Ebers [papyrus] (*i.e.*, previous to the 9th year of Amenophis I). . . . the provenance of the papyrus as well as its script points to the period between the twelfth and eighteenth dynasties as the period in which the Hearst papyrus was written."

"... The Hearst papyrus, although it does not mention the name of any physician or temple, is . . . made up of smaller collections. . . . in fact, the Hearst papyrus draws its material from the same sources as the Ebers. These

sources, however, deliver their material so inexactly that they must have been to some extent traditional. . . .

“Thus at the time when the Hearst and the Ebers collections were made, the practical medical knowledge of the Egyptians, it appears, was contained in a great number of small collections of prescriptions. These small collections had probably been gathered in practice by different physicians stationed in different towns or dependant [!] on different temples and were handed down partly in writing and partly by word of mouth. The large collections were then made by some travelling physician or by some priest in a center of pilgrimage for his own use in the practice of medicine or in the instruction of other physicians. Whether the actual papyri we now have are the original collections or only copies is a question which it is impossible to answer . . . The Hearst papyrus, found in a mud brick house in a provincial town, probably served as a book of reference for the local physician, and, less carefully arranged than [the] Ebers [papyrus], seems to have been made for this very purpose. . . . It is probable that Clement of Alexandria . . . referred to some such collection of remedies in his account of the hermetical books of medicine [!] of the Egyptians. It is probable even that in the Greek period some great priestly collection, more complete even than the Ebers, embodying all that the Egyptians knew of medicine [!], had come into universal use and had come finally to be almost scriptural in its authority. Even in the period of the Hearst and the Ebers papyri, the tendency to gain authority for certain prescriptions and collections, is visible in the ascription to them of supernatural origin. . . . There is no statement nor any implied claim in either of the papyri that it is sacred or canonical. On the contrary, the author of each dealing with the same material feels

at liberty to arrange it as suits his convenience. In a word, neither the Hearst papyrus nor the Ebers is an hermetical book of medicine[!] but only a collection of practical remedies intended for the use of practising physicians." (Quotations from Reisner, George A. : *The Hearst medical papyrus* (California. University. Publications: *Egyptian archaeology*, vol. 1 (Leipzig, 1905)), p. 1, 4.)