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The 51st California International Antiquarian Book Fair, Pasadena, 9-11 February 2018



Rare and important books & manuscripts in science and medicine, by Christian Westergaard.

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A founding work of spectroscopy

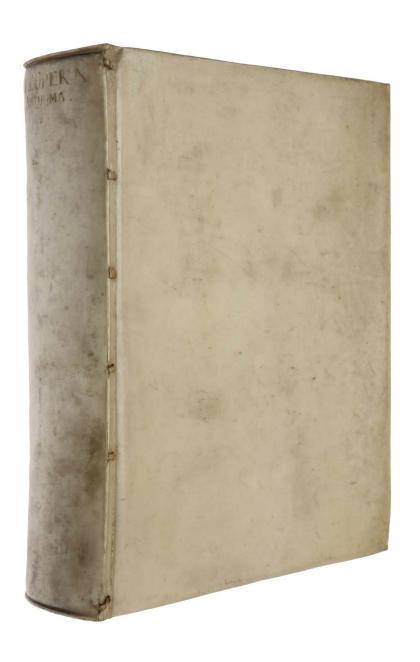
ÅNGSTRÖM, Anders Jonas. Recherches sur le Spectre Solaire. [With:] Spectre normal du soleil. Atlas. Uppsala: W. Schultz, 1868. **\$8,000**

First edition, rare in unrestored original printed wrappers, of one of the founding works of spectroscopy in which Ångström demonstrated the presence of hydrogen and a number of other elements in the sun; the atlas contains his great map of the solar spectrum.

Norman 56; Richard Green 11; Honeyman 96.

Large 4to, pp. [iv], 42, xv, [1], with lithographed frontispiece showing Ångström's spectrometer; Atlas: Oblong folio, [ii], with six plates by Robert Thalén (1827-1905). Original brown printed wrappers.





'Ethics, Demonstrated in Geometrical Order'

B. d. S. [SPINOZA, Benedictus de]. *Opera Posthuma*. [Amsterdam: Jan Rieuwertsz], 1677.

\$17,500

First edition, and a very fine copy, of Spinoza's *Opera* which "has served, then and since, with the *Tractatus Theologico-Politicus*, to immortalize his name" (PMM 153). The first work in the volume is Spinoza's one indisputable masterpiece: *Ethica, ordine geometrico demonstrata* - perhaps the most ambitious attempt to apply the method of Euclid in philosophy.

Norman 1988; See PMM 153.

4to, pp. [40], 614, [34], 112, [8]. Contemporary vellum, handwritten title to spine. A very fine and fresh copy with no restoration at all. Rare in such good condition.

A crucial moment in the history of calculus

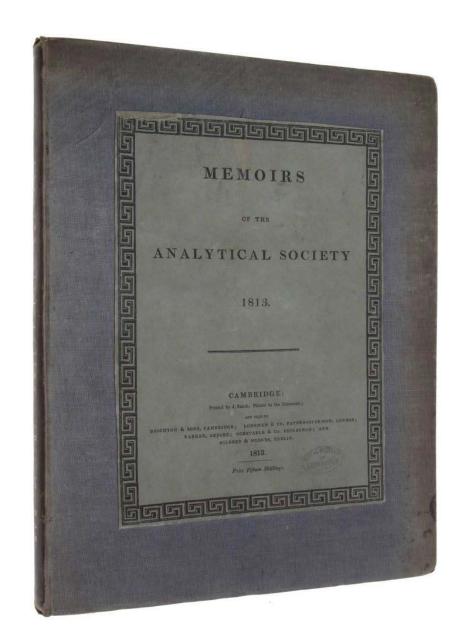
BABBAGE, Charles and HERSCHEL, John. *Memoirs of the Analytical Society 1813.* Cambidge: Smith, 1813.

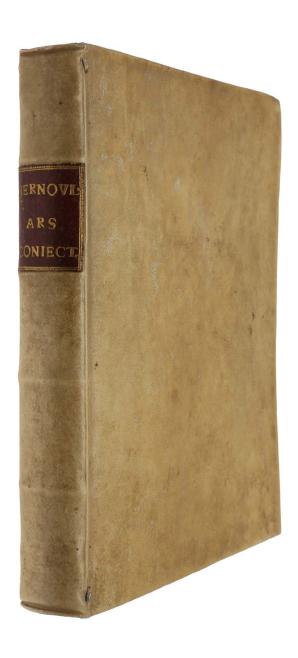
\$12,500

First edition, extremely rare, of the only volume of the *Memoirs of the Analytical Society*, written entirely by Babbage and Herschel. The aim of the society was to promote the Leibnizian approach to calculus as opposed to Newtonian fluxions.

Origins of Cyberspace 17 (lacking last two leaves of the Babbage paper). OCLC lists two copies in the US (Brown and NYPL) and one in UK.

4to, pp. [iv], xxii, [ii], 114. Uncut in contemporary cloth, spine lettered in gilt with original printed front wrapper pasted onto upper cover and original blank rear wrapper bound in at end.





The finest copy we have seen

BERNOULLI, Jacob. Ars conjectandi. Basel: Thurnisiorum, 1713.

\$40,000

First edition, an exceptionally fine copy, rare in this condition. Bernoulli's posthumous treatise was the first significant book on probability theory: it set forth the fundamental principles of the calculus of probabilities and contained the first suggestion that the theory could extend beyond the boundaries of mathematics to apply to civic, moral and economic affairs.

PMM 179; Dibner 110; Evans 8; Grolier/Horblit 12; Sparrow 21; Norman 216.

4to, contemporary vellum, pp [4] 1-306, 1-35 [1], printed folding tables between pp. 24-25 and 172-173, folding woodcut diagram after p. 306. An outstanding copy, entirely unrestored.

Binary Automatic Computer

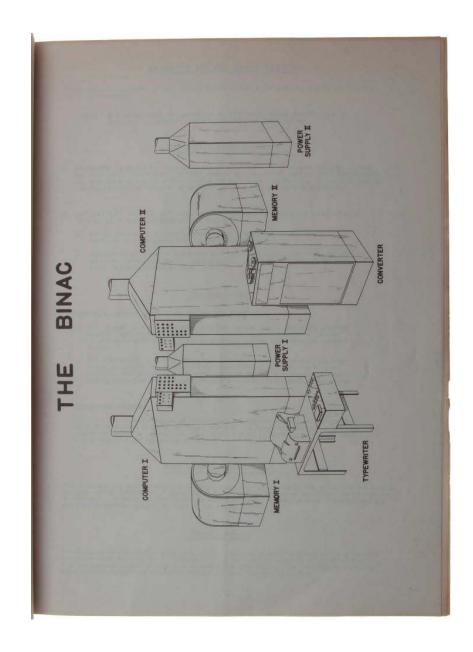
[ECKERT, John Presper. & John MAUCHLY]. *The BINAC*. Eckert-Mauchly Corp. 1949.

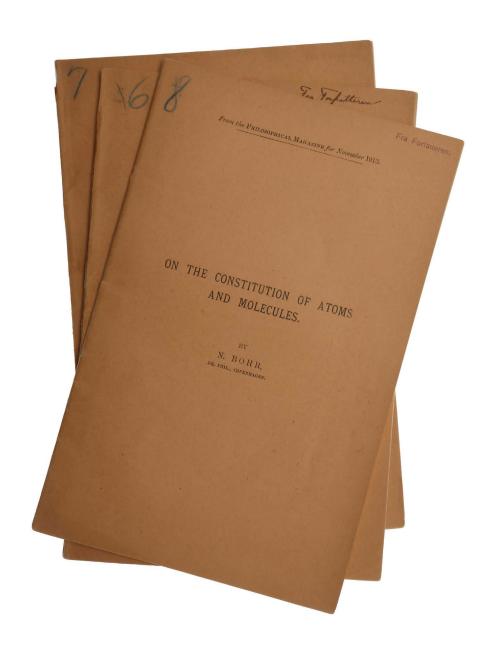
\$4,500

Rare original sales brochure for Eckert and Mauchly's BINAC, the first operational stored-program computer in the United States. "Had it been finished on time [i.e., by May 15, 1948] it would have been in contention with the British computers as the first working electronic stored-program computer.

Origins of Cyberspace 1145.

Reproduced typescript, stapled, 8 sheets, including full page illustration. Very fine condition, scarce.





The birth of modern atomic physics

BOHR, Niels. *On the Constitution of Atoms and Molecules, I-III.* London: Taylor & Francis, 1913.

\$55,000

Extremely rare author's presentation offprints of his great trilogy, "Bohr's three-part paper postulated the existence of stationary states of an atomic system whose behavior could be described using classical mechanics, while the transition of the system from one stationary state to another would represent a non-classical process accompanied by emission or absorption of one quantum of homogeneous radiation, the frequency of which was related to its energy by Planck's equation" (Norman).

8vo, original wrappers, first part inscribed in Bohr's hand, second and third part with his rubberstamp 'Fra Forfatteren' (i.e, 'From the author').

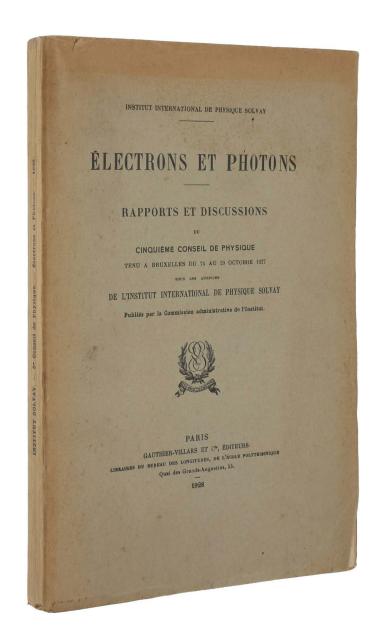
'God does not play dice'

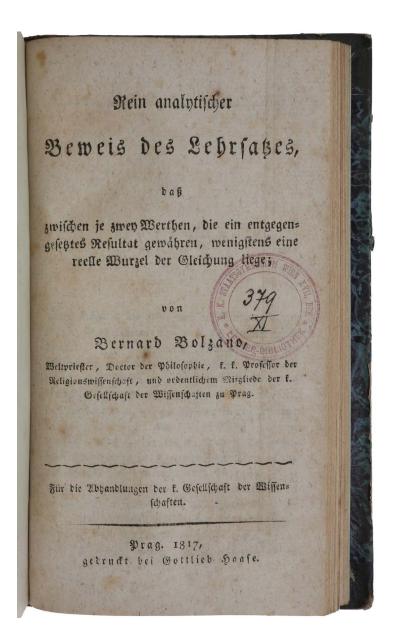
BOHR, Niels; EINSTEIN, Albert; et al. *Électrons et Photons.* Paris: Gauthier Villars, 1928.

\$5,000

First edition of the proceedings of the 5th Solvay Congress, where the debate between Bohr and Einstein on the consistency and completeness of quantum mechanics began. It was at this, the most famous of the Solvay conferences, that Einstein, disenchanted with Heisenberg's uncertainly principle, made his famous remark that "God does not play dice," to which Niels Bohr replied, "Einstein, stop telling God what to do!" Seventeen of the twenty-nine attendees were or became Nobel Prize winners.

8vo, pp. viii, 289, with frontispiece portrait of Lorentz. Uncut and unopened in the original printed wrappers.





The first rigorous foundation for calculus

BOLZANO, Bernard. *Rein analytischer Beweis des Lehrsatzes...* [Bound with two other works by Bolzano, his doctoral thesis and his autobiography]. Prague: Gottlieb Haase, 1817.

\$35,000

First edition, extremely rare, of this epoch-making paper in the history of mathematics, the first to provide a rigorous foundation for the calculus, four years before Cauchy's *Cours d'analyse*. No copy listed in U.S. libraries.

Parkinson, Breakthroughs 265.

Three works bound in one, 8vo, [Rein analytischer Beweis:] pp. 60; [Betrachtungen:] pp. [xvi], 63, [1], with one folding engraved plate; [Lebensbeschreibung:] pp. lvi, 272 with engraved portrait frontispiece. Contemporary half-roan and marbled boards.

Boolean algebra

BOOLE, George. The mathematical analysis of logic, being an essay towards a calculus of deductive reasoning. Cambridge: Macmillan, Barclay & Macmillan, 1847.

\$38,000

First edition, very rare in commerce, of Boole's first book, the birth of modern symbolic logic and the first presentation of 'Boolean algebra' - this is the copy of the great economist John Maynard Keynes (1883-1946).

Landmark Writings in Western Mathematics 36.

8vo, pp. [ii], [1-2], 3-82, errata slip tipped onto title verso, interleaved with blanks throughout. 19th-century half-calf.

http://sophiararebooks.com/4294

THE MATHEMATICAL ANALYSIS

OF LOGIC.

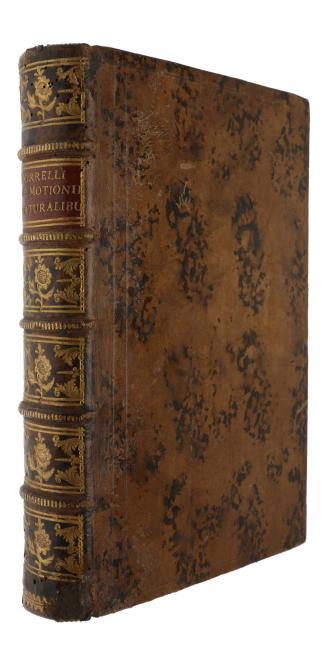
BEING AN ESSAY TOWARDS A CALCULUS OF DEDUCTIVE REASONING

BY GEORGE BOOLE.

Επικοινωνούσι δε πάσαι αι επιστήμαι άλλήλαις κατά τα κοινά. Κοινά δε λέγω, οίς χρώνται ώς έκ τούτων αποδεικνύντες άλλ' οὐ περί ὧν δεικνύουσιν, ARISTOTLE, Anal. Post., lib. 1. cap. XI.

MACMILLAN, BARCLAY, & MACMILLAN; LONDON: GEORGE BELL.

1847



The first treatise on capillarity

BORELLI, Giovanni Alfonso. *De motionibus naturalibus a gravitate pendentibus.* Bologna:Ferri, 1670.

\$8,500

First edition of Borelli's second book on mechanics. It "is important as the first treatise on capillarity. It contains the important investigations from which the author formulated the law that the height of the ascent of liquids in capillary tubes is inversely proportional to their diameters. His investigations also led him to the conclusion that the phenomenon of capillarity is independent of the pressure of air." (Roberts & Trent, *Bibliotheca Mechanica*, p. 42).

4to, pp. 4, 566, [5], 18th-century mottled calf, spine gilt.

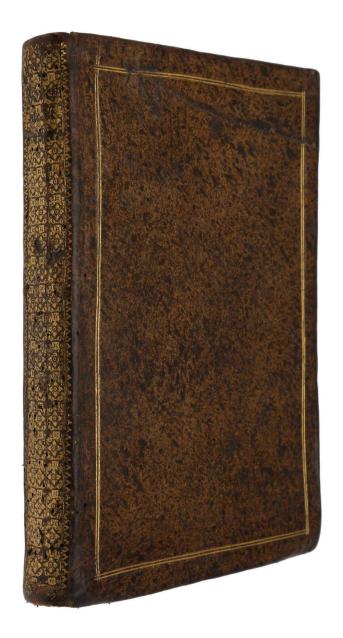
Presented by the founder of the Accademia del Cimento

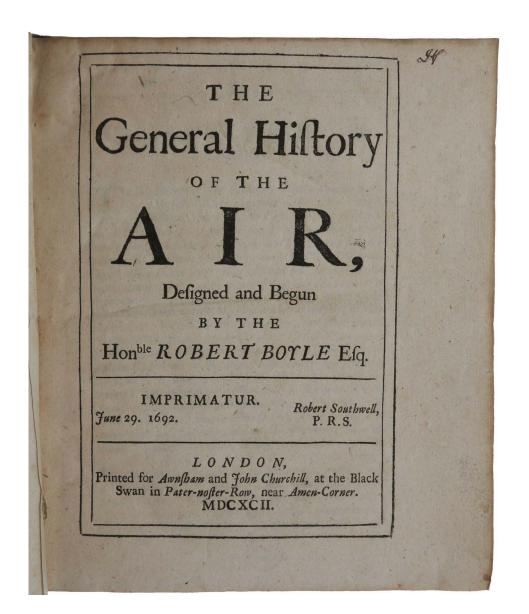
BORELLI, Giovanni Alfonso. *De vi percussionis liber.* Bologna: Giacopo Monti, 1667.

\$15,000

First edition, an extraordinary association copy, of the first published book on the laws of percussion, and containing important hitherto unpublished material from the lectures of Galileo and Torricelli. This copy was a gift from Prince Leopold of Tuscany, Borelli's patron at the Tuscan court.

4to, pp. [xii], 300, 30, [2, errata], with 5 folding engraved plates. Contemporary Italian speckled calf with double fillet gilt borders to sides; spine richly gilt-tooled in a floral pattern of oriental design, an exquisite and unusual binding intended for presentation.





First clear statement of the kinetic theory of gases

BOYLE, Robert; [LOCKE, John]. *The General History of the Air.* London: Awnsham and Churchill, 1692.

\$12,000

First edition of this rare work on the nature of gases, seen through the press by Boyle's friend John Locke and containing some of Locke's own early meteorological observations. The product of Boyle's life's work on gases, the *General History* "is of special interest in that it sums up his ultimate conclusions" (Fulton). The work is of considerable importance in the history of science – not only did the views Boyle expressed here become the basis for the phlogiston theory of combustion, it also contained the first clear statement of the kinetic theory of gases.

4to, pp. xii, 259, [1], woodcut diagrams, contemporary English calf. A fine copy.

Discovery of the Compton effect

COMPTON, Arthur Holly. *A Quantum Theory of the Scattering of X-rays by Light Elements.* Lancaster: APS, 1923.

\$4,500

First edition of this landmark paper in modern physics, which demonstrated the existence of quanta of electromagnetic radiation, later called photons. "This discovery created a sensation among the physicists of the time... It is probably the most important discovery which could have been made in the current state of physics" (*Pais*). The explanation and measurement of the Compton effect earned Compton a share of the Nobel Prize in physics in 1927.

Brandt, *The Harvest of a Century*, Chapter 31.

In: Physical Review, Second Series, Vol. 25, No. 5, May 1923, pp. 483-502. The complete issue offered in original wrappers.

http://sophiararebooks.com/3588

Second Series

May, 102

Vol. 21, No. 5

THE

PHYSICAL REVIEW

A QUANTUM THEORY OF THE SCATTERING OF X-RAYS BY LIGHT ELEMENTS

BY ARTHUR H. COMPTON

ABSTRAC

A quantum theory of the scattering of X-rays and y-rays by light elements. -The hypothesis is suggested that when an X-ray quantum is scattered it spends all of its energy and momentum upon some particular electron. This electron in turn scatters the ray in some definite direction. The change in tion results in a recoil of the scattering electron. The energy in the scattered quantum is thus less than the energy in the primary quantum by the kinetic energy of recoil of the scattering electron. The corresponding increase in the wave-length of the scattered beam is $\lambda_0 - \lambda_0 = (2h/mc) \sin^2 4\theta = 0.0484 \sin^2 4\theta$ where h is the Planck constant, m is the mass of the scattering electron, c is ray. Hence the increase is independent of the wave-length. The distribution of the scattered radiation is found, by an indirect and not quite rigid method, to be concentrated in the forward direction according to a definite law (Eq. 27). by the classical Thomson theory in the ratio $1/(1+2\alpha)$, where $\alpha=k/mc\lambda_0$ = 0.0242/ λ_0 . Of this energy a fraction $(1 + \alpha)/(1 + 2\alpha)$ reappears as scattered radiation, while the remainder is truly absorbed and transformed into kinetic energy of recoil of the scattering electrons. Hence, if oo is the scattering absorption coefficient according to the classical theory, the coefficient according to this theory is $\sigma = \sigma_0/(1+2\alpha) = \sigma_s + \sigma_0$, where σ_0 is the true scattering coefficient $[(1+\alpha)\sigma/(1+2\alpha)^{\eta}]$, and σ_a is the coefficient of absorpgiven which show that for graphite and the Mo-K radiation the scattered radiation is longer than the primary, the observed difference $(\lambda_{\pi/2} - \lambda_0 = .022)$ being close to the computed value .024. In the case of scattered γ-rays, the wave-length has been found to vary with θ in agreement with the theory, increasing from .022 A (primary) to .068 A ($\theta = 135^{\circ}$). Also the velocity of secondary β-rays excited in light elements by γ-rays agrees with the suggestion that they are recoil electrons. As for the predicted variation of absorption with A, Hewlett's results for carbon for wave-lengths below 0.5 A are in excellent agreement with this theory; also the predicted concentration in the forward direction is shown to be in agreement with the experimental results,

THÉORIE

DES

MACHINES SIMPLES,

EN AYANT ÉGARD AU FROTTEMENT DE LEURS PARTIES, ET A LA ROIDEUR DES CORDAGES.

Piece qui a remporté le Prix double de l'Académie des Sciences pour l'année 1781.

La Raison a tant de formes, que nous ne savons à laquelle nous prendre; l'Expérience n'en a pas moins.

Essai DE MONTAIGNE, Liv. III, ch. 13.

Par M. COULOMB, Chevalier de l'Ordre de SAINT LOUIS, Capitaine en premier au Corps Royal du Génie, pour lors Correspondant, & depuis Membre de l'Académie des Sciences.



A PARIS,

De l'Imprimerie de MOUTARD, Imprimeur-Libraire de la REINE, de MADAME, de Madame la Comtesse d'Artois, & de L'Académie Royale des Sciences, rue des Mathurins, Hôtel de Cluni.

M. DCC. LXXXII

Created the science of friction

COULOMB, Charles Augustin. Théorie des Machines simples, en ayant égard au frottement de leurs parties et a la roideur des Corages. Paris: Moutard, 1782.

\$13,500

Extremely rare offprint, with imprint three years before publication in journal form, of this important memoir in which Coulomb created the science of friction. "Coulomb's most celebrated study, one that brought him immediate acclaim, was Théorie des machines simples, his prize-winning friction study.

Norman 526 (journal issue from 1785); Roberts & Trent, 82 (1821 book edition).

4to, pp [1-3] 4-172, 5 plates, contemporary half calf over marbled boards. A very nice and completely unrestored copy.

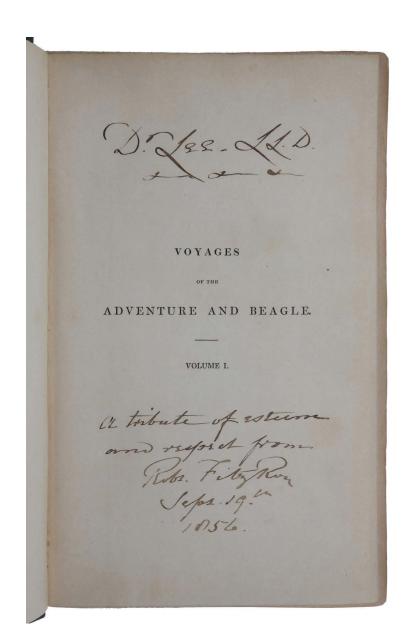
Inscribed presentation copy

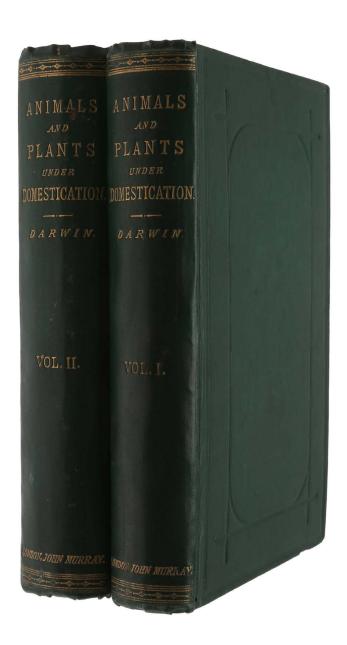
DARWIN, Charles and Robert FITZROY. *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle...* London: Henry Colburn, 1839.

\$195,000

First edition, an extraordinary presentation copy connecting two exceptional Victorians, inscribed by the Commander of the Beagle Robert FitzRoy, the man who chose Darwin to accompany him on the epochal voyage. "The voyage of the Beagle has been by far the most important event in my life, and has determined my whole career" (Charles Darwin, *Life and Letters*). Inscribed and signed on the half-title by FitzRoy, to 'Dr. Lee, LL.D., a tribute of esteem and respect from Robt. FitzRoy, Sept. 19th, 1856.' Also inscribed by Lee on the front pastedown.

4 vols, publisher's cloth. Complete with all maps and charts.





Presentation copy - 'survival of the fittest'

DARWIN, Charles. *The Variation of Animals and Plants under Domestication.* London: John Murray, 1868.

\$35,000

First edition, first issue, presentation copy, trimmed for presentation and with a slip of paper with inscription "From the Author" **in Darwin's hand** pasted to the front free endpaper. The term "survival of the fittest" first appeared in the *Variation* (vol. 2, p. 89), preceding its first use in the fifth edition of the *Origin of Species* (1869). "This represents the only section of Darwin's big book on the origin of species which was printed in his lifetime and corresponds to its first two intended chapters" (Freeman).

Two volumes, demy octavo. Special presentation binding of original publisher's green cloth

Inscribed presentation offprint

DIRAC, Paul Adrien Maurice. On the theory of quantum me-

chanics. London: Harrison & Sons, 1926.

\$27,500

First edition, inscribed presentation offprint, of Dirac's paper, which "is justly seen as a major contribution to quantum theory" (Kragh). It introduced his quantum mechanical derivation of

what is now called Fermi-Dirac statistics, which describes a distri-

bution of particles in certain systems containing many identical

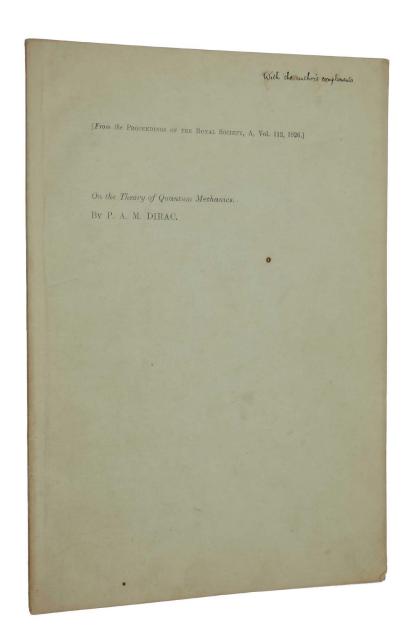
particles that obey the Pauli exclusion principle—meaning that

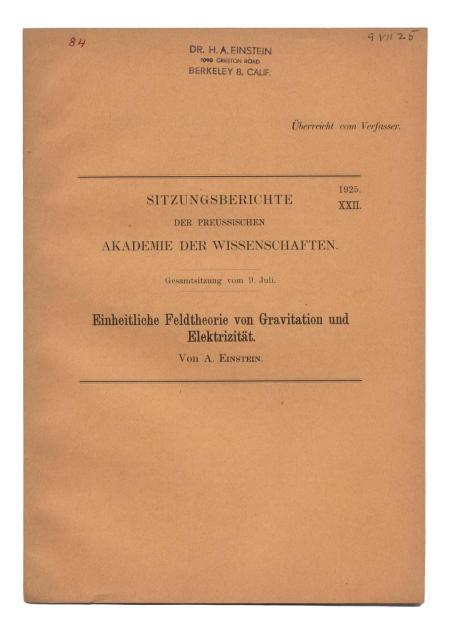
no two of the particles can occupy the same quantum state simul-

taneously. The paper "will be remembered as the first in which

quantum mechanics is brought to bear on statistical mechanics".

8vo, original printed wrappers, inscribed by Dirac.





His first original paper on unified field theory

EINSTEIN, Albert. *Einheitliche Feldtheorie von Gravitation und Elektrizität.* Berlin: Königlichen Akademie der Wissenschaften, 1915.

\$14,500

First edition, extremely rare author's presentation offprint (not to be confused with the much more common trade offprint), and the copy of Einstein's son Hans Albert, of Einstein's first original paper on unified field theory, and the first to use the term "Unified Field Theory" in its title. In the opening paragraph of this paper, Einstein wrote: "After incessant search during the last two years, I now believe I have found the true solution" (Pais).

8vo, original printed wrappers with ownership stamp of Hans Albert Einstein on front wrapper. Very fine.

Inscribed by Einstein to Nordström

EINSTEIN, Albert. *Die formale Grundlage der allgemeinen Relativitätstheorie.* Berlin: Königlichen Akademie , 1914.

\$12,000

First edition of this extremely rare offprint, a remarkable presentation copy inscribed by Einstein to the theoretical physicist Gunnar Nordström, often designated by modern writers as 'The Einstein of Finland'. Einstein had an extended correspondence with Nordström on the subject of Nordström's own competing theory of gravitation, which at the time was considered a serious competitor to Einstein's, and which he completed in the same year as the present paper. The present paper was the crucial step between Einstein's *Entwurf* theory of 1913 and the final form of general relativity which Einstein completed in November 1915.

8vo, original printed wrappers, inscribed 'G. Nordström.' in Einstein's hand, some annations in the text, probably by Nordström.

http://sophiararebooks.com/4148

1077 Gesammtsitzung v. 19. Nov. 1914. - Mitth. d. phys.-math. Cl. v. 29. Oct.

$$\sum_{\alpha r} \frac{\partial}{\partial x_r} \frac{\partial}{\partial x_{\alpha}} \left(g^{rr} \frac{\partial HV - g}{\partial g^{rr}_{\alpha}} \right) = 0,$$

also mit Rücksicht auf (80) die Gleichung

$$\sum \frac{\partial}{\partial x_r} \left\{ \Im_x + \frac{1}{z} \sum_{ar} \left(-g^r \frac{\partial H V - g}{\partial g^{rr}} + g^r_a \frac{\partial H V - g}{\partial g^r_a} \right) \right\} = 0.$$
 (80b)

Vermöge (78), (79) und (46) können wir an die Stelle der Gleichungen (80a) und (80b) die folgenden setzen

$$g_{\mu\nu}^{\dagger} = \frac{g_{\rho\rho}}{\chi_{\xi}} \qquad \sum_{\alpha\beta} \frac{\partial}{\partial x^{\alpha}} (\sqrt{-g} g^{\alpha\beta} \Gamma_{\tau\beta}^{\nu}) = -\varkappa (\mathfrak{T}_{\tau}^{\nu} + \mathfrak{t}_{\tau}^{\nu}) , \qquad (8)$$

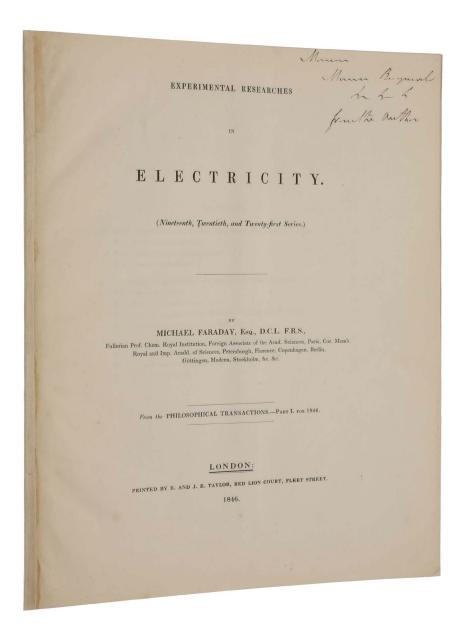
$$\sum_{r} \frac{\partial}{\partial x_{r}} (\mathfrak{T}_{r}^{r} + \mathfrak{t}_{r}^{r}) = 0, \qquad (420)$$

wobei

$$\Gamma_{\tau\beta}^{\nu} = \frac{1}{2} \sum_{\sigma} g^{\tau\tau} \frac{\partial g_{\sigma\tau}}{\partial x_{\alpha}},$$
 (81a)

Die Gleichungen (81) in Verbindung mit (81a) und (81b) sind die Differentialgleichungen des Gravitationsfeldes. Die Gleichungen (42c) drücken nach den in § 10 gegebenen Überlegungen die Erhaltungssätze des Impulses und der Energie für Materie und Gravitationsfeld zusammen aus. $\mathfrak{t}_{\varepsilon}^{\varepsilon}$ sind diejenigen auf das Gravitationsfeld bezüglichen Größen, welche den Komponenten $\mathfrak{D}_{\varepsilon}^{\varepsilon}$ des Energietensors (V-Tensors) der physikalischen Bedeutung nach analog sind. Es sei hervorgehoben, daß die $\mathfrak{t}_{\varepsilon}^{\varepsilon}$ nicht beliebigen berechtigten, sondern nur line aren Transformationen gegenüber Tensorkovarianz besitzen; trotzdem nennen wir ($\mathfrak{t}_{\varepsilon}^{\varepsilon}$) den Energietensor des Gravitationsfeldes. Analoges gilt für die Komponenten $\Gamma_{\varepsilon g}^{\varepsilon}$ der Feldstärke des Gravitationsfeldes.

Das Gleichungssystem (S1) läßt trotz seiner Kompliziertheit eine einfache physikalische Interpretation zu. Die linke Seite drückt eine Art Divergenz des Gravitationsfeldes aus. Diese wird — wie die rechte Seite zeigt — bedingt durch die Komponenten des totalen Energietensors. Sehr wichtig ist dabei das Ergebnis, daß der Energietensor des Gravitationsfeldes selbst in gleicher Weise felderregend wirksam ist wie der Energietensor der Materie.



Inscribed by Faraday to Becquerel

FARADAY, Michael. Experimental researches in electricity (19th, 20th and 21st Series.) London: R. & J. E. Taylor, 1846.

\$14,500

First edition, presentation offprint, of these three papers containing two of Faraday's major discoveries: the 'Faraday effect,' i.e., the effect of magnetism on the plane of polarisation of light - the first ever demonstrated link between light and magnetism (19th series); the second paper (Series 20) and its continuation (Series 21) explain his dramatic discovery on the universality of magnetism, noting that every material possesses an innate magnetic character to a greater or lesser degree. These were "the last, and in many ways the most brilliant, of Faraday's series of researches" (DSB).

4to, original printed wrappers, rebacked.

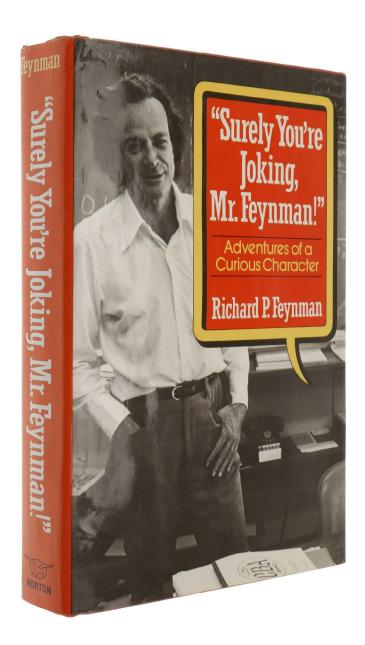
Inscribed by Feynman

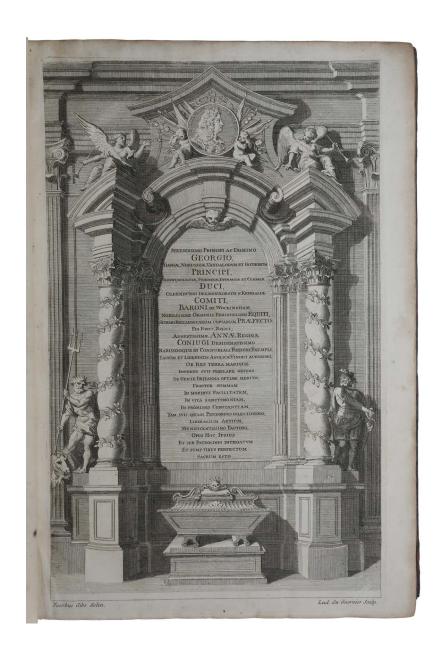
FEYNMAN, Richard Phillips. Surely You're Joking Mr. Feynman! New York: W. W. Norton & Company, 1985.

\$45,000

First edition, first printing, and a fine copy in a bright dust jacket, signed by Feynman and from the library of a second Nobel Prize winner, Edwin P. McMillan. Signed copies of this first printing are rare: Feynman was notorious for refusing to sign copies of his book, reportedly telling his editor "I'm not going to go on TV and I'm not going to sign any books!"

8vo, publisher's red cloth with dust jacket. Spine strip of dust jacket lightly sunned, top 1 mm of cloth spine slightly sunned, otherwise both very fine and fresh.





The foundation of modern observational astronomy

FLAMSTEED, John. Historiae coelestis. London: John Matthews, 1712.

\$185,000

First edition, extremely rare, of Flamsteed's catalogue of fixed stars and sextant observations, the foundation of modern observational astronomy. Flamsteed's catalogue was far more extensive and accurate than anything that had gone before. It was the first constructed with instruments using telescopic sights and micrometer eyepieces; Flamsteed was the first to study systematic errors in his instruments; he was the first to urge the fundamental importance of using clocks and taking meridian altitudes; and he insisted on having assistants to repeat the observations and the calculations.

Large folio, contemporary calf with gilt arms of Queen Anne in centre of each cover.

The source of all modern methods in mathematical physics

FOURIER, Jean-Baptiste-Joseph. *Théorie Analytique de la Chaleur.* Paris: Firmin Didot, 1822.

\$32,000

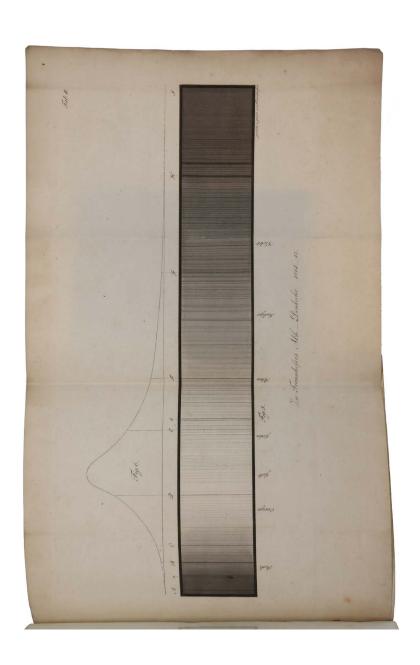
First edition of the first mathematical study of heat diffusion, the first major mathematization of a branch of physics outside mechanics. "This work marks an epoch in the history of both pure and applied mathematics. It is the source of all modern methods in mathematical physics... The gem of Fourier's great book is 'Fourier series'" (Cajori).

Dibner 154; Evans 37; Sparrow 68; Landmark Writings in Western Mathematics 26; Norman 824; En Français dans le Texte 232.

4to, contemporary half calf over marbled boards, a fine copy.

http://sophiararebooks.com/3841

THÉORIE ANALYTIQUE DE LA CHALEUR, PAR M. FOURIER. A PARIS, CHEZ FIRMIN DIDOT, PÈRE ET FILS, LIBRAIRES POUR LES MATHÉMATIQUES, L'ARCHITECTURE HYDRAULIQUE ET LA MARINE, RUE JACOB, Nº 24. 1822.



The founding work of astrophysics

FRAUNHOFER, Joseph. Bestimmung des Brechungs- und Farbenzerstreuungs- Vermögens verschiedener Glasarten. Münich: Lentner, [1817].

\$55,000

First edition, the extremely rare offprint, of the founding work of astrophysics, the discovery of the absorption lines in the solar spectrum; the second plate, which reproduces Fraunhofer's drawing of these lines (etched by Fraunhofer himself), is the first illustration of the solar spectrum.

Dibner 153; Norman 836; PMM 278a; Richard Green 125; Sparrow 70; *The Dawn of Science and Technology* 91 (last four references for the common journal issue).

4to, original drab wrappers, as issued.

Dialogue concerning the two chief world systems

GALILEI, Galileo. *Dialogo sopra i due massimi sistemi del mondo.* Florence: Giovanni Batista Landini, 1632.

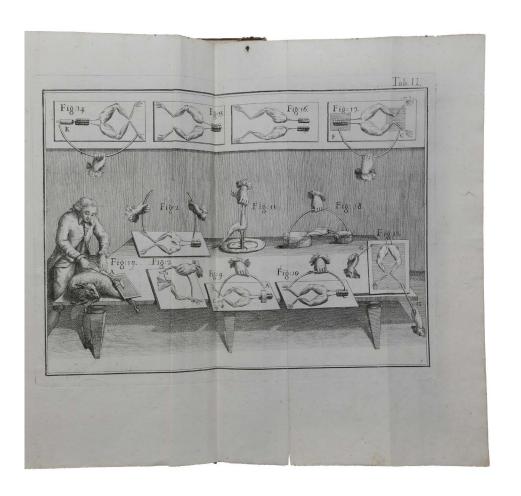
\$125,000

First edition of this epoch-making work, Galileo's celebrated defence of the Copernican view of the solar system, the most notorious banned book of the 17th century. The work 'was designed both as an appeal to the great public and as an escape from silence... it is a masterly polemic for the new science.... The *Dialogo*, more than any other work, made the heliocentric system a commonplace' (PMM).

PMM 128; Dibner 8; Grolier/Horblit 18c; Norman 858.

4to, 18th century vellum, later black leather lettering-piece on spine.





Presentation copy inscribed by Aldini

GALVANI, Luigi. *De viribus electricitatis in motu musculari commentarius cum Joannis Aldini dissertatione et notis.* Modena: apud Societatem Typographicam, 1792.

\$55,000

Presentation copy of the first edition in book form, and the first to contain the notes and commentary by Giovanni Aldini, Galvani's nephew and principal apologist, of this epoch-making work, one of the most important in the history of electricity. This is a superb presentation/association copy, inscribed by Aldini, of the first issue.

Dibner 59; Grolier/Medicine 50; Grolier/Horblit37a; Norman 869; PMM 240 (all for the 1791 journal version).

4to, contemporary boards.

Nuclear fission

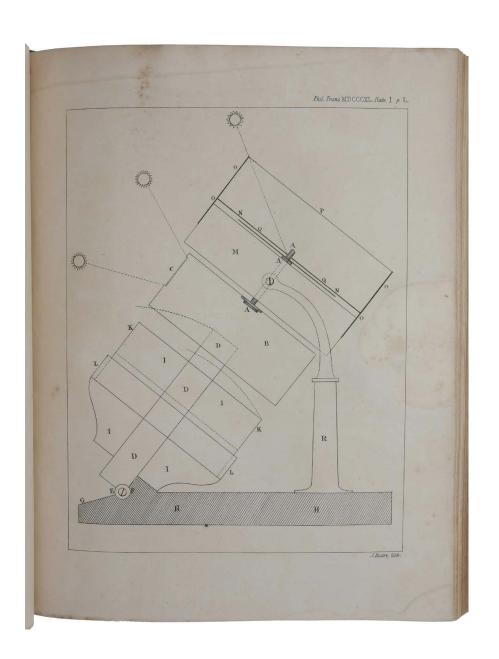
HAHN, Otto and Fritz STRASSMANN. Über das Zerplatzen des Urankernes...; Einiges Über die Experimentelle Entwirrung...; Die Chemische Abscheidung der bei der Spaltung... Berlin: de Gruyter. 1939 [1942, 1944].

\$5,000

First edition, offprint issues, of the three fundamental papers on nuclear fission which eventually lead to the creation of the atom bomb. Hahn received the 1944 Nobel Prize in Chemistry "for his discovery of the fission of heavy nuclei."

4to, original printed wrappers, a fine set.





Three landmark works in photography

HERSCHEL, John, Sir. On the chemical action of the rays of the solar spectrum... 1840; On the action of the rays of the solar spectrum... 1842; On certain improvements on photographic processes... 1843. [Offprints from *Philosophical Transactions*].

\$85,000

An extraordinary collection of 69 works by Sir John Herschel, assembled for presentation to his son William James Herschel. The collection includes offprints of Herschel's three most important publications on photography, the first two of which have corrections and annotations in his hand. These offprints are of extreme rarity – ABPC/RBH list no other copy of any of them in the past 75 years.

Three volumes, thick 4to, contemporary dark green half-morocco.

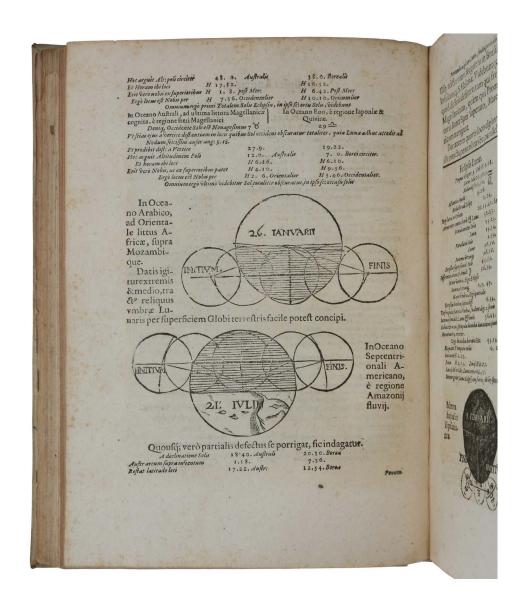
First tables based on his new astronomy

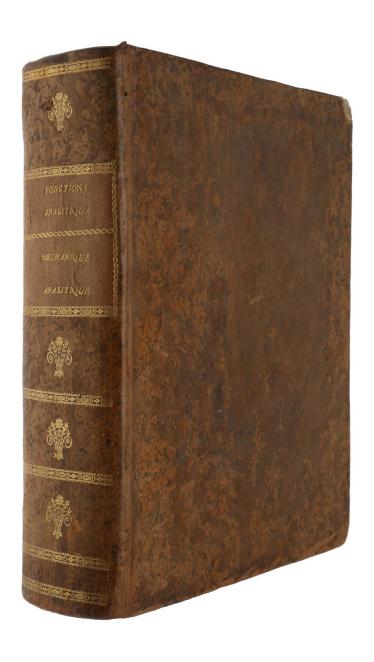
KEPLER, Johannes. *Ephemerides novae motuum coelestium.* Linz: Johannes Plank, [1617-1619].

\$35,000

First edition, very rare and with an exceptional royal provenance, of Kepler's *Ephemerides* for the years 1617-1620. These were the first tables of astronomical data calculated by Kepler on the basis of the new celestial mechanics he had published in *Astronomia nova* (1609), and also the first calculated using logarithms, preceding by a decade the *Tabulae Rudolphinae* (1627). *Provenance*: Queen Sophia of Württemberg, full-page hand-written dedication in Latin, dated 1863, on front free endpaper from her to; Francis Napier, 10th Lord Napier and 1st Baron Ettrick, his bookplate on front paste-down.

4to, 19th century vellum. A very fine copy.





The discovery of the general equations of motion

LAGRANGE, Joseph Louis de. *Méchanique analitique*. [Bound with:] *Théorie des fonctions analytiques*. Paris, 1788 & 1797.

\$15,000

An exceptional volume, in a fine contemporary binding, containing the first edition of Lagrange's masterpiece, the *Méchanique*, "one of the outstanding landmarks in the history of both mathematics and mechanics" (Sarton) and "perhaps the most beautiful mathematical treatise in existence, together with the corrected second printing of the *Théorie*, containing Lagrange's formulation of calculus in terms of infinite series, which provided the basis for Augustin-Louis Cauchy's development of complex function theory in the first decades of the next century.

Grolier/Horblit 61; Evans 10; Dibner 112; Sparrow 120.

4to, contemporary full calf.

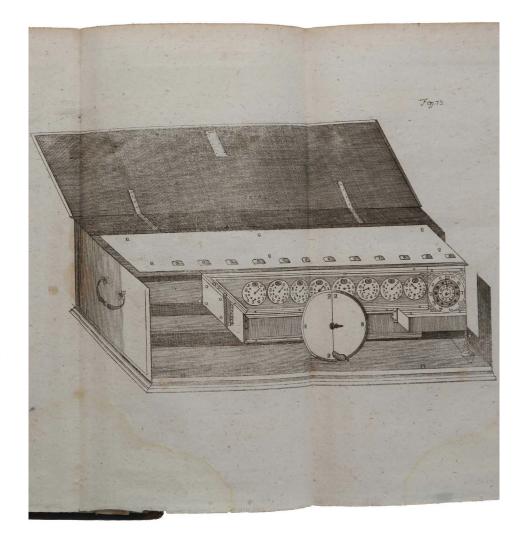
Leibniz' digital calculating machine

LEIBNIZ, Gottfried Wilhelm. *Brevis descriptio machinae arithmeticae, cum figura.* Berlin: Johann Christian Papen, 1710.

\$32,000

First edition, rare, of this milestone in computer history, Leibniz's description of his famous digital calculating machine, the first calculator that could perform all four arithmetic operations. The stepped reckoner, as it was called, was based on a gear mechanism that Leibniz invented and that is now called a Leibniz wheel. This mechanism was used for three centuries until the advent of the electronic calculator in the mid-1970s. Although Leibniz demonstrated his machine before the Royal Society and elsewhere, no description of it appeared in print until in the present form. It is contained in the first volume of the journal of the Berlin Academy of Science, which Leibniz founded.

In Miscellanea Berolinensia. 4to, contemporary calf.



SCIENTIÆ BACCALAUREUS No. 3 Vol. I FEBRUARY, 1891. Geometrical Researches THE THEORY OF PARALLELS, Nicolaus Lobatschewsky, IMPERIAL RUSSIAN REAL COUNCILLOR OF STATE AND REGULAR PROFESSOR OF MATHEMATICS IN THE UNIVERSITY OF KASAN. BERLIN, 1840. TRANSLATED FROM THE ORIGINAL GEORGE BRUCE HALSTED. A. M., Ph. D., Ex-Fellow of Princeton College and Johns Hopkins University, Professor of Mathematics in the University of Texas. AUSTIN, 1891.

Only one other copy known

LOBACHEVSKY, Nikolai Ivanovich. Geometrical Researches on the Theory of Parallels... Translated from the Original by George Bruce Halstead. Rolla, Missouri: School of Mines, 1891.

\$75,000

The true first publication in English, incredibly rare offprint issue (only one other copy known), of Lobachevsky's revolutionary discovery of non-Euclidean geometry. This work, published in the short-lived and little-known journal *Scientiae Baccalaureus*, is a translation of *Geometrische Untersuchungen zur Theorie der Parallellinien* (Berlin, 1840), which was the first complete account of Lobachevsky's work to be published in a Western European language. We have located only one other offprint of this work, held by the University of Virginia.

Offprint from: Scientiae Baccalaureus. 8vo, contemporary light-green boards with green cloth spine.

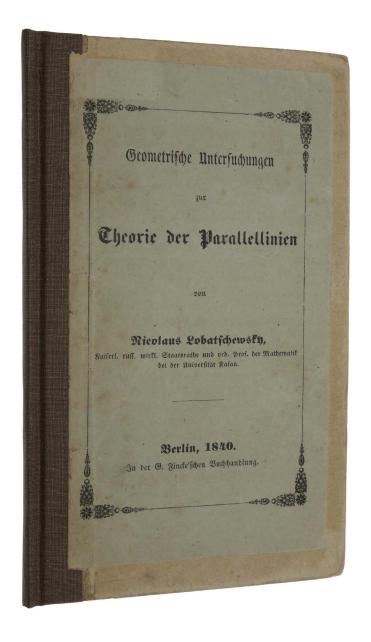
Non-Euclidean Geometry

LOBACHEVSKY, Nikolai Ivanovich. *Geometrische Untersuchungen zur Theorie der Parallellinien.* Berlin: G. Fincke, 1840.

\$40,000

First edition, very rare, of the first complete account of Lobachevsky's revolutionary discovery of non-Euclidean geometry to be published in a Western European language. It was through this book that the mathematical world outside Russia became aware of Lobachevsky's work. The present work, like all of Lobachevsky's publications, is very rare. OCLC lists just seven copies in the US. No copies on ABPC/RBH.

8vo, old boards with cloth spine, original front printed wrapper mounted on front cover.





Perhaps the first work in computer science

LULL, Ramon. Ars magna generalis et ultima quaruncunque artium et scientiarum... Lyons: Marechal for Vincent, 1517.

\$25,000

Third edition, the first edited by the Lullist Bernard de Lavinheta, of the *Ars Magna*, his greatest work, now recognised as perhaps the first work in computer science. Lull invented an 'art of finding truth' which inspired Leibniz's dream of a universal algebra four centuries later... The most distinctive characteristic of his *Art* is clearly its combinatory nature, which led to both the use of complex semi-mechanical techniques that sometimes required figures with separately revolving concentric wheels – 'volvelles', – and to the symbolic notation of its alphabet. These features justify its classification among the forerunners of both modern symbolic logic and computer science.

4to, 18th century German boards.

A landmark in the history of calculus

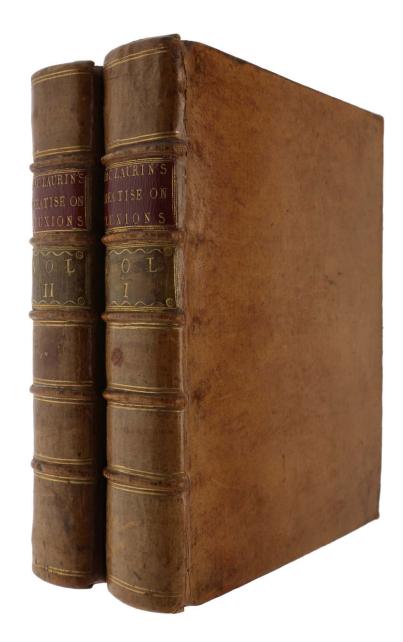
MACLAURIN, Colin. *A Treatise of Fluxions. In Two Books.* Edinburgh: Printed by T.W. and T. Ruddimans, 1742.

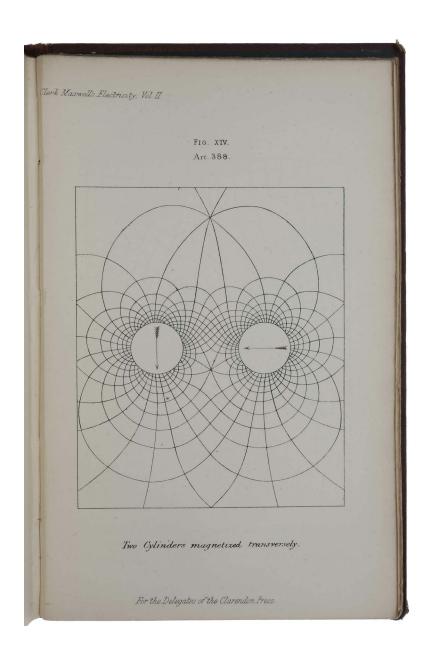
\$15,000

First edition, a very fine large and thick paper copy, of "the earliest logical and systematic publication of the Newtonian methods. It stood as a model of rigor until the appearance of Cauchy's *Cours d'Analyse* in 1821" (DSB). The text block of this copy is about 50% thicker than that of an unpressed (and uncut) copy we handled recently. MacLaurin provided a rigorous foundation for the method of fluxions based on a limit concept drawn from Archimedian classical geometry. He went on to demonstrate that the method so founded would support the entire received structure of fluxions and the calculus, and to make advances that were taken up by continental analysts.

Landmark Writings in Western Mathematics 10; Norman 1408; Honeyman 2084.

4to, English polished calf. A very fine and unrestored copy.





Light as a form of electricity

MAXWELL, James Clerk. A Treatise on Electricity and Magnetism. Oxford: Clarendon Press, 1873.

\$20,000

First edition, first issue, and a wonderful association copy, of Maxwell's presentation of his theory of electromagnetism, advancing ideas that would become essential for modern physics, including the landmark "hypothesis that light and electricity are the same in their ultimate nature" (Grolier/Horblit). "This treatise did for electromagnetism what Newton's *Principia* had done from classical mechanics. Provenance: The Wheatstone Collection, King's College, London. Maxwell was Professor of Natural Philosophy at King's from 1860 to 1865.

Grolier/Horblit 72; Norman 1666; Landmark Writings in Western Mathematics 44.

8vo, original publisher's blind-stamped plum cloth.

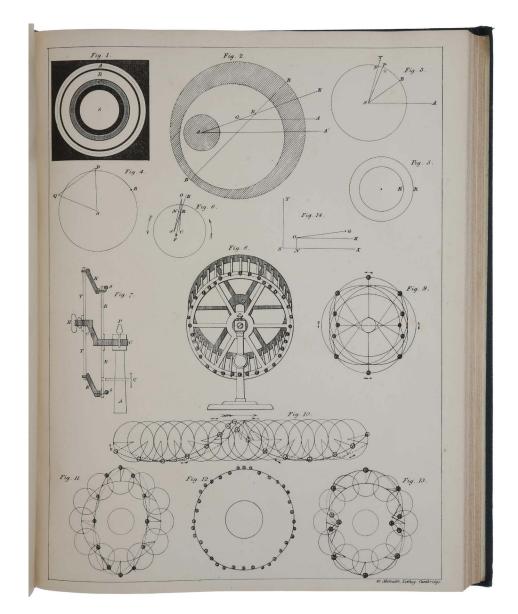
The Maxwell Gap

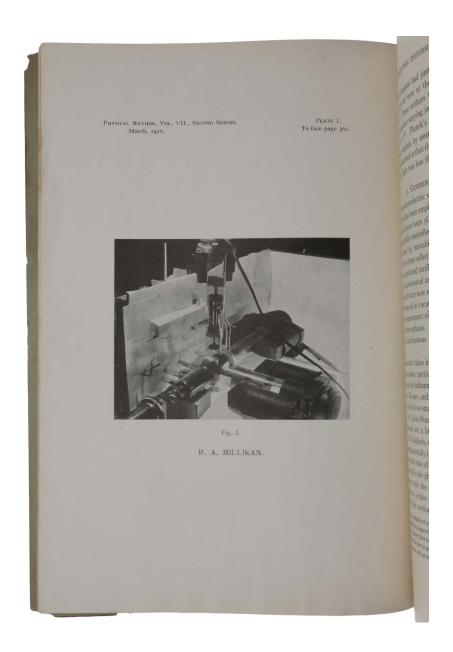
MAXWELL, James Clerk. *On the stability of the motion of Saturn's rings.* Cambridge: Macmillan & Co, 1859.

\$8,500

First edition, very rare in commerce. The work that made Maxwell's reputation in his day, amongst his contemporaries in Britain at least, was his Adams Prize essay *On the Stability of the Motion of Saturn's Rings*. In 1859, James Clerk Maxwell demonstrated that a nonuniform solid ring, solid ringlets or a continuous fluid ring would also not be stable, indicating that the ring must be composed of numerous small particles, all independently orbiting Saturn. In 2004 the NASA Cassini probe to Saturn showed that Maxwell's conclusion about the structure of the rings was correct. He is commemorated by having a feature of the rings named after him – the 'Maxwell Gap' within the *C* ring.

4to, 19th century blue cloth with gilt spine lettering.





The photoelectric effect

MILLIKAN, Robert Andrews. A Direct Photoelectric Determination of Plank's "h". Lancaster: APS, 1916.

\$9,500

First edition, rare offprint issue, of Millikan's first full account of his dramatic experimental confirmation of Einstein's quantum theory of the photoelectric effect, for which Einstein was awarded the Nobel Prize in Physics 1921. The Nobel Prize in Physics 1923 was awarded to Robert A. Millikan "for his work on the elementary charge of electricity and on the photoelectric effect".

Offprint from: The Physical Review, vol. 7, no. 3, 3 March, 1916, 8vo, original green printed wrappers.

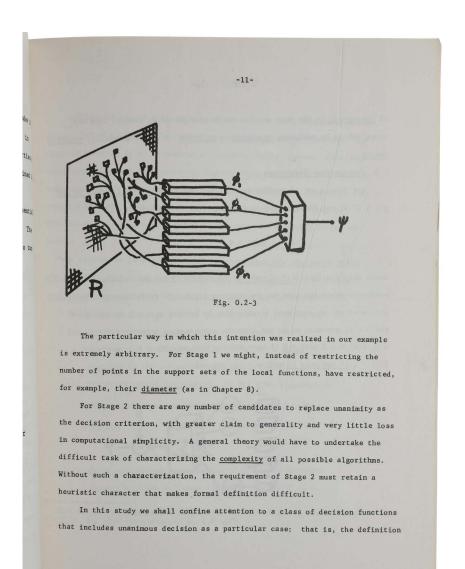
Artificial Intelligence

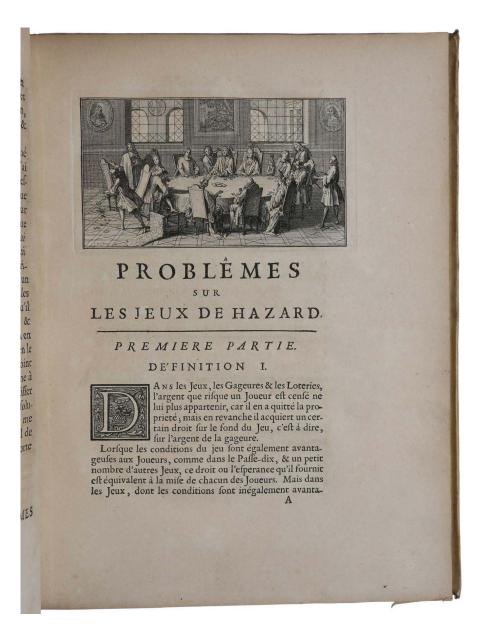
MINSKY, Marvin & PAPERT, Seymour. Perceptrons and Pattern Recognition. Artificial Intelligence Memo no. 140. MAC-M-358. Project MAC. Cambridge, MA: September 1967.

\$17,500

First edition, extremely rare pre-publication issue, of this important early work in Artificial Intelligence (AI), containing the first systematic study of parallelism in computation. It was first published in book form in 1969 as *Perceptrons. An Introduction to Computational Geometry*. It has remained a classical work on threshold automata networks for nearly two decades and marked a historical turn in artificial intelligence. OCLC lists only two copies (Stanford and National Research Council Canada). There appears to be no copy at MIT, where the research was carried out and where this work was published.

4to, stapled as issued into clear plastic covers, holes for ring binder.





The first book on probabilty

MONTMORT, Pierre Rémond de. Essay d'Analyse sur les Jeux de Hazard. Paris: J. Quilau, 1708.

\$12,000

Rare first edition, and a fine copy, of the first separately published textbook of probability. "In 1708 [Montmort] published his work on Chances, where with the courage of Columbus he revealed a new world to mathematicians" (Todhunter). "The *Essay* (1708) is the first published comprehensive text on probability theory, and it represents a considerable advance compared with the treatises of Huygens (1657) and Pascal (1665).

4to, contemporary vellum, rare in such good condition.

One of his most popular works

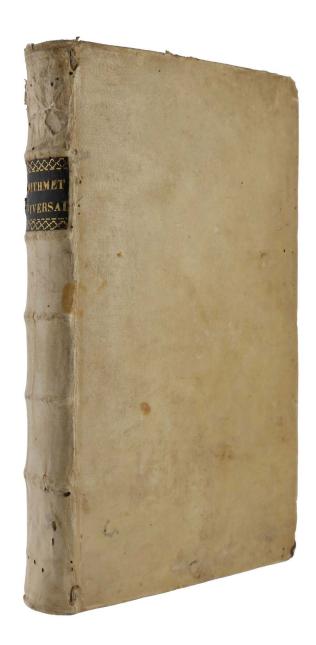
NEWTON, Isaac. *Arithmetica Universalis*. Cambridge/London:

Typis Academicus, 1707.

\$22,000

First edition of Newton's treatise on algebra, or 'universal arithmetic,' his "most often read and republished mathematical work" (Whiteside). "Included are 'Newton's identities' providing expressions for the sums of the *i*th powers of the roots of any polynomial equation, for any integer ⁱ, plus a role of providing an upper bound for the positive roots of a polynomial, and a generalization, to imaginary roots, of Rene Descartes' Rule of Signs" (Parkinson). The final chapter, on the extraction of roots, is by Edmund Halley.

8vo, contemporary velum with gilt spine label.



ACTA ERUDITOR UM decisioni magis credere, quam mille Hieronymis, Augustinis, Gregoriis, nedum Richardis, Scotis, aliisque, quia sciat credatque, Papam non posse errare in materiis sidei. Addit Joh. Fischeri Roffensis testimonium aperte fatentis, articulos de indulgentiis & purgatorio noviter ab Ecclesia receptos esle, veteribus non æque co-gnitos. Itaque ut Romanæ, ita etiam aliis omnibus Ecclesiis jus, sub traditionum prætextu, condendi articulos fidei abjudicat: ad art. 5. regulam Vincentii Lirinensis provocans. Ex eodem differentiam traditionum, quæ ante concilium Nicenum ex confessionibus supra dictis Episcoporum & Ecclesiarum probari poterant, & posteriorum ostendit, ita ut jam contra Hæreses ne veterum quidem traditionum allegatio sufficiat, quia de earum antiquitate certi non sumus, sed corruptiones & falsificationes metuendæ sunt. Itaque codem Vincentio teste, solæ Scripturæ ad hæresium examen & conart. 6. demnationem adhiberi debent. Dein traditionis oralis etiam antiquissimæ lubricitatem exemplis confirmat : Papia nempe, de regno mille annorum; traditionum contradictoriarum de tempore Paschatos, Irenai de atate Christi. Concludit ad Scripturam recurrendu esse, dein suo modo ad traditiones ei conformes ac subalternas, aut universalis Ecclesiæ & omnium seculorum testimonio probatas, non vero ad particulares, quas Romana obtrudit. Subjungit Epilogum sive parænesin de studio & praxi veræ religionis & pietatis, ex dicto Pauli ad Rom. VI, 17, illamque formam doctrinæ (quam fequendam laudat Apostolus, & quæ est secundum pietatem, & ad sancham vitam ducit,) sufficientissime in Scripturis tradi asseverat; cum ea quæ ex additamentis constat, licet facilior videatur, nempe per missas, indulgentias, satisfactiones, merita Sanctorum aliaque ejus generis inventa, Scripturæ tamen ignota sit. ISAACI NEVVTON, MATHESEOS PROFES-Soris Cantabrigiensis, & Regia Societatis Anglicana Socii, Philosophia Naturalis Principia Mathematica. Londini, jussu Soc. Regiæ, 1687, in 4. Vifum

Most important review of the 'Principia'

[NEWTON,Isaac].[PFAUTZ,Christoph].IsaaciNewton,Matheseos Professoris Cantabrigiensis, & Regiae Societatis Anglicanae Socii, Philosophiae Naturalis Principia Mathematica. Londoni, jussu Soc. Regiae, 1687, in 4. Leipzig: Grossius & Gleditsch, 1688.

\$6,000

First edition of the important *Acta Eruditorum* review of Newton's *Principia*. There were four reviews of the *Principia*, of which this is chronologically the third. It is "the most detailed and serious of the four reviews. It was comprehensive enough to provide many people in Europe without access to the *Principia* itself with a fairly full account of its contents" (Gjertsen, *Newton Handbook*, p. 472).

In: Acta Eruditorum 4to, contemporary vellum.

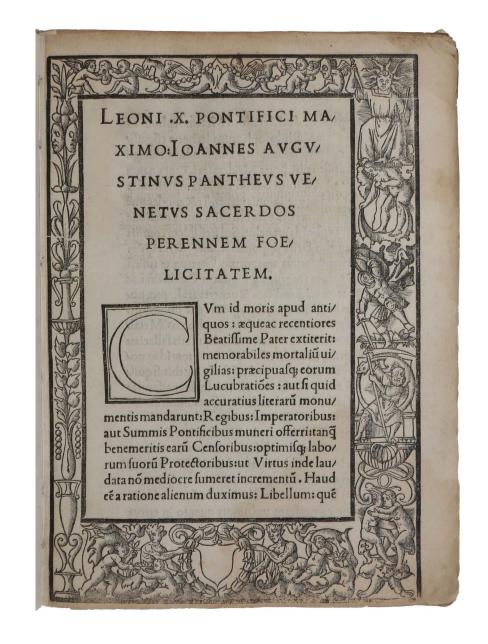
The black tulip of alchemical literature

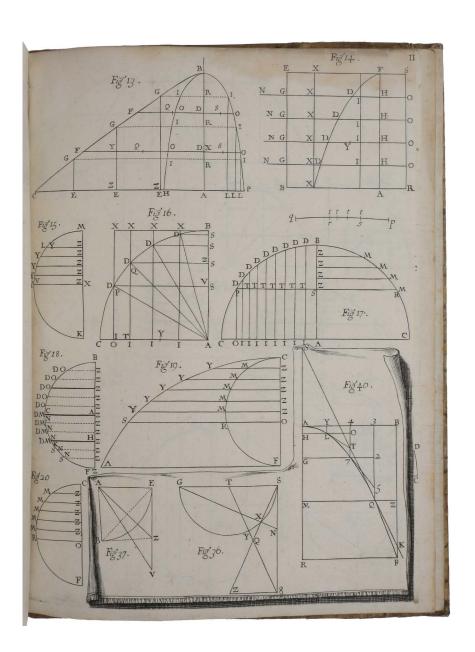
PANTHEUS, Giovanni Agostino. *Ars Transmutationis Metallicae...* [with, as issued] *Commentarium theoricae Artis Mettalicae Transmutationis.* Venice: Tacuino, 1518-1519.

\$48,000

First edition of one of the greatest rarities in the alchemical and chemical literature; this is an exceptionally interesting copy, bound with twelve leaves of contemporary script. The greatest collector of early chemistry books of the past century, Roy G. Neville, never found a copy. ABPC/RBH list just one copy in the last 80 years (and that in a modern binding). OCLC lists three copies in US (Claremont Colleges, Delaware, Madison (Wisconsin)).

4to, eighteenth-century vellum.





One of his most brilliant works

PASCAL, Blaise. *Lettres de A. Dettonville.* Paris: Guillaume Desprez, 1659.

\$75,000

First edition, extremely rare (one of about 120 copies printed), of one of Pascal's most brilliant works, a forerunner of integral calculus. Having perfected his theory of indivisibles to solve infinitesmal problems concerning the cycloid, he challenged other mathematicians to a contest to solve these problems. At the end of the contest he published 4 pamphlets under the pseudonym A. Dettonville setting out his method and its applications. They were collected and published together as the present work.

4to, complete with all four part-titles and the two-page 'Lettre de Monsieur de Carcavy à Monsieur Dettonville', some of which are often lacking, 18th century vellum.

PMM 385 - Conditioned reflexes

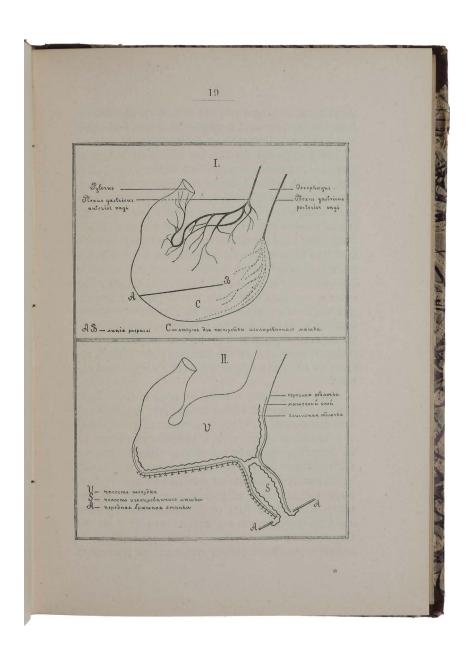
PAVLOV, Ivan Petrovitch. *Lektsii o rabotie glavnikh pisht-shevaritelnikh zhelyos.* St. Petersburg: Kushnereff, 1897.

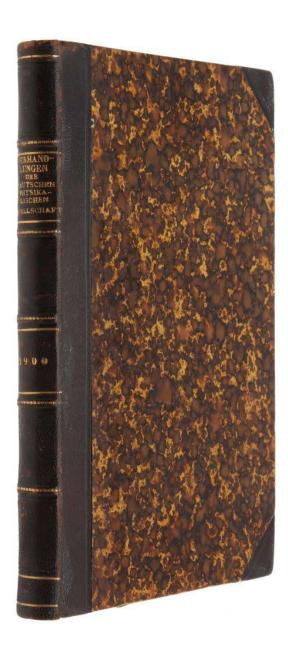
\$20,000

A fine copy, in contemporary Russian binding, of this famous work on digestive juices by the demonstrator of the 'conditioned reflex'. "Using live dogs in his experiments, Pavlov determined the effect of stimuli on the generation of body secretions, digestive juices and saliva thru brilliant operative techniques." (Dibner).

PMM 385; Grolier/Horblit 83; Dibner 135; Grolier/Medicine 85; Lilly, *Notable Medical Books* 24.

8vo, contemporary Russian brown half calf with gilt spine lettering in cyrillic, initials B.C. of previous owner gilt at bottom of spine.





PMM 391 - The birth of quantum theory

PLANCK, Max. Zur Theorie des Gesetzes der Energieverteilung im Normalspectrum. Leipzig: Johann Ambrosius Barth, 1900.

\$25,000

First edition of the first appearance of Planck's revolutionary quantum theory, arguably the most important development in twentieth-century physics. "In this important paper [Planck] stated that energy flowed not in continuous, indefinitely divisible currents, but in pulses or bursts of action [or quanta]" (Dibner).

Dibner 166; Evans 47; Grolier/Horblit 26a; Norman 1713; PMM 391a; Sparrow 162.

In: Verhandlungen der Deutschen Physikalischen Gesselschaft The entire volume offered here in fine contemporary half. A fine copy.

By the maker of Kepler's telescopes

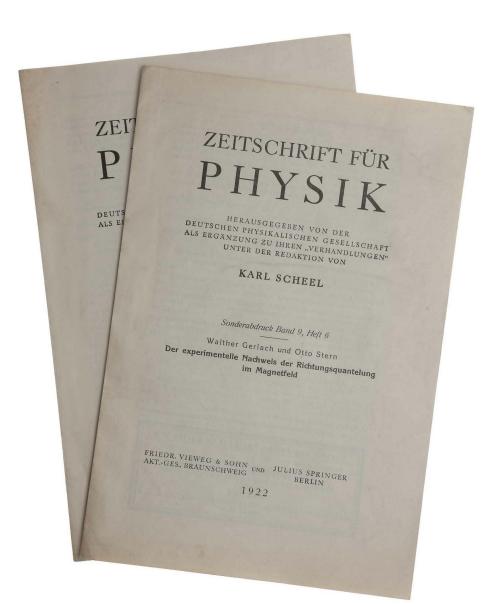
SCHYRLAEUS DE RHEITA, Anton Maria. *Oculus Enoch et Eliae.* Antwerp: Hieronymus Verdussen, 1645.

\$48,500

First edition of this very rare and influential work in the history of the telescope, a remarkable copy, uncut in the original interim boards. Rheita "introduced a number of crucial improvements in his work, leading to a real breakthrough in telescope design. First, Rheita suggested a new and much better method of polishing lenses, leading to a strong reduction of deviations; secondly (and even more importantly), he found that a compound ocular, composed of three or four lenses, resulted in a much better quality than using only a single (compound) ocular" (Van Helden).

Folio, uncut in the original interim boards, an exceptional copy.





One of the great achievements of experimental physics

STERN, Otto & GERLACH, Walther. Der experimentelle Nachweis der Richtungsquantelung im Magnetfeld. [with:] Das magnetische Moment des Silberatoms. Braunschweig: Vieweg, 1922. \$7,500

First edition, the very rare offprints, of the famous Stern-Gerlach experiment, which demonstrated the spatial quantization predicted by the Bohr-Sommerfeld quantum theory of the atom and the existence of electron spin. "This direct demonstration of spatial quantization was immediately accepted as among the most compelling evidence for quantum theory" (Friedrich & Herschbach). "The Stern-Gerlach experiment is undoubtedly one of the great achievements of experimental physics" (Longair).

8vo, original printed wrappers, fine copies.

The Turing test

TURING, Alan Mathison. Computing Machinery and Intelli-

gence. Edinburgh: Thomas Nelson, 1950.

\$4,500

First edition of Turing's landmark explanation of what would become known as the 'Turing test' to determine whether a machine can 'think'. Together with 'On computable numbers', 'Computing machinery and intelligence' forms Turing's best-known work. Turing's friend Robin Gandy said that *Computing Machinery* 'was intended not so much as a penetrating contribution to philosophy but as propaganda. Turing thought the time had come for philosophers and scientists to take seriously the fact that computers were not merely calculating engines but were capable of behaviour which must be accounted as intelligent.

8vo, original printed wrappers.

http://sophiararebooks.com/4406

Vol. LIX. No. 236.]

[October, 1950

MIND

A QUARTERLY REVIEW

OF

PSYCHOLOGY AND PHILOSOPHY

I.—COMPUTING MACHINERY AND INTELLIGENCE

By A. M. TURING

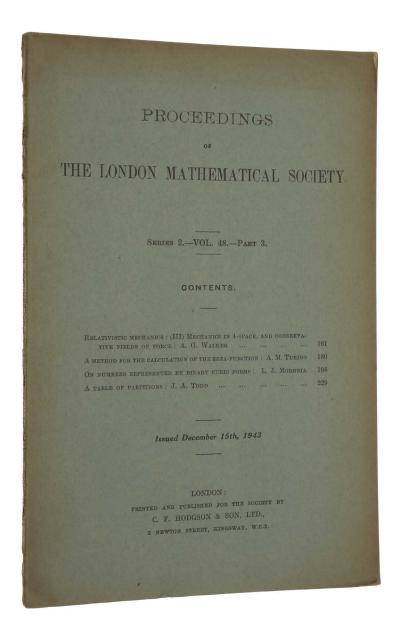
1. The Imitation Game.

I PROPOSE to consider the question, 'Can machines think?' This should begin with definitions of the meaning of the terms 'machine' and 'think'. The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words 'machine' and 'think' are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, 'Can machines think?' is to be sought in a statistical survey such as a Gallup poll. But this is absurd. Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words.

The new form of the problem can be described in terms of a game which we call the 'imitation game'. It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman. He knows them by labels X and Y, and at the end of the game he says either 'X is A and Y is B' or 'X is B and Y is A'. The interrogator is allowed to put questions to A and B thus.'

C: Will X please tell me the length of his or her hair?
Now suppose X is actually A, then A must answer. It is A's

Pose 22 20 mm



Turing on the Riemann hypothesis

TURING, Alan Mathison. *A Method for the Calculation of the Zeta-Function.* London: C. F. Hodgson and Son, 1943.

\$7,500

First edition of Turing's ground-breaking work outlining a method (which he hoped could be performed by a machine) to decide the most famous open problem in mathematics, the so-called Riemann hypothesis. This is a conjecture about the location of the zeros of the 'Riemann zeta function' – it asserts that, apart from some 'trivial' zeros, they all lie on a certain 'critical line.' If true, this would have enormous implications for the study of prime numbers.

8vo, original printed wrappers, a fine copy.

A founding work in computer science

TURING, Alan Mathison. Systems of logic based on ordinals.

London: C. F. Hodgson and Son, 1939.

\$9,500

First edition of Turing's PhD thesis, "one of the key documents in the history of mathematics and computer science" (Appel), and perhaps Turing's most formidable paper. "Systems of logic based on ordinals is a profound work of first rank importance. Among its achievements are the exploration of a means of circumventing Gödel's incompleteness theorems; the introduction of the concept of an 'oracle machine,' thereby opening the field of relative computability; and, in the wake of the demolition of the Hilbert programme (by Gödel, Turing and Church), an analysis of the place of intuition in mathematics and logic" (Copeland).

8vo, original printed wrappers.

http://sophiararebooks.com/4425

SYSTEMS OF LOGIC BASED ON ORDINALS.

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SYSTEMS OF LOGIC BASED ON ORDINALS†

By A. M. TURING.

[Received 31 May, 1938.—Read 16 June, 1938.]

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The well-known theorem of Gödel (Gödel [1], [2]) shows that every system of logic is in a certain sense incomplete, but at the same time it indicates means whereby from a system L of logic a more complete system L' may be obtained. By repeating the process we get a sequence L' $L_1 = L'$, $L_2 = L_1'$, ... each more complete than the preceding. A logic L_ω may then be constructed in which the provable theorems are the totality of theorems provable with the help of the logics L, L_1 , L_2 , ... We may then form L_{g_ω} related to L_ω in the same way as L_ω was related to L. Proceeding in this way we can associate a system of logic with any constructive ordinal... It may be asked whether a sequence of logics of this kind is complete in the sense that to any problem A there corresponds

[†] This paper represents work done while a Jane Eliza Proeter Visiting Fellow at Princeton University, where the author received most valuable advice and assistance from Prof. Alonzo Church.

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Von Neumann algebras

VON NEUMANN, John. Zur Algebra der Funktionaloperationen und Theorie der normalen Operatoren. Berlin: Springer, 1929. **\$2,200**

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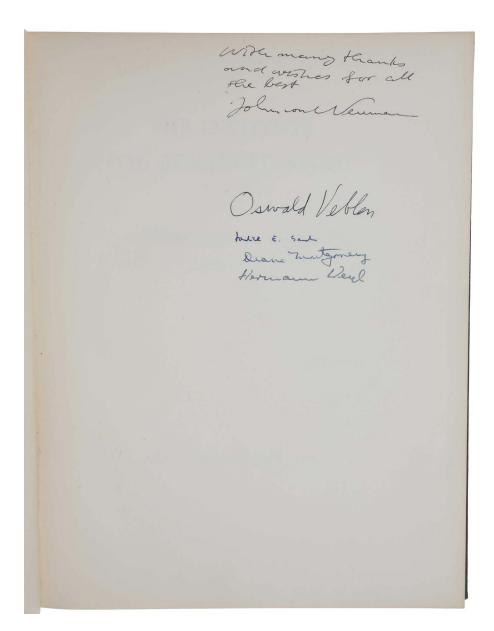
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WATSON; CRICK; WILKINS; STOKES; WILSON; FRANK-LIN; GOSLING; SEEDS. [The six milestone papers on the structure of DNA published in Nature, all in original wrappers]. London: Macmillan, 1953.

\$15,000

First edition, in the form in which they first appeared, of six crucial papers documenting the discovery of the structure of DNA and the mechanism of the genetic code. The first is Watson & Crick's paper 'Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid, which "records the discovery of the molecular structure of deoxyribonucleic acid (DNA), the main component of chromosomes and the material that transfers genetic characteristics in all life forms. Publication of this paper initiated the science of molecular biology.

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No. 4356 April 25, 1953

NATURE

equipment, and to Dr. G. E. R. Deacon and the is a residue on each chain every 3.4 A. in the z-direcpart in making the observations.

Young, F. B., Gerrard, H., and Jevons, W., Phil. Mag., 40, 149

*Ekman, V. W., Arkiv. Mat. Astron. Fysik. (Stockholm), 2 (11) (1905).

MOLECULAR STRUCTURE OF NUCLEIC ACIDS

A Structure for Deoxyribose Nucleic Acid

WE wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.), This structure has novel features which are of considerable biological interest

A structure for nucleic acid has already been proposed by Pauling and Corey¹. They kindly made their manuscript available to us in advance of publication. Their model consists of three intertwined chains, with the phosphates near the fibre axis, and the bases on the outside. In our opinion, this structure is unsatisfactory for two reasons: (1) We believe that the material which gives the X-ray diagrams is the salt, not the free acid. Without (purine) with cytosine (pyrimidine).

distances appear to be too small.

Another three-chain structure has also been suggested by Fraser (in the press). In his model the inside, linked together by hydrogen bonds. This structure as described is rather ill-defined, and for this reason we about the sequence of the other library that is a claim is automatically determined. It has been found expaning and the control of the control o

We wish to put forward a for deoxyribose nucleic acid. helical chains each coiled round der Waals contact. the same axis (see diagram). We ester groups joining β-D-deoxyhanded helices, but owing to chemical arguments. berg's2 model No. 1; that is, sugar being roughly perpendi-

captain and officers of R.R.S. Discovery II for their tion. We have assumed an angle of 36° between adjacent residues in the same chain, so that the structure repeats after 10 residues on each chain, that is, after 34 A. The distance of a phosphorus atom *Longuet-Higgins, M. S., Mon. Not. Roy. Astro. Soc., Geophys. Supp., 5, 285 (1949). Von Arx, W. S., Woods Hole Papers in Phys. Oceanog. Meteor., 11
(3) (1990).

The structure is an open one, and its water content is rather high. At lower water contents we would expect the bases to tilt so that the structure could

The novel feature of the structure is the manner in which the two chains are held together by the purine and pyrimidine bases. The planes of the bases are perpendicular to the fibre axis. They are joined together in pairs, a single base from one chain being hydrogen-bonded to a single base from the other chain, so that the two lie side by side with identical z-co-ordinates. One of the pair must be a purine and the other a pyrimidine for bonding to occur. The hydrogen bonds are made as follows: purine position I to pyrimidine position 1; purine position 6 to pyrimidine position 6.

If it is assumed that the bases only occur in the structure in the most plausible tautomeric forms (that is, with the keto rather than the enol configurations) it is found that only specific pairs of bases can bond together. These pairs are: adenine

In other words, if an adenine forms one member of would hold the structure together, especially as the a pair, on either chain, then on these assumptions the other member must be thymine; similarly for negatively charged phosphates near the axis will the other member must be thymine; similarly for repel each other. (2) Some of the van der Waals guanine and cytosine. The sequence of bases on a single chain does not appear to be restricted in any way. However, if only specific pairs of bases can be

of guanine to cytosine, are always very close to unity

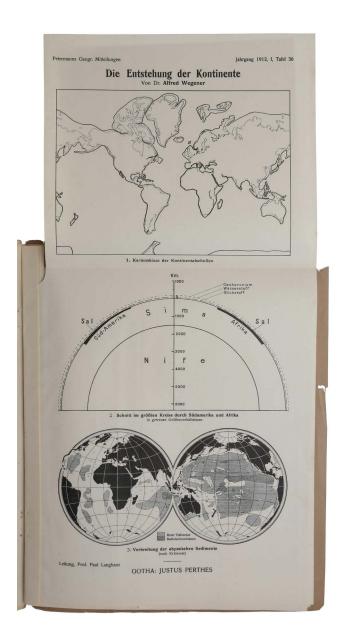
radically different structure for the salt of deoxyribose nucleic with a ribose sugar in place of the deoxyribose, as This structure has two the extra oxygen atom would make too close a van

have made the usual chemical ribose nucleic acid are insufficient for a rigorous tes assumptions, namely, that each chain consists of phosphate di-compatible with the experimental data, but it must be regarded as unproved until it has been checked ribofuranose residues with 3',5' against more exact results. Some of these are given linkages. The two chains (but in the following communications. We were not aware not their bases) are related by a of the details of the results presented there when we dyad perpendicular to the fibre devised our structure, which rests mainly though not Both chains follow right- entirely on published experimental data and stereo-

the dyad the sequences of the It has not escaped our notice that the specific atoms in the two chains run in opposite directions. Each chain loosely resembles Fur-Full details of the structure, including the con-

ditions assumed in building it, together with a set the bases are on the inside of the helix and the phosphates on the outside. The configuration we are much indebted to Dr. Jerry Donohue for

of the sugar and the atoms constant advice and criticism, especially on internear it is close to Furberg's atomic distances. We have also been stimulated by 'standard configuration', the a knowledge of the general nature of the unpublished experimental results and ideas of Dr. M. H. F. cular to the attached base. There Wilkins, Dr. R. E. Franklin and their co-workers at



Continental drift

WEGENER, Alfred. *Die Entstehung der Kontinente.* Gotha: Justus Perthes, 1912.

\$5,500

First edition, journal issues in the original printed wrappers. "Wegener is remembered today as the originator and one of the chief proponents of the theory of continental drift, which he conceived after being struck by the apparent correspondence in the shapes of the coastlines on the west and east sides of the Atlantic, and supported with extensive research on the geological and paleontological correspondences between the two sides.

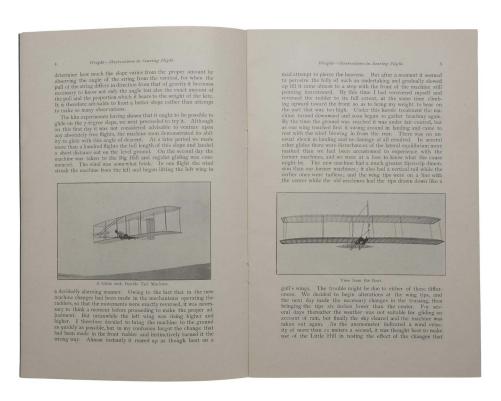
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A landmark work in the field of neurology

WILLIS, Thomas. Cerebri anatome: cui accessit nervorum descriptio et usus. London: Typis Ja. Flesher, 1664

\$42,000

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