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

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London International Antiquarian Book Fair
22-24 May 2014

(The descriptions in this list are abbreviated; full descriptions are available)

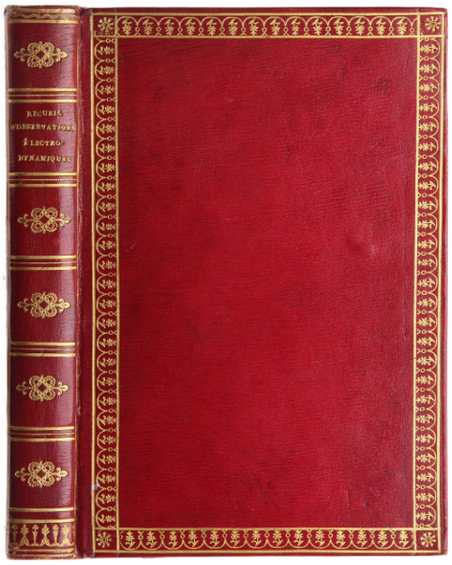
(Item 49: RUINI, Carlo. Dell'anatomia, et dell'infermita del cavallo. Bologna: heirs of Giovanni Rossi, 1598.)

Established the new science of electrodynamics

1. AMPERE, André-Marie. *Recueil d'observations électro-dynamiques, contenant divers mémoires, notices, extraits de lettres ou d'ouvrages périodiques sur les sciences, relatifs à l'Action mutuelle de deux courans électriques, à celle qui existe entre un courant électrique et un aimant ou le globe terrestre,...* Paris: Crochard, 1822 [1821-23].

£7,750

An exceptional copy containing all 17 parts and 10 plates, beautifully bound in fine red contemporary morocco. Ampére's papers on the relationship between electric current-flow and magnetism, which established the new science of electrodynamics. Ampère's first paper on the relationship between electric current-flow and magnetism was published in the *Annales de chimie et de physique* the 6th November 1820. Over the next seven years Ampére pursued his research in electrodynamics. The bibliography of Ampére's writings is extremely complex and remains to be studied: he published "his researches in a bewildering array of journal articles, offprints, and revisions of earlier works" (Norman). From 1821 through 1823 Ampére published several collections of his memoirs on electrodynamics under two different general titles: '*Memoires sur l'action mutuelle de deux courans electriques*' and '*Recueil d'observations électro-dynamiques*' but with varying contents. "Ampere had originally intended the collection to contain all the articles published on his theory of electrodynamics since 1820, but as he prepared new articles on the subject continued to appear, so that the fascicles, which apparently began publication in 1821 were in a constant state of revision, with at least five versions of the collection appearing between 1821 and 1823 under different titles" (Norman). The offered copy is in the most complete state; having 17 parts and 10 plates and a table of the parts plus two pages of errata.



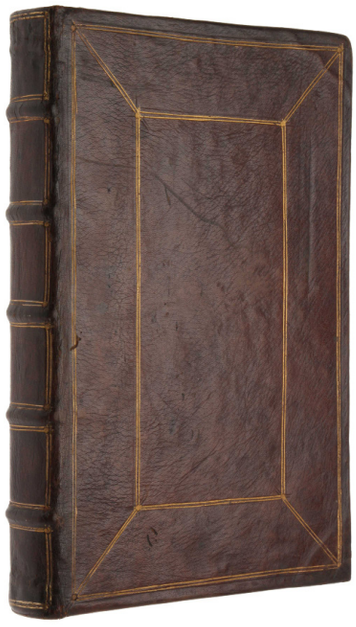
❧*Norman 45; Wheeler Gift 784 [both copies incomplete].*

Large-paper copy in contemporary morocoo

2. APOLLONIUS Pergaeus. *Conicorum Lib. V. VI. VII. paraphraste Abalphato Asphahanensi nunc primum editi. Additus in calce Archimedis Assumptorum liber, ex codicibus Arabicis m.ss.* Florence: Giuseppe Cocchini, 1661.

£7,000

First edition, large-paper copy in contemporary morocco. Editio princeps of books V-VII of the *Conics*, the most original parts of Apollonius' treatise on conic sections. Books I-IV were translated and published in 1537, and at the time it was believed that the remaining books were lost. "In the first half of the seventeenth century the Medici family acquired an Arabic manuscript containing Books V-VII of Apollonius's Conics, which had been lost up to that time. In 1658, with the help of the Maronite scholar Abraham Ecchellensis, Giovanni Borelli prepared an edited Latin translation of the manuscript, which was published three years later (the offered work). This was a valuable addition to the mathematical knowledge of the time, for whereas Books I-IV of the *Conics* dealt with information already known to Apollonius's predecessors, Books V-VII were largely original. Book V discusses normals to conics and contains Apollonius's proof for the construction of the evolute curve; Book VI treats congruent and similar conics and segments of conics; Book VII is concerned with propositions about inequalities between various functions of conjugate diameters" (Norman). "The fifth book reveals better than any other the giant intellect of its author. Difficult questions of maxima and minima, of which few examples are found in earlier works, are here treated most exhaustively. The subject investigated is to find the longest and shortest lines that can be drawn from a given point to a conic. Here are also found the germs of the subject of evolutes and centres of osculation" (Cajori, *A History of Mathematics*). The work also contains the first printing of the *Assumptorum liber*, attributed to Archimedes.

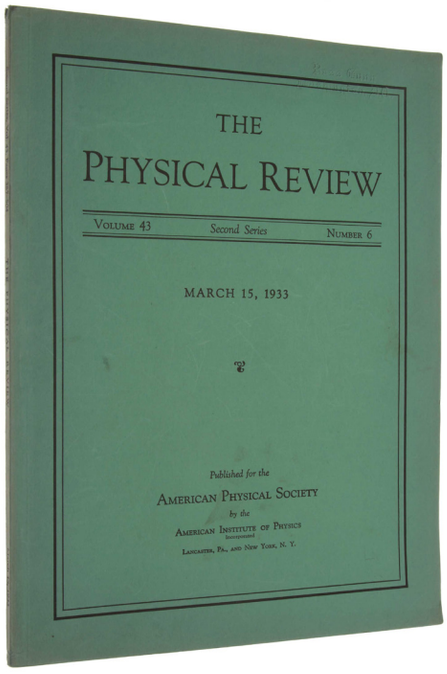


❧*Norman 58, Honeyman 119, De Vitry 29.*

Discovery of antimatter

3. ANDERSON, Carl David. *Positive electron.* Lancaster, New York: American Physical Society by the American Institute of Physics, 1933.

£1,800



A fine copy, with distinguished provenance (see below), of Carl Anderson's announcement of the discovery of the positron, the first antiparticle. Its existence had been predicted by Dirac three years earlier in his paper *Quantised Singularities in the Electromagnetic Field* (see item 20). "The prediction and subsequent discovery of the positron rank among the great triumphs of modern physics". (Pais, *The Genius of Science*). Anderson shared the Nobel Prize in Physics 1936 "for his discovery of the positron."

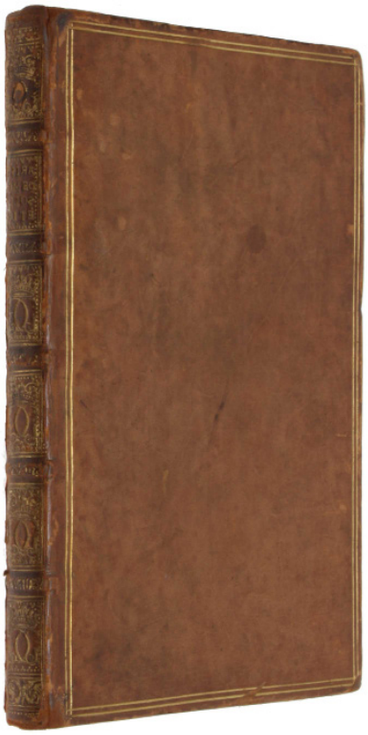
Provenance: With the blind stamp of Ross Gunn (1897 - 1966) to the front wrapper and two first leaves. Gunn was an American physicist, a key player in the US nuclear submarine program, and a principal in the Manhattan Project. The New York Times described Gunn as "one of the true fathers of the nuclear submarine program". For his contributions to the Manhattan Project Gunn received the Navy Distinguished Civilian Service Award on September 4, 1945. The National Academies Press said that he "was one of the most versatile physicists of the early and mid-twentieth century""

❧*Brandt, Harvest of a Century, Episode 49.*

The first proponent of the heliocentric hypothesis

4. ARISTARCHUS of Samos. *De Magnitudinibus et Distantiis Solis et Lunae.* Pesaro: Franciscanus, 1572.

£11,400



This treatise is the sole extant work of Aristarchus - the first proponent of a heliocentric system - and marks "the first attempt to determine astronomical distances and dimensions by mathematical deductions based upon a set of assumptions." (DSB). "This treatise is also of great mathematical interest because of it containing the calculation of ratios which are in fact trigonometrical ratios." (Sarton, I p.156-57). "The propositions of Aristarchus are also of particular mathematical interest because the ratios of the sizes and distances which have to be calculated are really trigonometrical ratios, sines, cosines, &c., although at the time of Aristarchus trigonometry had not been invented, while no reasonably close approximation to the value of π had been made (it was Archimedes who first obtained the value 22/7). Exact calculation of the trigonometrical ratios being therefore impossible for Aristarchus, he set himself to find upper and lower limits for them, and he succeeded in locating those which emerge in his propositions within tolerably narrow limits." (Heath, Aristarchus of Samos, The Ancient Copernicus, p.328).

Provenance: The Macclesfield copy, fine 17th-century calf with crowned monogram of Gaston, Duke of Orléans (1608-1660), initials F.S.L.A. on title. Exceptionally fine and clean throughout.

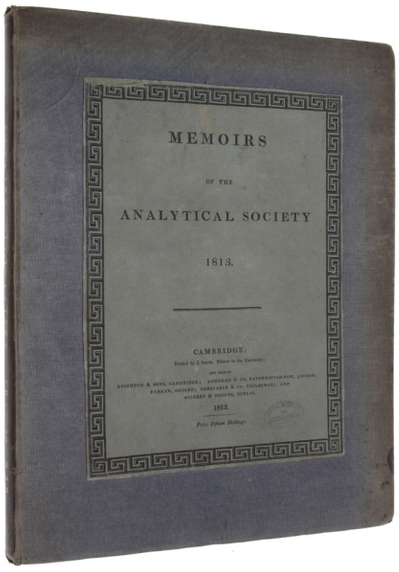
❧*Sparrow, Milestones of Science 10; Barchas Collection 82; Stanitz 19.*

Babbage's first publication

5. BABBAGE, Charles and HERSCHEL, John. *Memoirs of the Analytical Society 1813.* Cambidge: printed by J. Smith and sold by Deighton & Sons, 1813.

£9,400

First edition, extremely rare, of the only volume of the *Memoirs of the Analytical Society*. "Babbage, Herschel, George Peacock and several other mathematlly minded students at Cambridge University founded the Analytical Society, dedicated to the reform of mathematics in Britain, in 1812. This is the only volume of its Memoirs. It is also Babbage's first publication. Mathematics at British universities—and by extension the entire country—had become stagnant over the previos century, due to the universities' partisan adherence to Newton's dot-notation and method of fluxions over the powerful Leibnitzian differential methods and d-notation used in Europe. The first objective of the Society was to promote the continental method as embodied in Lacroix's *Sur le calcul differentiel et integrale* (1802), which Babbage deemed "so perfect that any comment was unncccssary". In 1813 the Society published its single volume of Memoirs, written entirely by Babbage and Herschel; in deciding upon a title for the work, Babbage punningly suggested that it should be called "The Principle of pure D-ism in opposition to the Dot-age of the University". Babbage and Herschel cowrote the preface, which gives a brief history of analysis since the time of Newton, and draws attention to what was to be a lasting preoccupation for Babbage—"the importance of adopting a clear and comprehensive notation", Babbage's first published work, a paper entitled '*On continued products*,' also appeared in the *Memoirs*.


MEMOIRS

OF THE

ANALYTICAL SOCIETY

1813.

CAMBRIDGE:

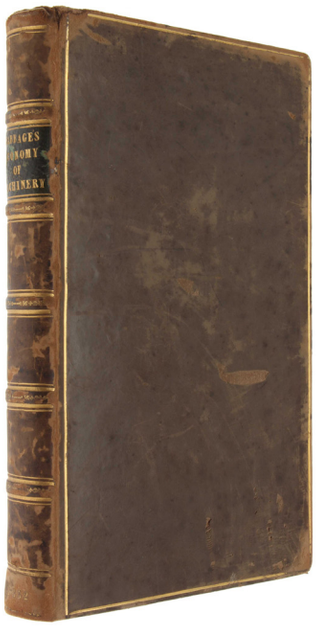
❧*Norman, Origins of Cyberspace 17 [lacking 2 leaves of the Babbage paper]. OCLC lists two copies in the US (Brown and NYPL) and one in the UK.*

Large-paper copy - 'a turning point in economic writing'

6. BABBAGE, Charles. *On the Economy of Machinery and Manufacturers.* London: Charles Knight, 1832.

£3,000

First edition, very rare large paper issue in unrestored contemporary binding, of Babbage's pioneering work of political economy, "a remarkable performance of a remarkable man" (Schumpeter), and "a turning point in economic writing" (ODNB). "The first edition of *On the economy of machinery and manufacturers* was issued in two versions: a large-paper version, of which a small number were printed for presentation only; and the regular version of which three thousand copies were issued" (OOC). "Babbage undertook the analysis of machinery and manufacturing processes to discover ideas and techniques that could be applied to the construction of his Difference Engine no. 1, which he knew would stretch the available mechanical technology to its limits. Primary themes of the book were the division of labor and the division of mental labor, to which Babbage devoted chapters 19 and 20... Rather than a study limited to engineering and manufacturing techniques, his book turned out to be an analysis of manufacturing processes within their economic context. Written when manufacturing was undergoing rapid development and radical change, the book represents an original contribution to British economics. "*On the economy of machinery and manufacturers* was also the first book on operations research, discussing topics like the regulation of power, control of raw materials, division of labor, times studies, the advantage of size in manufacturing, inventory control, and duration and replacement of machinery. On pages 166 and 167 Babbage analyzed the production of his book as an example of the cost of each step in a particular production process. The work was Babbage's most complete and professional piece of writing, and the only one of his books that went through four editions in his lifetime" (OOC).

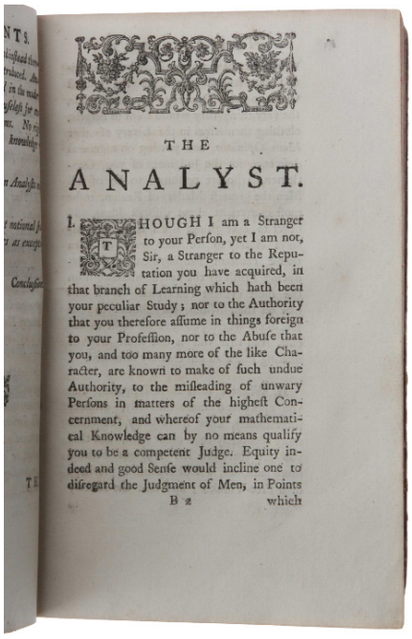


❧*Norman, Origins of Cyberspace, no. 42.*

'The most spectacular event of the century in the history of British mathematics'

7. BERKELEY, George. *The Analyst; or, a discourse addressed to an infidel mathematician. Wherein it is examined whether the object, principles, and inferences of the modern analysis are more distinctly conceived, or more evidently deduced, than religious mysteries and points of faith.* London: J. Tonson, 1734.

£11,500



THE

ANALYST.

THOUGH I am a Stranger to your Perſon, yet I am not, Sir, a Stranger to the Reputation you have acquired, in that branch of Learning which hath been your peculiar Study; nor to the Authority that you therefore aſſume in things foreign to your Profeſſion, nor to the Abuſe that you, and too many more of the like Character, are known to make of ſuch undue Authority, to the miſleading of unwary Perſons in matters of the higheſt Concernment, and whereof your mathematical Knowledge can by no means qualify you to be a competent Judge. Equity indeed and good Senſe would incline one to diſregard the Judgment of Men, in Points

B 2 which

First edition, first issue, of Berkeley's famous attack on the new analysis of Newton and Leibniz, which "marks a turning-point in the history of mathematical thought in Great Britain" (Cajori), bound here with Berkeley's *Theory of Vision* (1733) - a work of "of major importance" (Keynes), and *Defence of Free-Thinking in Mathematics* (1735), and five more pamphlets. "Despite the great progress of analysis during the 18th century, foundational questions remained largely unsolved... The most influential criticism of the new analysis was put forward by the famous English philosopher George Berkeley in 1734. The subtitle of his work *The Analyst Or A Discourse Addressed to an Infidel Mathematician* [referred to Newton's friend and proponent of fluxions Edmund Halley]... Berkeley's criticism was well informed and efficient. Rooted in the tradition of English sensualism, he showed that many definitions in the infinitesimal calculus are paradoxical and cannot be justified by intuition. He explained the success of the new calculus by a repeated neglect of infinitely small quantities leading through a compensation of errors to a correct answer." (Jahnke, *History of Analysis*).

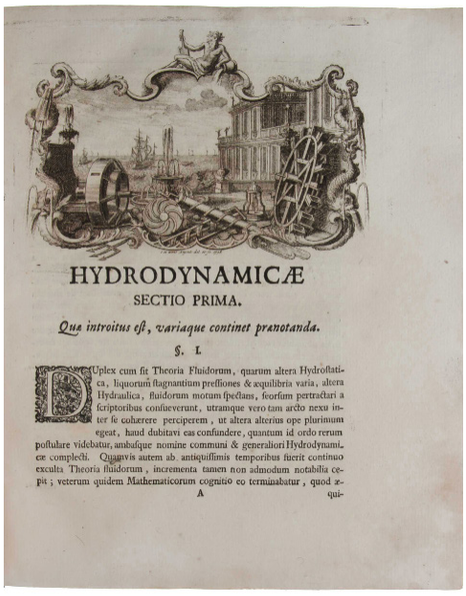
❧*Barchas 167; Stanitz 52a.*

A very fine copy

8. BERNOULLI, Daniel. *Hydrodynamica, sive De Viribus et Motibus Fluidorum Commentarii. Opus Academicum..* Strasbourgh: Johann Reinhold Dulsseker, 1738.

£11,000

A beautiful and very large copy in contemporary binding of Bernoulli's epochal work on fluid dynamics and kinetic gas theory. "Bernoulli's *Hydrodynamica* [was] one of the major works initiating the mathematical study of fluid flow. Bernoulli presents the following equations for steady, non viscous, incompressible flow: $p + \rho\, v^2/2 + \rho\, gy = A$, where p symbolizes pressure, ρ density, v velocity, g the acceleration of gravity, y height, and A a constant. He also examines the equilibrium oscillation of an interialess ocean, and explicitly states that the flow equations are appropriate not only for the more common applications of fluid dynamics but also for the flow of blood in veins and arteries. Bernoulli, like Galileo Galilei in 1638 and Christian Huygens, assumes conservation of mv^2 rather than conservation of momentum mv, m and v symbolizing a body's mass and velocity respectively" (Parkinson, *Breakthroughs*). The *Hydrodynamica* also "initiates the mathematical study of the kinetic theory of gases... and analytically deduces Boyle's Law that volume and pressure of a gas are inversely related, a law originally obtained empirically... Bernoulli's explanation, based on random motions of the gas particles, is more modern than an earlier attempt by Isaac Newton to explain Boyle's Law by assuming relatively motionless particles which repel each other with a force inversely proportional to the distance between them" (ibid).



HYDRODYNAMICÆ

SECTIO PRIMA.

Quæ introitus eſt, variaque continet pranotanda.

§. I.

DUplex cum ſit Theoria Fluidorum, quarum altera Hydroſtatica, liquorum ſtagnantium preſſiones & æquilibria varia, altera Hydraulica, fluidorum motum ſpectans, ſeorſum pertractari a ſcriptoribus conſueverunt, utramque vero tam arcto nexu inter ſe cohærere perciperem, ut altera alterius ope plurimum egeat, haud dubitavi eas confundere, quantum id ordo rerum poſtulare videbatur, ambaſque nomine communi & generaliori Hydrodynamicæ complecti. Quamvis autem ab antiquiſſimis temporibus fuerit continuo excultа Theoria fluidorum, incrementa tamen non admodum notabilia cepit; veterum quidem Mathematicorum cognito eo terminabatur, quod æ-

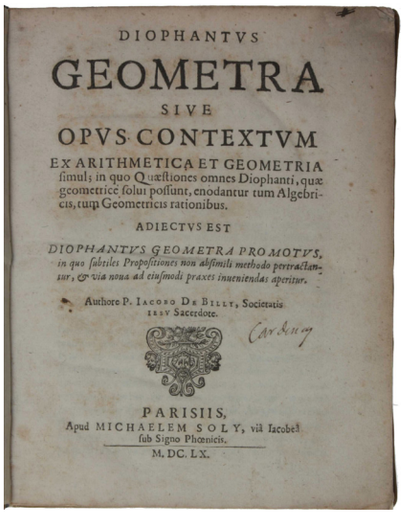
A qui-

❧*Norman 215; PMM 179n; Barchas 175; Parkinson pp 155-6; Roberts and Trent, pp 34-35.*

Fermat and number theory - the copy of Géraud de Cordemoy

9. BILLY, Jacques de. *Diophantus geometra siue Opus contextum ex arithmetica et geometria simul: in quo quæstiones omnes Diophanti, quæ geometrice solui possunt, enodantur tum algebricis, tum geometricis rationibus. Adiectus est Diophantus geometra promotus, in quo subtiles propositiones non absimili methodo pertractantur, & via noua ad eiusmodi praxes inueniendas aperitur.* Paris: Michel Soly, 1660.

£9,800


DIOPHANTVS

GEOMETRA

SIVE

OPVS CONTEXTVM

EX ARITHMETICA ET GEOMETRIA simul; in quo Quæstiones omnes Diophanti, quæ geometrice solui possunt, enodantur tum Algebricis, tum Geometricis rationibus.

ADIECTVS EST

DIOPHANTVS GEOMETRA PROMOTVS, in quo subtiles Propositiones non absimili methodo pertractantur, & via noua ad eiusmodi praxes inueniendas aperitur.

Authore P. Iacobo De Billy, Societatis Iesv Sacerdote.

PARISIIS,
Apud MICHAELEM SOLY, viâ Iacobeâ sub Signo Phœnicis.
M. DC. LX.

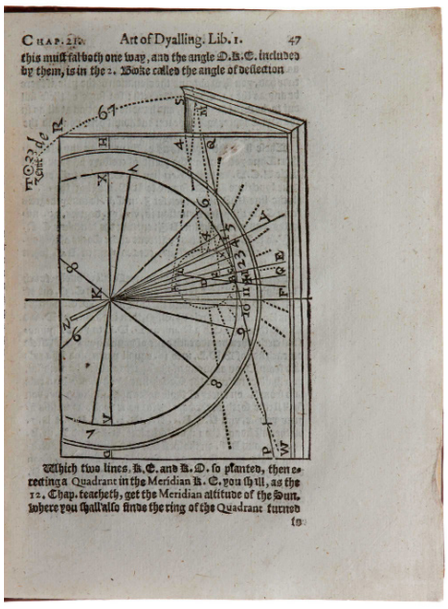
Rare first edition of this work on the indeterminate problems of Diophantus' *Arithmetica*. Billy corresponded actively with Fermat on number theory, and it is mainly through his collection of letters from Fermat, published as 'Doctrinae Analyticae Inventum Novum' in the 1670 edition of Bachet's *Diophantus* (see item 24), that we know of Fermat's methods for solving Diophantine equations. This work, published a decade before the 'Inventum Novum', also deals with Diophantine problems, in which both arithmetical and geometrical solutions are given. The second part is devoted to 59 algebraic problems that are not found in Diophantus. "Billy corresponded with Fermat and produced a number of results in number theory which have been named after him. Billy had collected many problems from Fermat's letters and, after the death of his father, Fermat's son appended de Billy's collection under the title 'Doctrinae analyticae inventum novum' (New discovery in the art of analysis) as an annex to his edition of the *Arithmetica* of Diophantus (1670)" (DSB).

Provenance: ownership inscription on title of [Géraud de] Cordemoy. "Geraud de Cordemoy (1626-1684) was one of the more important Cartesian philosophers during the decades immediately following the death of Descartes... His two most important works are *Le Discernement du corps et de l'âme* (1666) and his *Discours physique de la parole* (1668)" (SEP).

One of the earliest English books on dialing

10. BLAGRAVE, John. *The Art of Dyalling in two Parts. The first shewing plainly, and in a maner mechanichally to make dyals to all plaines, either Horizontall, Murall, declining, reclining or inclining, with the theoricke of the Arte. The second how to performe the selfe same, in a more artificall kinde, and without use of Arithmeticke, together with concaue and conuex Dyals, and the inserting of the 12 signes, and the howres of any other country in any dyall, with many other things to the same Art appertaining.* London: Printed by N[icholas] O[kes] for Simon Waterson, 1609.

£13,850


CHAP. 21. Art of Dyalling. Lib. 1. 47

this must fal both one way, and the angle D.B.E. included by them, is in the 2. Booke called the angle of deflection

Which two lines. B.E. and B.D. so planted, then erecting a Quadrant in the Meridian B.E. you shall, as the 12. Chap. teacheth, get the Meridian altitude of the Sun. Where you shall also finde the ring of the Quadrant turned to

Very rare first edition, of one of the earliest English books on dialing, the last of four books published by the famous English mathematician during his lifetime. It is unusual to find such early English scientific books in fine condition and in a contemporary binding as here. Only four other complete copies have appeared at auction in the last 50 years, all except the Horblit copy being in later bindings. *Provenance*: armorial bookplate of the Rt. Hon. Algernon Capell, Earl of Essex, 1701, on verso of title, stamp of Christopher St. J. H. Daniel on two endpapers. "Like many mathematical practitioners, Blagrave found steady employment in designing, erecting and repairing sundials for churches, mansions and gardens. And since dialling was a favourite amateur pursuit, a text-book and a teacher were always in demand. Blagrave is exceptionally clear and practical, and explains the various ways in which the meridian can be established by relative positions of prominent stars or with simple improvised instruments" (Taylor, *Mathematical Practitioners*, p.327).

❧*Horblit sales catalogue, Sotheby's 1974, lot 126; Frank Streeter, Christie's 2007, lot 42. Not in Macclefield or Honeyman.*

The rare original edition of this spectacular machine book

11. BOECKLER, Georg Andreas. *Theatrum Machinarum Novum.* Nürnberg: Christoff Gerhard für Paul Fürst, 1661.

£11,500

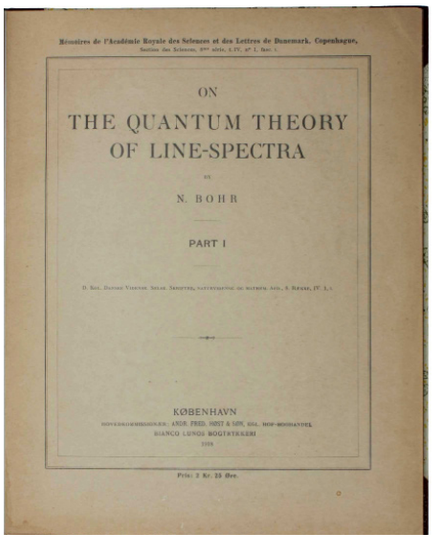
This 1661 edition with text in German was eventually followed by three later editions and a translation into Latin. The 154 full page plates are mostly engraved by (or reworked from) Balthasar Schwan. Boeckler's artistic display of mechanisms of many sorts was, in part, a compilation from contemporary and slightly earlier sources. The fine plates demonstrate ingenious uses of the cogwheel in machinery ranging from gigantic mills to a humble kitchen spit (which is only slightly more complicated than usual examples). Motion drives, or is supplied by, the intricate systems of wheels employing water, wind, weights, horse power, human muscle, or some striking combinations of all these. The final plate represents important reportage of a very recently invented machine from the city in which this wonderful book was printed — This is Plate 154, which depicts a fire engine pump made by the Nuremberg compass-maker Hans Hautsch in 1658. The suction-and-force mechanism of Hautsch's clever device (described on pp. 60-1 of Boeckler's text) enabled twenty-four men to raise water to a height of eighty to one hundred feet in a continuous stream. Current historians of engineering view it as the basis of the modern fire engine. Provenance: Estate of Ambassador and Mrs. William H.G. FitzGerald, Washington, DC, by (Mrs. Fitgerald's) descent from Ignaz Petschek and Nikodem Caro, Austro-Hungarian Empire. Ignaz Petschek (1857-1934) was a Czech banker, with commercial interests in mining, coal distribution and major industry.

❧*Stanitz 46; [for the 1662 edition see:] Macclesfield 2195; Horblit 132; Honeyman 359.*

Bohr's correspondance principle

12. BOHR, Niels Henrik David. *On the Quantum Theory of Line-Spectra, I-III [all published].* Copenhagen: Bianco Luno, 1918-1922.

£2,200


Mémoires de l'Académie Royale des Sciences et des Lettres de Danemark, Copenhague,

ON

THE QUANTUM THEORY
OF LINE-SPECTRA

BY

N. BOHR

PART I

KØBENHAVN

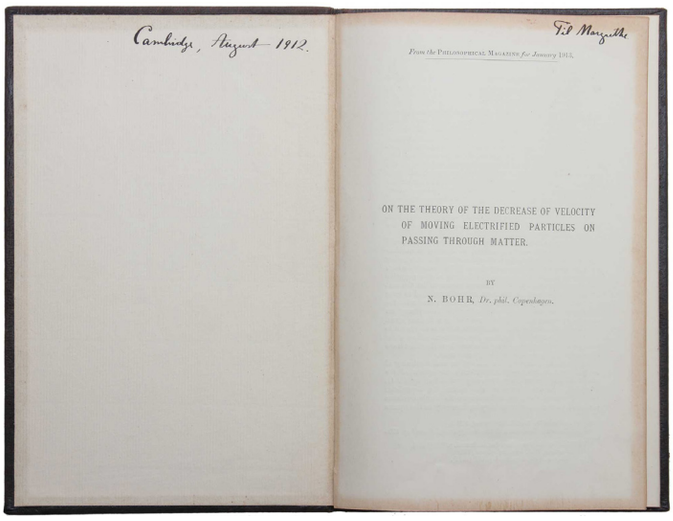
BIANCO LUNOS BOGTRYKKERI

A fine set of this major work: It was in this fundamental paper that Bohr first gave a clear formulation of, and fully utilized, his 'correspondence principle'. Besides his atom model (1913), this is by many considered to be Bohr's greatest contribution to physics. Bohr's correspondence principle (or postulate) states in general that although classical physics is incomplete there must be a fundamental analogy between quantum theory and classical physics. Actually Bohr at first reffered to the postulate as the 'principle of analogy'. It was Bohr's underlying idea that the new quantum theory must satisfy in the limiting cases, e.g., when frequencies ν tend to zero or quantum numbers $n \to \infty$, that it's predictions approximate those of classical physics. When studying different quantum theoretic problems one can thus utilize already established facts from what classical physics predicts in that particular situation, and then work backwards to arrive at new quantum theoretic rules for the systsem. In this major paper, of which the two first parts were published in 1918 and the third in 1922, Bohr penetrated far into the quantum theory of line-spectra of the Hydrogen atom, and other elements, by using his principle and the classical theory of electrodynamics. Bohr's method was the principle guide to the progress of quantum theory during the early twenties, until it was finaly built into the foundation of quantum mechanics.

Bohr's own copy - his first epochal paper on atomic physics

13. BOHR, Niels. *On the Theory of the Decrease of Velocity of Moving Electrified Particles on Passing Through Matter.* [London: Taylor & Francis, 1912/1913].

£13,500



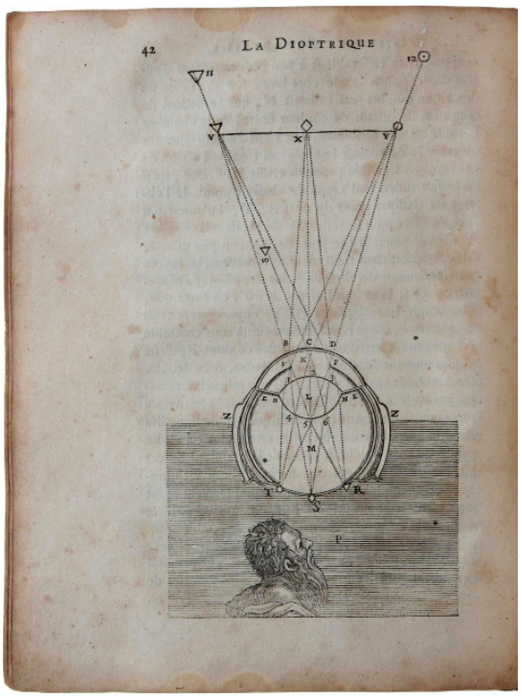
Bohr's own copy, inscribed to his wife, and a probably unique pre-offprint, dated by Bohr 'Cambridge, August 1912' and thus preceding the ordinary publication date by four months; it is bound for his wife in a beautiful gift binding. This is Bohr's first epochal paper on atomic physics and contains the founding blocks for his atom model. In the present paper (published just before his celebrated trilogy *On the Constitution of Atoms and Molecules*), Bohr was able to conclude 'that a hydrogen atom contains only 1 electron outside the positively charged nucleus, and that a helium atom only contains 2 electrons outside the nucleus.' "Bohr's 1913 paper on alpha-particles [the present work], which he had begun in Manchester, and which had led him to the question of atomic structure, marks the transition to his great work, also of 1913, on that same problem." (Pais, p. 128).

❧*Rosenfeld, Bohr Bibliography No. 5. Rosenfeld, DSB II, pp. 240-41. Pais, Niels Bohr's Times, pp. 117-31.*

Exceptionally large copy in the original Dutch vellum

14. DESCARTES, René. *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..* Leiden: Jan Maire, 1637.

£115,000



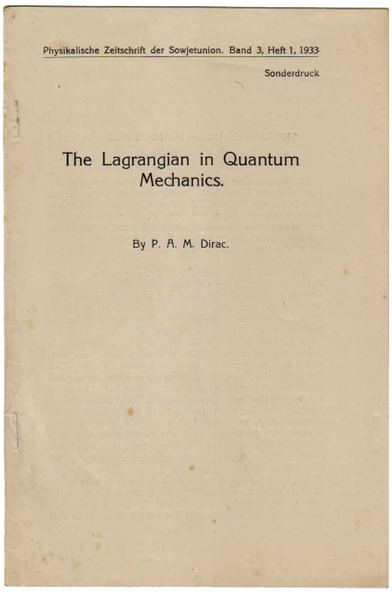
A very fine and exceptionally large copy (203 x 158 mm), entirely unrestored, in its original Dutch vellum binding - the birth of analytical or coordinate geometry, designated by John Stuart Mill as "the greatest single step ever made in the progress of the exact sciences". "It is no exaggeration to say that Descartes was the first of modern philosophers and one of the first modern scientists; in both branches of learning his influence has been vast... His application of modern algebraic arithmetic to ancient geometry created the analytical geometry which is the basis of the post-Euclidean development of that science. His statement of the elementary laws of matter and movement in the physical universe, the theory of vortices, and many other speculations threw light on every branch of science from optics to biology... All this found its starting point in the 'Discourse on the Method for Proper Reasoning and Investigating Truth in the Sciences'. Descartes's purpose is to find the simple indestructible proposition which gives to the universe and thought their order and system. Three points are made: the truth of thought, when thought is true to itself (thus cogito, ergo, sum), the inevitable elevation of its partial state in our finite consciousness to its full state in the infinite existence of God, and the ultimate reduction of the material universe to extension and local movement." (PMM).

❧*PMM 129; Grolier/Horblit 24; Dibner 81; Evans 5; Sparrow 54.*

The starting point of Feynman's path-integral formalism

15. DIRAC, Paul Adrien Maurice. *The Lagrangian in Quantum Mechanics.* Charkow: Technischer Staatsverlag, 1933.

£6,000


Physikalische Zeitschrift der Sowjetunion. Band 3, Heft 1, 1933

Sonderdruck

The Lagrangian in Quantum Mechanics.

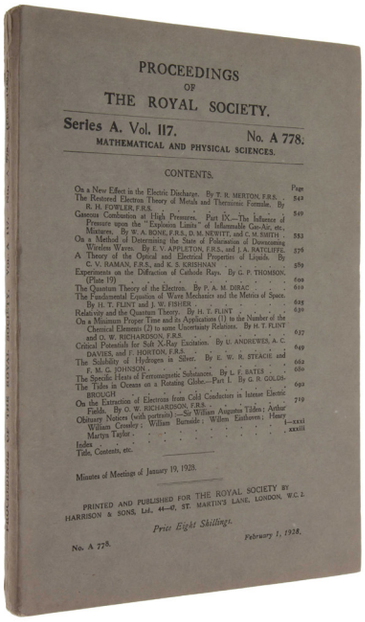
By P. A. M. Dirac.

Extremely rare offprint of this seminal paper which, in the hands of Richard Feynman, gave birth to the path-integral formulation of quantum mechanics and Fey- nman integrals. "Dirac thought that the concept of 'action' might be just as important in the quantum world of electrons and atomic nuclei as it is in the large-scale domain. When he generalized the idea to quantum mechanics [in the present paper], he found that a quantum particle has not just one path available to it but an infinite number, and they are – loosely speaking – centred around the path predicted by classical mechanics. He also found a way of taking into account all the paths available to the particle to calculate the probability that the quantum particle moves from one place to another" (Farmelo). At a chance meeting in Princeton in 1947, Herbert Jehle pointed out to Feynman that Dirac, in the present paper, had given "an infinitesimal time development operator involving the classical Lagrangian. Successive applications of this operator to the initial wave function generated the wave function at any later time, and the wave function was equivalent to finding the solution of the Schrödinger equation. To obtain the wave function after a finite time has elapsed, however, [Feynman realised that] one had to integrate over all possible paths containing two arbitrary space-time points. This, in fact, was the path-integral approach of Feynman" (Biogr. Mems Fell. R. Soc.Lond. 48 (2002), p. 107).

The Dirac equation

16. DIRAC, Paul Adrien Maurice. *The Quantum Theory of the Electron.* London: Harrison, 1928.

£3,600


PROCEEDINGS OF THE ROYAL SOCIETY.

Series A. Vol. 117. No. A 778.

MATHEMATICAL AND PHYSICAL SCIENCES.

CONTENTS.

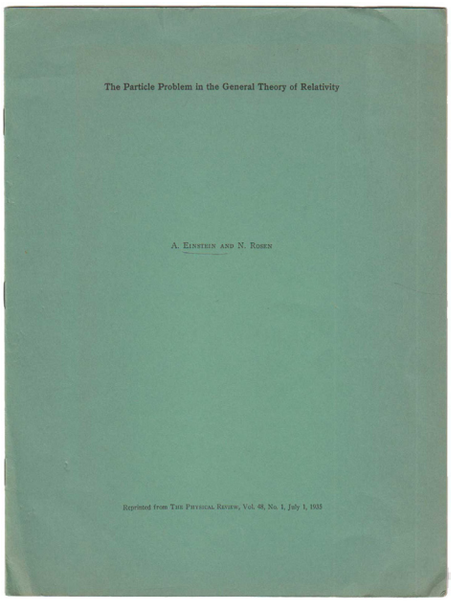
A fine copy in original wrappers of the discovery of the 'Dirac equation'. "The relativistic wave equation of the electron ranks among the highest achievements of twentieth-century science" (Pais, Inward Bound, p. 290). "What is widely regarded as Dirac's greatest contribution to physics came in 1928, when he found an equation which incorporates both quantum physics and the requirements of the special theory of relativity to give a complete description of the electron. One of the most remarkable features of this equation was that it had two sets of solutions, corresponding to positive energy electrons and negative energy electrons; the 'negative energy electrons' are now called positrons. Dirac had predicted the existence of antimatter, although even Dirac was not entirely clear what the equations meant until the positron was discovered by Carl Anderson in 1932. Because they incorporated relativistic effects, Dirac's wave equations had accurately predicted the electron's motion, spin, and magnetic and other properties. Moreover, these equations laid the foundations for the theory of quantum electrodynamics, which incorporates both quantum and relativity theory in its descriptions of the interactions of charged particles with the electromagnetic field" (Britannica).

❧*Brandt, Harvest of a Century, Episode 43.*

The introduction of wormholes

17. EINSTEIN, Albert; ROSEN, Nathan *The Particle Problem in the General Theory of Relativity.* Lancaster PA: Lancaster Press, 1935.

£1,800


The Particle Problem in the General Theory of Relativity

A. Einstein and N. Rosen

Reprinted from The Physical Review, Vol. 48, No. 1, July 1, 1935

Rare offprint of the famous 'Einstein-Rosen bridge' paper in which the authors introduced the concept of a wormhole. "In the last decades of his life, Albert Einstein tried endlessly to unify electromagnetism with his own theory of gravity, general relativity. These efforts are mostly now regarded as quixotic, but a short proposal written in 1935 with a colleague has survived in unlikely fashion as the source of science-fiction ideas for speeding across the universe by means of 'wormholes' through spacetime. From the modern perspective, the paper also illustrates how general relativity posed mathematical and conceptual difficulties that foxed even its creator. Einstein and Nathan Rosen, both at the Institute for Advanced Study in Princeton, wanted to rid physics of singularities–points where mathematical quantities become infinite or otherwise ill-defined–such as the concept of a particle that has all its mass concentrated into an infinitely small geometrical point They imagined a path tracing radially inward. Instead of trying to cross the imaginary spherical shell at the singular radius and proceeding down to the center, Einstein and Rosen showed how to match the path onto another track that emerges outward again–but into a separate section of spacetime. Imagine funnel shapes pulled out of two adjacent rubber sheets and connected at their necks, providing a continuous, tube-shaped path from one surface to the other. This construction makes a smooth connection or bridge between two distinct pieces of spacetime" (Lindley, *The Birth of Wormholes*, Physical Review Focus volume 15, p.11, 2005).

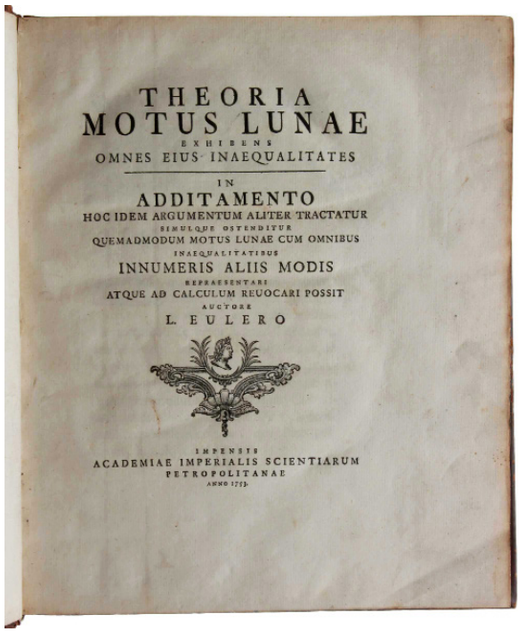
❧*Weil 196; Boni 228.*

Large-paper copy

18. EULER, Leonhard. *Theoria Motus Lunae Exhibens Omnes Eius Inaequalitates.* St. Petersburg: Academiae Imperialis Scientiarum, 1753.

£9,750

Very rare first edition, large-paper copy (276 x 228 mm), and in fine unrestored binding. A beautiful copy of Euler's 'first lunar theory', the theoretical basis for Tobias Mayer's lunar tables that won the British Parliament prize for the longitude problem. "Based on Newton's universal law of gravitation, Euler first developed his first lunar theory with the aid of his method of variation of orbital parameters. This method is fairly general in the sense that it cannot only be applied to the theory of lunar motion, but also to the planetary motion. Euler published his first lunar theory in his celebrated treatise 'Theory of lunar motion' in 1753. He continued his research for almost the next three decades to make significant improvement of his first lunar theory including the lunar orbit, Moon's position, equations for the Moon's motion, lunar eclipses and the period of revolution of the Moon." (Debnath: The Legacy of Leonhard Euler, p.365). "Astronomy owes to Euler the method of variation of arbitrary constants. By it he attacked the problem of perturbations, explaining, in case of two planets, the secular variations of eccentricities, nodes, etc. He was one of the first to take up with success the theory of the moon's motion by giving approximate solutions to the 'problem of three bodies'. He laid a sound basis for the calculation of tables of the moon." (Cajori, *History of Mathematics*, p.240).


THEORIA
MOTUS LUNAE
EXHIBENS
OMNES EIUS INAEQUALITATES
IN
ADDITAMENTO
HOC IDEM ARGUMENTUM ALITER TRACTATUR
SIMULQUE OSTENDITUR
QUEMADMODUM MOTUS LUNAE CUM OMNIBUS
INAEQUALITATIBUS
INNUMERIS ALIIS MODIS
REPRAESENTARI
ATQUE AD CALCULUM REVOCARI POSSIT
AUCTORE
L. EULERO
IMPENSIS
ACADEMIAE IMPERIALIS SCIENTIARUM
PETROPOLITANAE
ANNO 1753

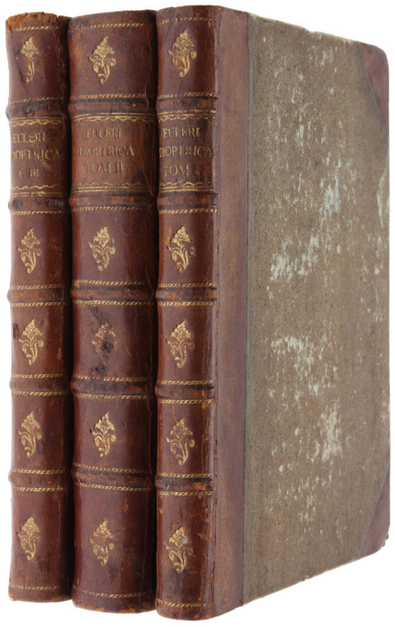
❧*Eneström 187; Sotheran, Second Supplement 3098; Honeyman 1068; Macclesfield 743.*

The foundation work of optical systems

19. EULER, Leonhard. *Dioptricae Pars prima ... De explicatione principiorum; Pars secunda ... De constructione telescopiorum dioptricorum; Pars tertia ... De constructione microscopiorum.* St. Petersburg: Imperial Academy of Sciences, 1769-1771.

£9,750

First edition, and a very fine copy, of Euler's rare work on optics, 'widely known and important in the physics of the eighteenth century' and which 'laid the foundations of the calculation of optical systems' (DSB). The first volume presents his general theory of optics, including his prediction of the possibility of constructing achromatic lenses. The second and third volumes discuss the construction of the telescope and the microscope. "Next to the lunar theory, the most important subject which exercised the genius of [18th century] mathematicians was the improvement of the achromatic telescope" (*Edinburgh Encyclopedia*, Vol. 6). "In the second half of his life, from 1750 on and throughout his sixties, Leonhard Euler worked intensively on problems in geometric optics. His goal was to improve in several ways optical instruments, in particular, telescopes and microscopes. Besides the determination of the enlargement, the light intensity and the field of view, he was primarily interested in the deviations from the point-by-point imaging of objects (caused by the diffraction of light passing through as system of lenses), and also in the even less tractable deviations which arise from the spherical shape of the lenses… As was his custom, he collected his results in a grandly conceived textbook, the *Dioptrica* (1769-1771).

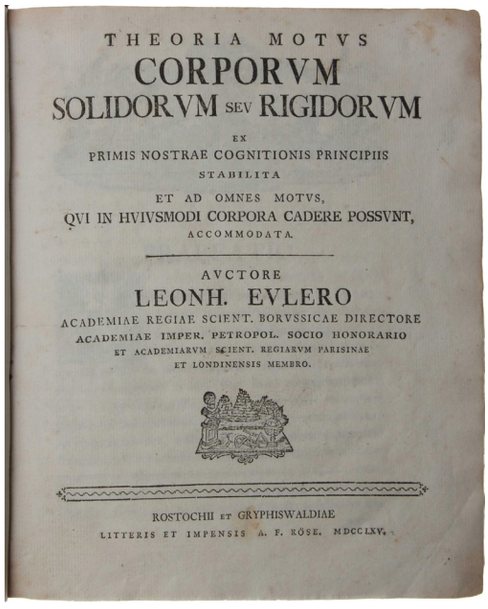


❧*Eneström 367, 386, 404; Arnaud de Vitry 377.*

The sequel to Euler's Mechanica - copy of Friedrich Engel

20. EULER, Leonhard. *Theoria motus corporum solidorum seu rigidorum. Ex primis nostrae cognitionis principiis stabilita et ad omnes motus, qui in huiusmodi corpora cadere possunt, accommodata.* Rostock & Greifswald: A. F. Röse, 1765.

£6,000


THEORIA MOTVS
CORPORVM
SOLIDORVM SEV RIGIDORVM
EX
PRIMIS NOSTRAE COGNITIONIS PRINCIPIIS
STABILITA
ET AD OMNES MOTVS,
QVI IN HVIVSMODI CORPORA CADERE POSSVNT,
ACCOMMODATA.
AVCTORE
LEONH. EVLERO
ACADEMIAE REGIAE SCIENT. BORVSSICAE DIRECTORE
ACADEMIAE IMPER. PETROPOL. SOCIO HONORARIO
ET ACADEMIARVM SCIENT. REGIARVM PARISINAE
ET LONDINENSIS MEMBRO.
ROSTOCHII ET GRYPHISWALDIAE
LITTERIS ET IMPENSIS A. F. RÖSE. MDCCLXV.

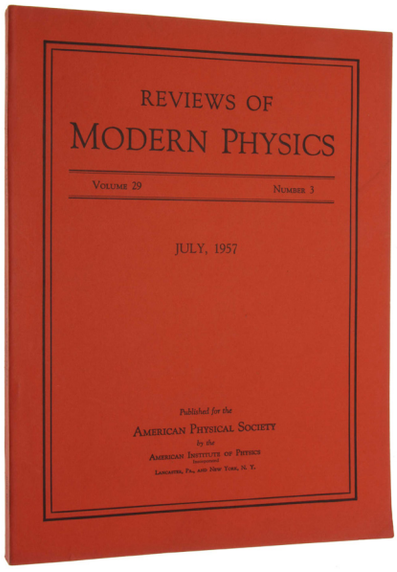
First edition, the copy of mathematician Friedrich Engel, of this continuation of Euler's *Mechanica* (1736), in which he moves on from the treatment of the motion of point-masses in the earlier work to that of rigid bodies, studying rotational problems (some motivated by the problem of the precession of the equinoxes) and introducing many now familiar concepts such as the 'moment of inertia,' 'principal axes' and 'Euler angles.' "The *Theoria motus corporum solidorum*, published almost thirty years later (1765), is related to the *Mechanica*. In the introduction to this work, Euler gave a new exposition of punctual mechanics and followed Maclaurin's example (1742) in projecting the forces onto the axes of a fixed orthogonal rectilinear system. Establishing that the instantaneous motion of a solid body might be regarded as composed of rectilinear translation and instant rotation, Euler devoted special attention to the study of rotatory motion. Euler thus laid the mathematical foundation of the numerous studies on variational principles of mechanics and physics which are still being carried out" (DSB). *Provenance*: With the signature of the eminent German mathematician Friedrich Engel (1861–1941) to the front free end-paper, dated 1894/Leipzig. Front paste-down with extensive pencil notes in German.

❧*Parkinson, Breakthroughs, p. 154; Roberts and Trent, pp. 105-6.*

The Multiverse

21. EVERETT, Hugh III. *'Relative State' Formulation of Quantum Mechanics.* Lancaster: American Institute of Physics, 1957.

£1,300



A fine copy, in original wrappers, of this famous paper in which Everett first formulated his 'many-worlds interpretation' of quantum mechanics. "The Many-Worlds Interpretation (MWI) is an approach to quantum mechanics according to which, in addition to the world we are aware of directly, there are many other similar worlds which exist in parallel at the same space and time. The existence of the other worlds makes it possible to remove randomness and action at a distance [e.g., the EPR paradox] from quantum theory and thus from all physics." (Stanford Encyclopedia). "In the early 1950's... Hugh Everett, puzzled over the Copenhagen interpretation and the magical collapse of the wave function, decided that it made more sense to treat each outcome of every possible quantum event as existing in a real world. In the classic example of Schrödinger's cat, this means that if the experiment really were carried out, the Universe would divide into two worlds, in one of which the experimenter opened the box to find a dead cat, and in the other of which the experimenter opened the box to find a live cat. Encouraged by his thesis supervisor, John Wheeler, Everett developed his idea into a fully worked-out interpretation of quantum theory, and showed that the assumption that all of the quantum possibilities are real leads to exactly the same predictions for the outcome of experiments as the Copenhagen interpretation... Everett's work was published in the journal *Reviews of Modern Physics* in 1957 alongside a paper by Wheeler drawing attention to it [also contained in the offered issue]" (John Gribben). In recent years Everett's theory has gained an increasingly strong following in the scientific community (led, most notably, by David Deutsch) as a viable alternative that corrects some of the inherent inconsistencies of the Copenhagen interpretation.

Fermat's Last Theorem

22. [FERMAT, Pierre de] DIOPHANTUS of Alexandria. *Arithmeticorum libri sex, et de numeris multangulis liber unus. Cum commentariis C.G. Bacheti V.C. & observationibus D.P. de Fermat senatoris Tolosani.*. Toulouse: Bernard Bosc, 1670.

£39,000

First edition of Fermat's discoveries in number theory and first printing of his celebrated 'last theorem', one of the most famous problems in mathematics and unsolved for over 325 years until its solution in 1995. Fermat showed not the slightest interest in publishing his work, which remained confined to his correspondence, personal notes, and to marginal jottings in a copy of the 1621 editio princeps, edited by Claude Bachet, of Diophantus' *Arithmetica*. Fermat's marginalia included not only arguments against some of Bachet's conclusions, but also new problems inspired by Diophantus. After his death, Fermat's eldest son Clement-Samuel published in 1670 his father's marginalia in this new edition. Most famous of the 48 observations by Fermat included here is the tantalizing note that appears on fol. H3r; stating one of the most famous problems in mathematics; the impossibility of finding a positive integer $n > 2$ for which the equation $x^n + y^n = z^n$ holds true for the positive integers x, y, and z. Fermat noted that he had discovered a 'truly marvelous demonstration' of this proposition, but that the margin was too narrow to transcribe it. In 1995 Andrew Wiles, professor of mathematics at Princeton, who had been obsessed with Fermat's proposition since the age of 10, completed a 130-page proof of the theorem (first presented in 1993, with a flaw that required revision), using the most advanced techniques of modern mathematics. His achievement was described by fellow mathematicians as the mathematical equivalent 'of splitting the atom or finding the structure of DNA' (Simon Singh). ❧*Norman 777.*

First edition of his collected works

23. GALILEI, Galileo. *Opere di Galileo Galilei linceo nobile fiorentino, Già Lettore delle Matematiche nelle Università di Pisa, e di Padova, di poi Sopraordinario nello Studio di Pisa. Primario Filosofo e matematico del serenissimo Gran Duca di Toscana* Bologna: Heredi del Dozza, 1655-56.

£12,000

A very fine copy of the first collected edition of the works of Galileo, edited by Carlo Manolessi, and appearing only a year after his death. This was the edition in which Newton and his later contemporaries read their Galileo. The volumes contain not only most of the major works written and published over his lifetime, but also substantial unpublished material, both by Galileo himself as well as by his supporters and critics. Many of these items were provided to the editor by Vincenzo Viviani, Galileo's friend and disciple, including a number of Galileo's hitherto unpublished letters and experiments and La Bilancetta, his first scientific work, written in 1586. The Dialogo was of course on the Index and was not included in editions of the Opere until 1744. A feature of this edition is that each work has its own separate title page, imprint and pagination, which has resulted in several copies being broken up, the individual tracts being sold individually.

With numerous contemporary annotations

24. GAURICUS, Lucas. [GAURICO, Luca]. *Ephemeridies recognitae et ad vngem Castigatae... Eiusdem schemata & praedictiones ad Annum vsque virginei partus 1552 Eiusdem Isagogicus in totam ferme Astrolgiam Libellus...* Venice: Sumptibus Lucentonii Juntae Typographi, 1533.

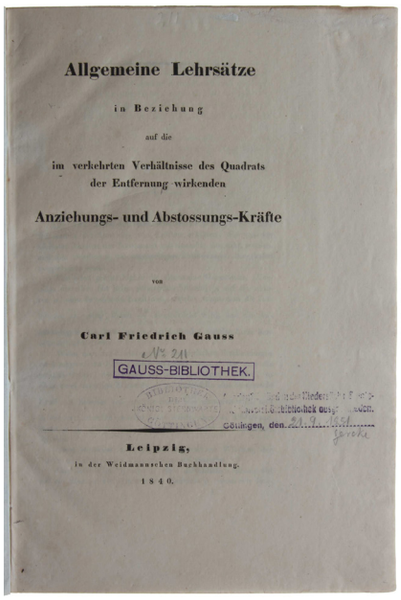
£6,950

A fine copy of these very rare ephemerides, containing tables as well as astrological prognostications for the years 1534 through 1551, each preceded by a special title page. According to Houzeau and Lancaster, the ephemerides are calculated after the Alphonsine Tables, and for the meridian of Venice. Astrologer and mathematician, Luca Gaurico was born at Giffoni, near Naples, in 1476 and died at Rome in 1558. As a mathematician he is best known for the first published Latin translations of Archimedes' works *De Mensura Circuli* and *De Quadratura Parabolae* (1503). He went on to publish an edition of Pecham's *Perspectiva Communis* (Venice, 1504), and Trapezuntius's translation of the *Almagest* (Venice, 1528). Rose (p. 120) suggests that Gaurico may have met Copernicus at Padua, as they were both at the university in the early years of the 16th century, and would have shared a common interest in Ptolemy and Archimedes. In 1531 he was appointed professor of mathematics at Ferrara, where Scaliger was one of his pupils. ❧*Horblit 447; Honeyman 1448 (both copies defective).*

From the library of Gauss

25. GAUSS, Carl Friedrich *Allgemeine Lehrsätze in Beziehung auf die im verkehrten Verhältnisse des Quadrats der Entfernung wirkenden Anziehungs- und Abstossungs-Kräfte.* Leipzig: Weidmannschen Buchhandlung, 1840.

£24,500


Allgemeine Lehrsätze

in Beziehung

auf die

im verkehrten Verhältnisse des Quadrats der Entfernung wirkenden

Anziehungs- und Abstossungs-Kräfte

von

Carl Friedrich Gauss

GAUSS-BIBLIOTHEK.

Göttingen, den

Leipzig,

in der Weidmannschen Buchhandlung.

1840.

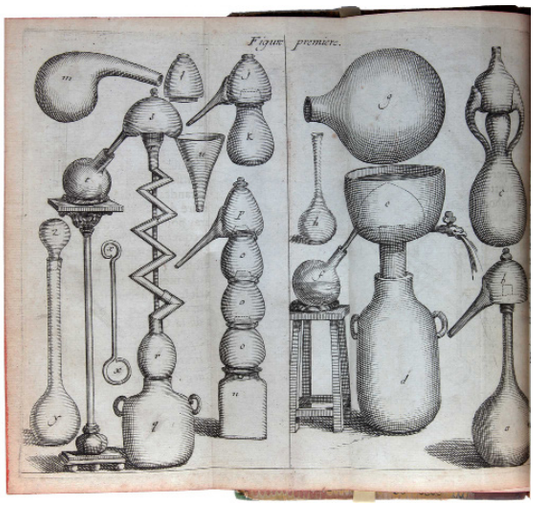
First separate edition, Gauss's own personal copy, of "the first systematic treatment of potential theory as a mathematical topic, [which] recognized the necessity of existence theorems in that field, and reached a standard of rigor that remained unsurpassed for more than a century" (DSB V 306). Gauss's ideas on potential theory developed over several decades, beginning with his work on geodesy. In 1813 he had published Theoria attractionis corporum sphaeroidicorum ellipticorum homogeneorum methodus nova tractatus, which used several early results in potential theory to calculate the gravity at different points of the earth's surface (although Gauss did not use the term 'potential' at that time). Almost two decades later he began his collaboration with Wilhelm Weber on geomagnetism. In Allgemeine Theorie der Erdmagnetismus (1839), his general theory of terrestrial magnetism, Gauss determined the magnetic force at the earth's surface by expressing the magnetic potential as the sum of a converging series of spherical functions (Gauss retained only the first few terms as an approximation).

❧*Norman 882.*

'One of the most important chemical textbooks of the 17th century'

26. GLASER, Christophle. *Traite de la Chymie. Enseignant par une brieve et facile methode toutes ses plus necessaires preparations.* Paris: Chez l'autheur, 1663.

£6,800



First edition, a fine copy, of this very important chemistry text, which went through some thirteen editions between 1663 and 1710. It is one of the earliest attempts to strip chemistry from its alchemical mysticism and to describe chemical preparations in an unambiguous manner. "The work is divided into two books: book I briefly describes the utility, definitions, principles, operations, and apparatus of chemistry: book II is devoted to a description of medicinal preparations drawn from the mineral, vegetable, and animal kingdoms. The section devoted to mineral remedies is by far the largest. Little is novel in these preparations, although Glaser displays individual refinements of technique. His recipe for a sel antifebrile (potassium sulfate made by heating saltpeter and sulfur and recrystallizing from water) became uniquely identified with him and was later known as sel polychrestum Glaseri. The naturally occurring mixed sulfate of sodium and potassium (3K2SO4:Na2SO4) was named glaserite in his honor." (DSB).

❧*The Roy G. Neville Historical Chemical Library, pp. 528-29.*

A very fine copy with distinguished provenance

27. GRATAROLI, Guglielmo. *Verae Alchemiae Artis'que Metallicae, Citra Aenigmata, Doctrina, certus'que modus, scriptis tum novis tum veteribus nunc primùm & fideliter maiori ex parte editis, comprehensus: quorum elenchum à Praefatione reperies.* Basel: H. Petri & P. Pernam, 1561.

£11,400

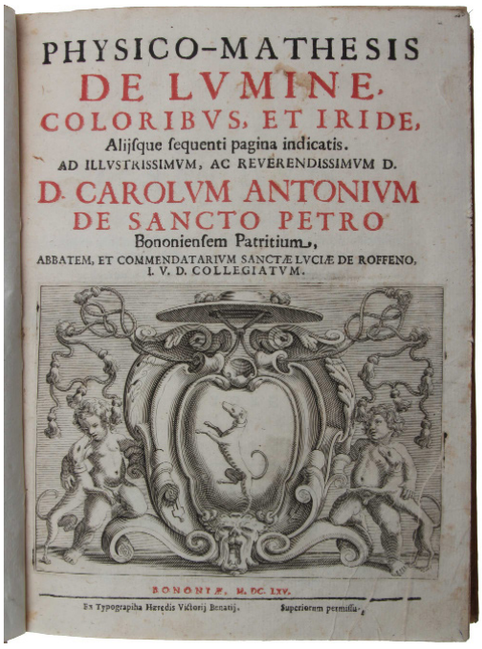
First edition of this very rare and important compilation of alchemical texts: including works by by Jābir ibn Hayyān, Roger Bacon, Richardus Anglicus, Robertus Tauladanus, Giovanni Battista da Monte, Arnaldus de Villanova, Albertus Magnus, Ramon Llull, Aristotle, Avicenna, Johannes de Rupescissa, Guglielmo Grataroli, Giovanni Braccesco, and Giovanni Aurelio Augurelli. "Gratarolo was a native of Bergamo, where he was born in 1516. He went through the customary training, and then turned his attention to medicine. Having acquired a liking for Protestantism he settled in Basel in 1555, and remained there till 1562, when he was summoned to Marburg as professor of medicine. He, however, remained only a year there, and returned to Basel, where he practiced medicine and wrote several works." (Ferguson). *Provenance*: Signature from Giovanni Antonio Delfino 1506-1561. Famous theologean and Regent of the convent of San Fransco in Bologna from 1550-1558. Later elected by Pope Paul IV as Vicar General of the Order of the convent. Delfino was deeply involved as a scholar at the College of Spain in Bologna with the task of public reader of metaphysics at the University of Bologna, Faculty of artists. He died in 1561, the same year as the printing of the book. Thus the signature must be dated the same year as the book is published in 1561. It is interesting that a devoted Christian and follower of the faith has given his provenance on a "heretic" book like Verae alchimiae artisque metallicae citra aenigmata doctrina certusque modus, that was considerd a "truly diabolical" work by the Vatican (Vatican City, Arch of the Congregation for the Doctrine of the Faith, Mss., GG.3. to.).

Hogart 79; Duveen, 268; Ferguson, Thorndike, V, pp. 600-16.

The discovery of optical diffraction

28. GRIMALDI, Francesco Maria. *Physico-mathesis de lumine, coloribus, et iride, aliisque adnexis libri duo, in quorum primo asseruntur nova experimenta, & rationes ab iis deductae pro substantialitate luminis...* Bologna: heirs of Vittorio Benacci for Girolamo Bernia, 1665.

£40,750

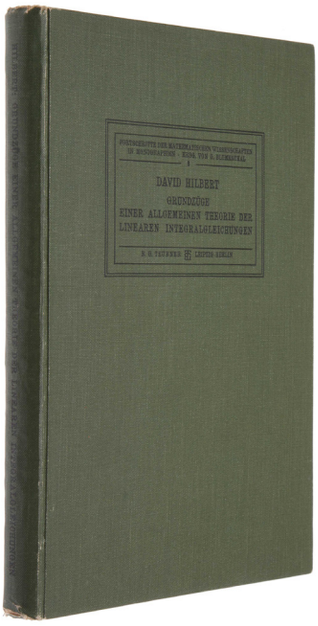

PHYSICO-MATHESIS
DE LVMINE,
COLORIBVS, ET IRIDE,
Alijſque ſequenti pagina indicatis.
AD ILLVSTRISSIMVM, AC REVERENDISSIMVM D.
D. CAROLVM ANTONIVM
DE SANCTO PETRO
Bononienſem Patritium,
ABBATEM, ET COMMENDATARIVM SANCTÆ LVCIÆ DE ROFFENO,
I. V. D. COLLEGIATVM.
BONONIÆ, M. DC. LXV.
Ex Typographia Hæredis Victorij Benatij. Superiorum permiſſu.

First edition, a fine copy including the letter press title which is often lacking, contemporary vellum. This is Grimaldi's only book; in it he describes the discovery of optical diffraction. This is perhaps the rarest of all great optical books, especially in such good condition, and marks the first scientific attempt to establish a comprehensive wave theory of light. The diffraction experiments which Grimaldi describes here show "that a new mode of transmission of light had been discovered and that this mode contradicts the notion of an exclusively rectilinear passage of light. Diffraction thus gave prima facie evidence for a fluid nature of light. The name 'diffraction' comes from the loss of uniformity observed in the flow of a stream of water as it 'splits apart' around a slender obstacle placed in its path." (DSB). Grimaldi repeatedly states that colors are not something different from light but are modifications of light produced by the fine structure of the bodies which reflect it, and probably consisting of an alteration in the type of motion and in the velocity of the light. The different colors are produced when the eye is stimulated by light oscillations whose velocities differ. All these views were of fundamental importance for the subsequent development of optics. Newton was aware of Grimaldi's work, though only secondhand.

Parkinson, Breakthroughs p. 103.

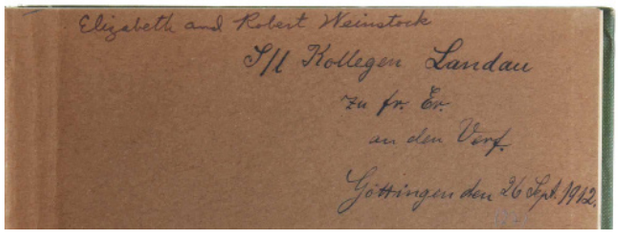
Presentation copy - from one master to another

29. HILBERT, David. *Grundzüge einer Allgemeinen Theorie der Linearen Integralgleichungen.* Leipzig & Berlin: B.G. Teubner, 1912.



£2,250

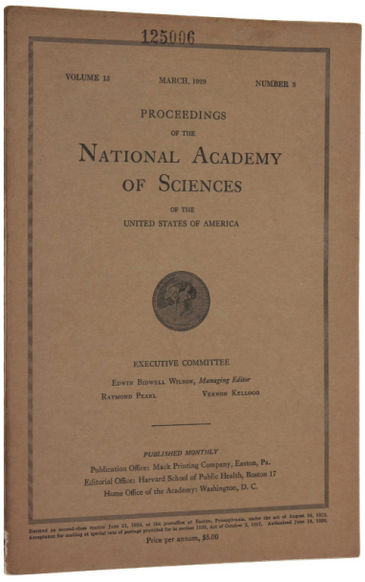
A fine copy of Hilbert's classical text with presentation to the eminent number theorist Edmund Landau. Handwritten presentation on front fly leaf: "S.l Kollegen Landau / zu. fr. Er. / aus dem Verf. / Göttingen den 26 Sept. 1912". This is the first book form of Hilbert's groundbreaking work on integral equations (originally published as six papers in the Göttinger Nachrichten, 1904-10) which lead to the development of Hilbert spaces. An outstanding presentation from one master to another. Signed items by Hilbert are rare.



With previous owner's signature at top, above presentation (Robert Weinstock - Prof. of mathematics at Stanford and author of a popular text book on the calculus of variations).

'As great a change in man's conception of the universe as the Copernican revolution'

30. HUBBLE, Edwin. *A Relation between Distance and Radial Velocity among Extra-Galactic Nebulae.* Washington: National Academy of Sciences, 1929.



£12,250

A fine copy, in the rare original printed wrappers, of Hubble's landmark paper which "is generally regarded as marking the discovery of the expansion of the universe" (*Biographical Encyclopedia of Astronomers*). It established what would later become known as Hubble's Law: that galaxies recede from us in all directions and more distant ones recede more rapidly in proportion to their distance. "…the repercussions were immense. The galaxies were not randomly dashing through the cosmos, but instead their speeds were mathematically related to their distances, and when scientists see such a relationship they search for a deeper significance. In this case, the significance was nothing less than the realization that at some point in history all the galaxies in the universe had been compacted into the same small region. This was the first observational evidence to hint at what we now call the Big Bang" (Simon Singh, *Big Bang*). Hubble's "result has come to be regarded as the outstanding discovery in twentieth-century astronomy. It made as great a change in man's conception of the universe as the Copernican revolution 400 years before" (DSB).

❧*Parkinson, Breakthroughs p. 508.*

Uncut in original boards

31. HUTTON, James *Theory of the Earth; or an Investigation of the laws observable in the composition, dissolution, and restoration of land upon the globe [Read March 7 and April 4 1785].*. Edinburgh: Royal Society, 1788.

£5,300

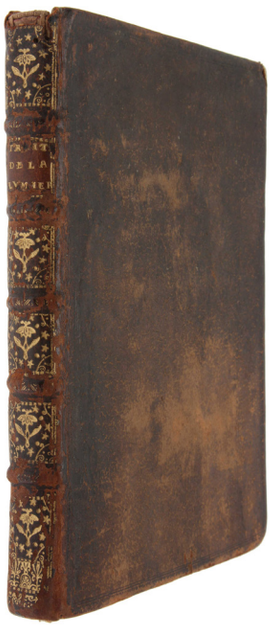
An exceptional copy, uncut in the original boards, of this epoch-making work, the foundation of modern geology. "[Hutton's] fundamental conception, now accepted as a matter of course, but then entirely new, was the doctrine of uniformitarianism. The formation of the surface of the earth is one continuous process which can be studied entirely from terrestrial materials without cosmological or supernatural intervention… Another important feature of Hutton's system is his discussion of the erosion of land-surfaces due to the atmospheric, chemical and mechanical action of water… his central ideas of uniformitarianism and of the effect of small changes in nature leading eventually to gigantic transformations have had far-reaching consequences in their influence on Charles Lyell and Darwin" (PMM).

❧*Dibner 73; Sparrow, Milestone of Science 107; Horblit 52a; PMM 247; Norman 1131 [the last three referring to the first book appearance of 1795].*

The wave theory of light

32. HUYGENS, Christiaan. *Traité de la Lumière. Où sont expliquées les Causes de ce qui luy arrive dans la Reflexion, & dans la Refraction. Et particulierement dans l'etrange Refraction du Cristal d'Islande ... Avec un Discours de la Cause de la Pesanteur.* Leyden: Pierre vander Aa, 1690.

£32,200



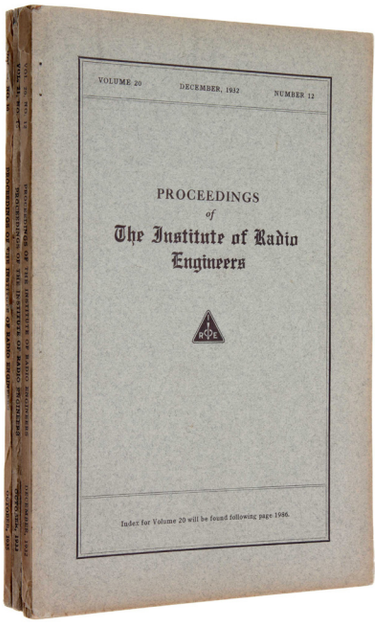
An excellent copy, entirely unrestored in contemporary binding, of Huygens's path breaking exposition of his wave theory of light. "Light, according to Huygens, is an irregular series of shock waves which proceeds with very great, but finite, velocity through the ether. This ether consists of uniformly minute, elastic particles compressed very close together. Light, therefore, is not an actual transference of matter but rather of a 'tendency to move', a serial displacement similar to a collision which proceeds through a row of balls ... Huygens therefore concluded that new wave fronts originate around each particle that is touched by light and extend outward from the particle in the form of hemispheres..." (DSB). Huygens was able to explain reflection and refraction using this theory, of which he became completely convinced in August 6, 1677, when he found that it explained the double refraction in Iceland spar. His view of light was opposed to the corpuscular theory of light advanced by Newton. In the second part of the work, the Discours de la cause de la pesanteur, written in 1669, Huygens expounded his vortex theory of gravity, a purely mechanistic theory that also contrasted markedly with Newton's notion of a universal attractional force intrinsic to matter.

❧*Grolier/Horblit 54; Dibner 146; Evans 32; Sparrow 111.*

Initiated the field of radio astronomy

33. JANSKY, Karl. *1. Directional Studies of Atmospherics at High Frequencies; 2. Electrical Disturbances Apparently of Extraterrestrial Origin; 3. Minimum Noise Levels Obtained on Short-Wave Radio Receiving Systems.* New York: Institute of Radio Engineers, 1932.

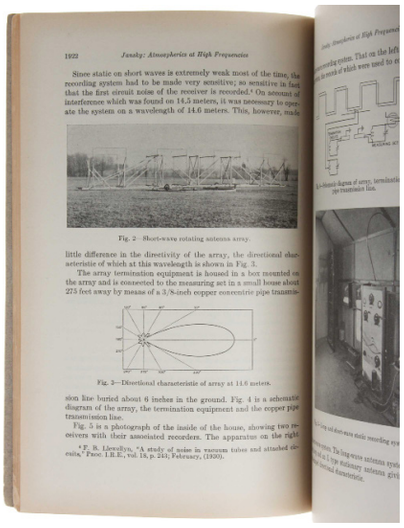
£1,800


VOLUME 20 DECEMBER, 1932 NUMBER 12

PROCEEDINGS
of
The Institute of Radio Engineers

Index for Volume 20 will be found following page 1946.

A fine set in original wrappers of Jansky's seminal papers which initiated the field of radio astronomy, a new science that has become one of the essential methods for making modern astronomical observations. "At the age of just twenty-six, Karl Jansky had become the first person to detect and identify radio waves coming from outer space, a truly historic discovery... The true significance of Jansky's breakthrough surpasses even the momentous discovery that the Milky Way emits radio waves. His accomplishment was to establish the science of radio astronomy and to demonstrate that astronomers could learn a huge amount about the universe by looking beyond the narrow band of electromagnetic wavelengths that are visible to the human eye... He announced his result in a paper entitled 'Electrical Disturbances Apparently of Extraterrestrial Origin.'" (Simon Singh, *Big Bang*).


1932 *Jansky: Atmospherics at High Frequencies*

Since static on short waves is extremely weak most of the time, the recording system had to be made very sensitive; so sensitive in fact that the first circuit noise of the receiver is recorded.[1] On account of interferences which was found on 14.5 meters, it was necessary to operate the system on a wavelength of 14.6 meters. This, however, made

Fig. 2—Short-wave rotating antenna array.

little difference in the directivity of the array, the directional characteristic of which at this wavelength is shown in Fig. 3.

The array termination equipment is housed in a box mounted on the array and is connected to the measuring set in a small house about 275 feet away by means of a 3/8-inch copper concentric pipe transmis-

Fig. 3—Directional characteristic of array at 14.6 meters.

sion line buried about 6 inches in the ground. Fig. 4 is a schematic diagram of the array, the termination equipment and the copper pipe transmission line.

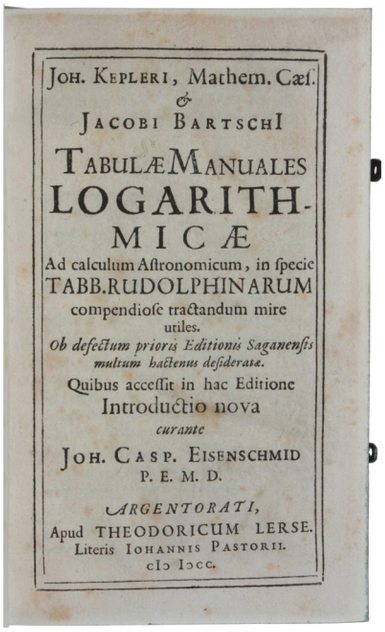
Fig. 5 is a photograph of the inside of the house, showing two receivers with their associated recorders. The apparatus on the right

[1] F. B. Llewellyn, "A study of noise in vacuum tubes and attached circuits," Proc. I.R.E., vol. 18, p. 243, February, (1930).

A pristine copy of the first obtainable edition

34. KEPLER, Johannes & BARTSCH, Jakob. *Tabulae Manuales Logarithmicae ad Calculum Astronomicum, in specie Tabb. Rudolphinarum compendiose tractandum mire utiles. Ob defectum prioris Editionis Saganensis multum hactenus desideratae. Quibus accessit in hac Editione Introductio nova curante Joh. Casp. Eisenschmid.* Strasbourg: Johannes Pastorius for Theodor Lerse, 1700.

£9,750


JOH. KEPLERI, Mathem. Cæs.
&
JACOBI BARTSCHI
TABULÆ MANUALES
LOGARITH-
MICÆ
Ad calculum Astronomicum, in specie
TABB. RUDOLPHINARUM
compendiosè tractandum mire
utiles.
Ob defectum prioris Editionis Saganensis
multum hactenus desideratæ.
Quibus accessit in hac Editione
Introductio nova
curante
JOH. CASP. EISENSCHMID
P. E. M. D.
ARGENTORATI,
Apud THEODORICUM LERSE.
Literis IOHANNIS PASTORII.
cIↃ IↃCC.

Rare second edition (the first obtainable edition) of the logarithmic tables used in calculating the celebrated Rudolphine Tables. Caspar records only one copy of the first edition, published in Sagan in 1631, and that defective, in the University Library of Königsberg. Jacob Bartsch (1600-1633) was Kepler's son-in-law. After Kepler died in 1630, Bartsch decided that Kepler's logarithms should be made available in a less expensive form than the Rudolphine Tables published in 1627 (the first work to introduce logarithms into the field of astronomy). The intention was to fund the printing by collecting the salary owed to Kepler. Kepler traveled to Vienna to try to collect the money but failed to do so and the printing was stopped and the distribution of the 1631 edition was practically nil. This second edition was brought out by John Caspar Eisenschmid in 1700 and in his introduction he gives a detailed account of the fate of the first edition. This second edition is by no means a common book on the market (ABPC lists only two copies in the past fifty years; 1971 and 1984). A very fine copy, complete with the errata leaf.

❧*Caspar 99; Erwin Tomash Library on the History of Computing K-28; Houzeau and Lancaster 12757; Lalande p.338.*

Large-paper copy bound for Cardinal de' Medici

35. KIRCHER, Athanasius. *Ars Magna Lucis et Umbrae.* Rome: Hermann Scheus (printed by Lodovico Grignani), 1645.

£45,500

Magnificent large-paper copy bound for presentation to Cardinal de' Medici by Kircher, with two manuscript corrections possibly in Kircher's hand, and with the extremely rare variant titles dated 1645; just two copies located by WorldCat (Chile and France) and only one copy auctioned the past 50 years. An apparently unique large-paper copy of the first edition of Kircher's major scientific work and his principal contribution to optics. In this work Kircher writes of light, shadow, color, refraction, projection, distortion and luminescence, and provides early descriptions of the camera obscura: beautifully and copiously illustrated with plates and illustrations. This particular copy shows a number of variations which suggest that it was specially prepared: the whole work is printed on a thicker paper stock that is of a better quality and less prone to browning than the usual paper, the title is a variant dated 1645 rather than the usual 1646. This copy is large paper: an uncut copy of the normal paper issue measures no more than 330 x 225 mm - the present example, trimmed, is 20 mm taller and 10 mm wider. This copy was certainly bound for Cardinal de' Medici and it seems likely that it was also specially printed for presentation to him, perhaps in an effort to gain patronage - Kircher was in Rome and the Cardinal, a member of one of the most powerful families in Italy, was a prominent figure in the Vatican at the time. The manuscript corrections are on the Qq4 verso (p.312) a 4-line correction and Rr3 recto (p.317) a 2-line correction.

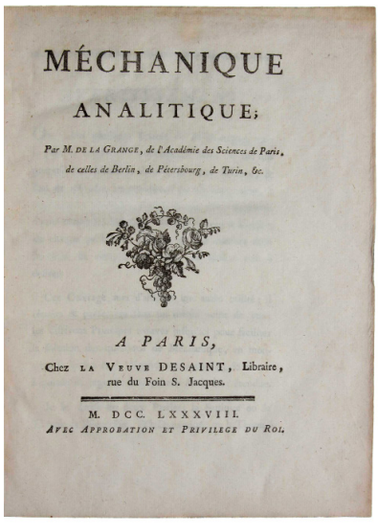
❧*Norman 1216; Honeyman 1814; Jesuit Science in the Age of Galileo 10; Merrill, Athanasius Kircher 7; for the arms & binding: cf. M. Bernardini, Medicea volumina (2001), no. 48.*

Second only to of Newton's Principia

36. LAGRANGE, Joseph Louis de. *Méchanique Analitique.* Paris: Veuve Desaint, 1788.

£12,250

An exceptionally fine copy of "perhaps the most beautiful mathematical treatise in existence. It contains the discovery of the general equations of motion, the first epochal contribution to theoretical dynamics after Newton's Principia" (Evans). "Lagrange's masterpiece, the *Méchanique Analitique* (Paris, 1788), laid the foundations of modern mechanics, and occupies a place in the history of the subject second only to that of Newton's *Principia*." "With the appearance of the *Mecanique Analytique* in 1788, Lagrange proposed to reduce the theory of mechanics and the art of solving problems in that field to general formulas, the mere development of which would yield all the equations necessary for the solution of every problem ... [it] united and presented from a single point of view the various principles of mechanics, demonstrated their connection and mutual dependence, and made it possible to judge their validity and scope." (DSB). "In the preface of the book La Grange proudly points to the complete absence of diagrams, so lucid is his presentation. He regarded mechanics (statics and dynamics) as a geometry of four dimensions and in this book set down the principle of virtual velocities as applied to mechanics." (Dibner).

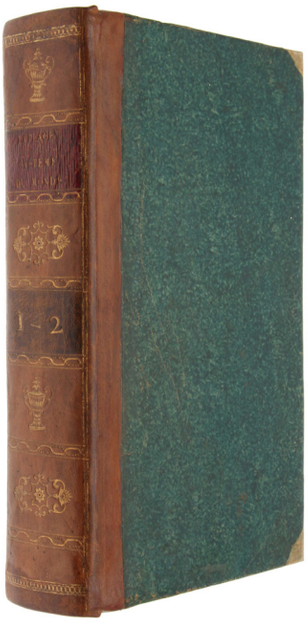

MÉCHANIQUE
ANALITIQUE;
Par M. DE LA GRANGE, de l'Académie des Sciences de Paris, de celles de Berlin, de Pétersbourg, de Turin, &c.
A PARIS,
Chez LA VEUVE DESAINT, Libraire, rue du Foin S. Jacques.
M. DCC. LXXXVIII.
AVEC APPROBATION ET PRIVILEGE DU ROI.

❧*Grolier/Horblit 61; Evans 10; Dibner 112; Sparrow 120; Norman 1257.*

On the origin of the solar system

37. LAPLACE, Pierre Simon. *Exposition du Systême du Monde.* Paris: De l'Imprimerie du Cercle-Social, l'An IV [1796].

£3,250



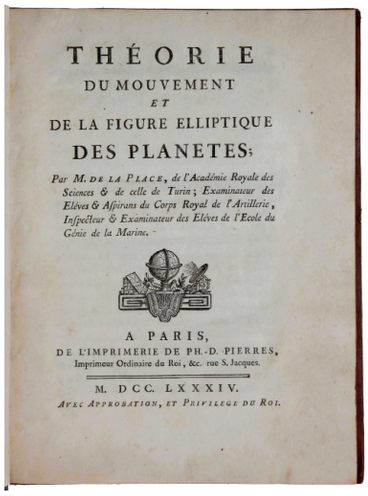
A very fine copy, with the very rare errata leaves, of Laplace's classic work on the origin and formation of the solar system in which he first stated his celebrated 'nebular hypothesis.' "One of the most successful popularizations of science ever composed." (DSB). "An elegant, non-mathematical classic on astronomy. It is in this work that Laplace introduced one of his most notable contributions (although he himself did not take it very seriously at first), the so-called nebular hypothesis, which provided a conjectural account of the origin of the solar system. This remained through the 19th century the most widely accepted view on the subject" (PMM 252). "The two-volume work consists of five books. Book I begins with what any attentive observer may see if he will open his eyes to the spectacle of the heavens on a clear night with a view of the whole horizon. Book II (...) sets out the 'real' motions of planets, satellites, and comets and gives the dimensions of the solar system. Book III is a verbal précis of the laws of motion as understood in eighteenth-century rational mechanics, with special reference to astronomy and hydrostatics. In Book IV, Laplace in effect summarized his own work in gravitational mechanics. (...) Only Book V contains material that Laplace had not written up in technical form or presupposed. It gives an overview of the history of astronomy and concludes with the speculation since called the nebular hypothesis and another on the nature of the universe in outer space". (DSB). As mentioned in the 2004 Christie's sale of the library of Jean-Louis Mosès: "A pair of errata leaves was added to very few copies [not present in the Mosès-Barrillot copy]". Both of these errata leaves are present in our copy. We can find no copy in the auction records having the errata leaves. A fine copy in contempoary calf with vellum corners. ❧*Sparrow, Milestones of Science 123; Honeyman 1919.*

The veritable embryo of his Méchanique Céleste

38. LAPLACE, Pierre Simon. *Théorie du mouvement et de la figure elliptique des planètes.* Paris: PH.-D. Pierres, 1784.

£11,400

First edition, extremely rare (see below), of the author's first separate publication, which constitutes the "veritable embryo" (Chapin, p. 1098) of his epoch-making *Traité de mécanique celeste* (1799-1825). It also contains the first publication of Laplace's calculations that led to the realization that the object observed by Herschel in 1781 was in fact a new planet (i.e. Uranus), as well as the invention of the concept of 'potential', an idea central to many areas of theoretical physics up to the present day. The relation of the present work to the *Traité* can be compared to that of Rheticus' *Narratio prima* (1540) to *De revolutionibus* (1543): in each case the earlier work is essentially a précis of the later, more comprehensive work, but containing most of its seminal ideas, and in each case the earlier work is by far the rarer of the two.



THÉORIE
DU MOUVEMENT
ET
DE LA FIGURE ELLIPTIQUE
DES PLANETES;
Par M. DE LA PLACE, de l'Académie Royale des Sciences & de celle de Turin; Examinateur des Elèves & Aspirans du Corps Royal de l'Artillerie, Inspecteur & Examinateur des Elèves de l'Ecole du Génie de la Marine.
A PARIS,
DE L'IMPRIMERIE DE PH.-D. PIERRES,
Imprimeur Ordinaire du Roi, &c. rue S. Jacques.
M. DCC. LXXXIV.
AVEC APPROBATION, ET PRIVILEGE DU ROI.

Very rare: Querard notes that only 200 copies were printed. Lalande, p. 591: "Ce volume fut imprime aux frais du president de Saron, pour encourager un geometre qui annoncait déjà les belles choses qu'il a faites depuis. On en tira un petit nombre, et ce livre est très-rare."

Large-paper copy

39. MACLAURIN, Colin. *An Account of Sir Isaac Newton's Philosophical Discoveries, in Four Books.* London: Printed for the author's children and sold by A. Millar, et al., 1748.

£4,000

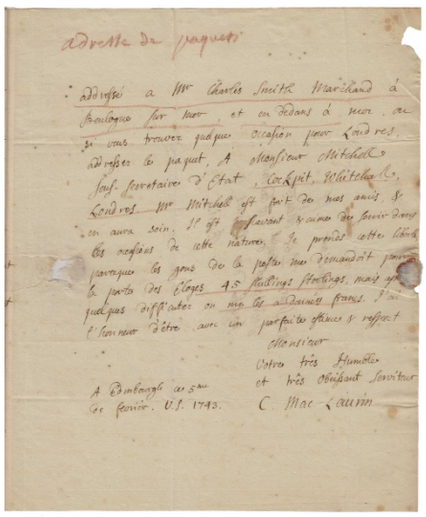
First edition, large-paper copy, of Maclaurin's statement of Newtonian theory, one of the three "most outstanding popular introductions to Newtonian science of the eighteenth century" (I. B. Cohen, *Franklin and Newton*, 1956, p. 209). "Though a number of other general expositions of Newton's thought were published during the eighteenth century, Maclaurin's *Account* has long been recognized as the leading authoritative statement of mainstream Newtonianism" (DNB). "Gifted with a genius for geometrical investigation second only to Newton's… Maclaurin, the one mathematician of the first rank trained in Great Britain in the [18th] century, confirmed Newton's exclusive influence over British mathematics" (*ibid.*). After Newton's death in March 1727, his nephew-in-law John Conduitt started to collect materials for a biographical memoir of Newton and applied to several of Newton's contemporaries, including Maclaurin, for assistance. Although Conduitt's memoir never materialized (although some of the materials he collected made their way into Fontenelle's *Éloge* in 1728), his request prompted Maclaurin to prepare an account not only of Newton's discoveries in astronomy, gravitation and mechanics (though omitting his work on optics), but also of the philosophical systems that preceded Newton's. Maclaurin had nearly completed this work when, during the Jacobite rebellion of 1745, a Highland army marched upon Edinburgh. Maclaurin took a prominent part in preparing trenches and barricades for the city's defense. As soon as the rebel army captured Edinburgh, Maclaurin fled to England until it was safe to return. But the ordeal of his escape ruined his health, and he died at age 48. "Only a few hours before his death he dictated the concluding passage of his work on Newton's philosophy, in which he affirmed his unwavering belief in a future life" (DSB).

Babson 85; Gray 112; Macclesfield 1285.

Important letter discussing his main work

40. MACLAURIN, Colin. *Signed autograph letter, four pages in French, to Jean-Jacques d'Ortous de Mairan, secretary of the Académie des Sciences in Paris, discussing Maclaurin's Treatise of Fluxions, and also the Académie's geodetic mission to Peru.* Edinburgh: 5 February.

£9,750



Important autograph letter from the great Scottish mathematician Colin Maclaurin (1698-1746) discussing his most important work, *Treatise of Fluxions* (1742), "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).

Autograph material by Maclaurin is of great rarity on the market – this is the only example we have traced at auction in the last 40 years.

Four pages on a single sheet (375 x 227 mm) folded once vertically (thin paper strip mounted, proably from having been bound), remains of red wax seal on address page, small tears from opening the seal. Edinburgh: 5 February, 1743 (received 16 February). A full transcription and English translation available.

'Less than a dozen copies are known' (Neville)

41. MATTE LA FAVEUR, Sebastian. *Pratique de chymie, divisée en quatre parties, par S. Matte La Faveur, distillateur & demonstrateur ordinaire de la chymie en la faculté de Medecine de Montpelier. Avec un avis sur les eaux minerales..* Montpelier: Daniel Pech, 1671.

£11,400

Extremely rare complete copy of this important work "less than a dozen copies are known to exist, most imperfect with missing leaves and fewer plates" (The Roy G. Neville Historical Chemical Library, vol. 2, p. 153 - describing their copy as "probably the finest example extant" – this copy collates as theirs and is similarly bound in contemporary unrestored calf). "Sold only by the author at his home in Montpellier, the *Pratique* contains clear directions on practical operations and the preparation of chemicals. Matte La Faveur (fl. 1671), distiller and demonstrator of chemistry at Montpellier, simultaneously gave a course at Paris until 1684, when he was succeeded by the famous chemist Nicolas Lemery. Undoubtedly, Lemery used this work when writing his celebrated *Cours de Chymie*(1675), and it is well known that he seldom acknowledged his sources. The *Pratique* forms a direct link between the *Traite de la Chymie* (1663) of Christophle Glaser [see item 30] and the *Cours* of Lemery. Extremely rare." (Neville).

❧*Sotheran, Cat. 800 [1926], 11519; Thorndike, VIII, 141; Thornton 8c; Tully, 122.*

With nearly 1000 contemporarily hand colored woodcuts

42. MATTIOLI, Pietro Andrea. *Kreutterbuch jetzt widerumb mit viel schönen neuwen Figuren, auch nützlichen Artzneyen, und andern guten stücken, auss sonderm fleiss gemehret, und verfertiget durch Joachimum Camerarium.* Frankfurt: Feyer, 1586.

£19,200

First edition, contemporarily colored, of the first edition of Camerarius's version of Mattioli's great herbal. This edition contains the Gesner/Camerarius suite of woodcuts. Gesner had been preparing material for a massive historia plantarum but died before finishing the task; Camerarius acquired the material, utilized the woodcuts in the present work and supplemented them with his own. They are remarkable in their scientific detail, especially the enlarged depictions of floral structure, seeds, and fruit. This is the first time that such representation was consistently followed, and marks the beginning of what only much later became a convention in scientific botanical illustration, when the taxonomic importance of these details was fully appreciated. They first appeared in Camerarius' recension of Mattioli, *De plantis epitome utilissima* of the same year. In addition to the botanical cuts, the German edition contains seven woodcuts of distilling apparatus. In the Vorred, Camerarius describes in detail the edition history of this book, and of the woodblocks in particular.

❧*Hunt 153*

De Moivre's law

43. MOIVRE, Abraham de. *Annuities upon Lives: or, The Valuation of Annuities upon any Number of Lives; as also, of Reversions. To which is added, An Appendix concerning the Expectations of Life, and Probabilities of Survivorship.* London: Printed by W.P. and sold by F. Fayram; Benj. Motte; and W. Pearson, 1725.

£2,950

A very nice copy of the first edition of de Moivre's influential study of annuities based upon the mortality statistics gathered by Edmund Halley in the 1690s. "De Moivre's contribution to annuities lies not in his evaluation of the demographic facts then known but in his derivation of formulas for annuities based on a postulated law of mortality and constant rates of interest on money. Here one finds the treatment of joint annuities on several lives, the inheritance of annuities, problems about the fair division of the costs of a tontine, and other contracts in which both age and interest on capital are relevant. This mathematics became a standard part of all subsequent commercial applications in England" (DSB).

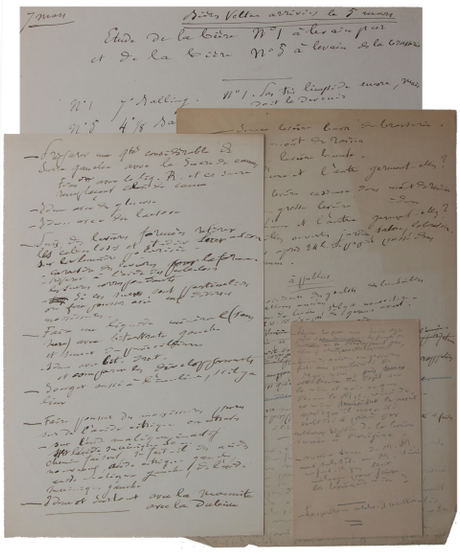
❧*Norman 1530; Garrison-Morton 1690.*

Eight pages of research notes on the brewing of beer

44. PASTEUR, Louis. *Highly important group of autograph manuscript research notes by Pasteur relating to his early studies and experiments with beer, probably carried out in the first half of 1871 at the Kuhn brewery in Clermont-Ferrand, which revolutionized beer production.*

£21,500

In 1876, Louis Pasteur published his groundbreaking volume, *Études sur la Bière*, soon translated into English as *Studies On Fermentation*. This book changed the course of brewing during the late 19th and early 20th centuries, representing an enormous leap forward in the scientific understanding of the processes involved in beer making. Brewers around the globe put Pasteur's findings to work in their breweries, and thus plunged the industry headlong into the modern era. In his preface, Pasteur modestly wrote, "I need not hazard any prediction concerning the advantages likely to accrue to the brewing industry from the adoption of such a process of brewing as my study of the subject has enabled me to devise, and from an application of the novel facts upon which this process is founded. Time is the best appraiser of scientific work, and I am not unaware that an industrial discovery rarely produces all its fruits in the hands of its first inventor." But, of course, the brewing industry recognized almost immediately the impact that Pasteur's work would have on the art and science of beer making. Frank Faulkner, the British brewing scholar who translated Pasteur's volume explains: "The more I studied the work, the more I was convinced of its immense value to the brewer as affording him an intelligent knowledge of the processes and materials with which he deals . . . The debt which we English brewers owe to M. Pasteur can hardly be over-estimated."

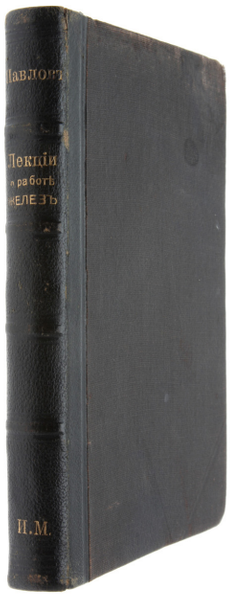


❧*Patrice Debré, Louis Pasteur, 1998. DSB X: 373-4.*

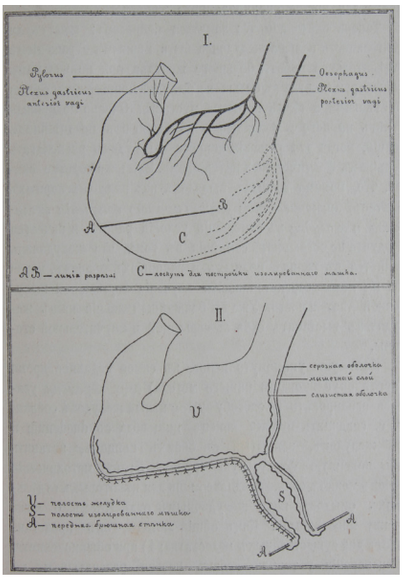
Pavlov's dogs

45. PAVLOV, Ivan Petrovitch. *Lektsii o rabotie glavnikh pishtshevaritelnikh zhelyos.* St. Petersburg: Kushnereff, 1897.

£16,250



A fine copy, in contemporary Russian binding, of this famous work on digestive juices by the demonstrator of the 'conditioned reflex'. "Mouthwatering is a familiar experience and may be induced without the sight or smell of food. The sounds of a table being laid for lunch in another room may induce salivation in man, and the rattle of a dish in which its food is usually served will cause similar reaction in a dog. "By detailed analysis of such facts as these Pavlov made great contributions to our knowledge of the physiology of digestion in a series of lectures delivered in St Petersburg and published in the following year [i.e., the offered work]. In the course of these lectures he described the artificial stomach for dogs used by him to produce for the first time gastric juices uncontaminated by food. Further experiments led him to the conclusion that salivation and the flow of gastric juice ensuing upon the sight or smell of food was due to a reflex process. This simple form of reaction he called first a 'psychic', later an 'unconditioned', reflex. Reflex action was familiar to physiologists, but it had never been invoked to explain such a complicated process…" (PMM).

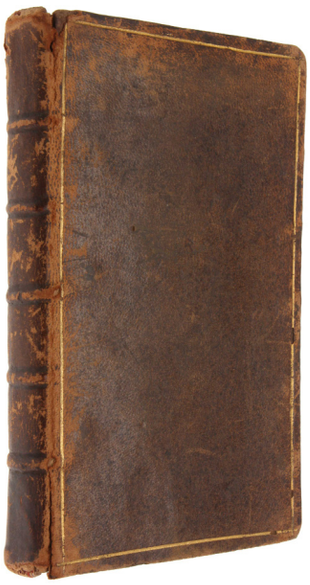


❧*PMM 385; Grolier/Horblit 83; Dibner 135; Grolier/Medicine 85; Lilly, Notable Medical Books 24.*

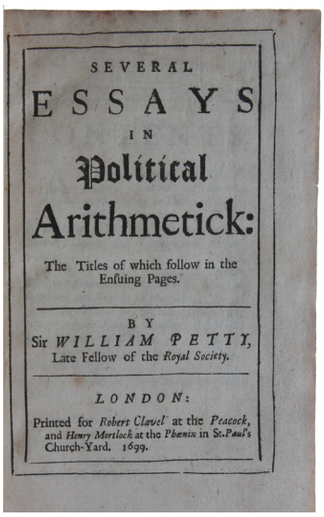
The foundation for modern census techniques

46. PETTY, William. *Several Essays in Political Arithmetick: the titles of which follow in the ensuing pages..* London: Robert Clavel and Henry Mortlock, 1699.

£6,950



First edition, very rare complete copy of this collection of Petty's essays on demography and economics, "including the influential *Political Arithmetick* (first published 1690), a major comparative study of the wealth and economic policies of England and her rivals France and Holland. This was the first of Petty's works to contain in its title the phrase he had coined to describe the application of statistics to economic theory and policy. Petty was the first to employ numerical evaluation in economics, and his work provided the decisive impulse toward econometrics and the general application of statistics" (Norman).

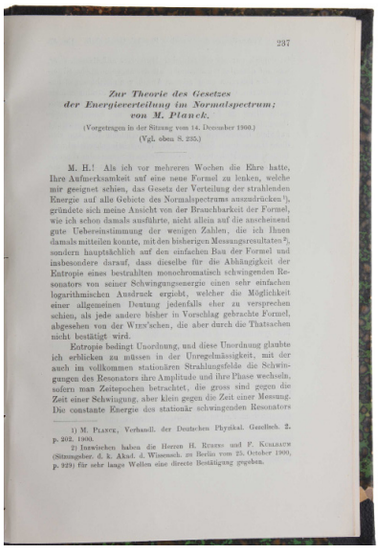

SEVERAL
ESSAYS
IN
Political
Arithmetick:
The Titles of which follow in the Enſuing Pages.
BY
Sir WILLIAM PETTY,
Late Fellow of the Royal Society.
LONDON:
Printed for Robert Clavel at the Peacock, and Henry Mortlock at the Phœnix in St. Paul's Church-Yard. 1699.

❧*Garrison-Morton 1688; Norman 1688 (lacking several of the part-titles).*

The beginning of quantum theory

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

£18,500



237

Zur Theorie des Gesetzes der Energieverteilung im Normalspectrum; von M. Planck.

(Vorgetragen in der Sitzung vom 14. December 1900.) (Vgl. oben S. 235.)

M. H.! Als ich vor mehreren Wochen die Ehre hatte, Ihre Aufmerksamkeit auf eine neue Formel zu lenken, welche mir geeignet schien, das Gesetz der Verteilung der strahlenden Energie auf alle Gebiete des Normalspectrums auszudrücken[1]), gründete sich meine Ansicht von der Brauchbarkeit der Formel, wie ich schon damals ausführte, nicht allein auf die anscheinend gute Uebereinstimmung der wenigen Zahlen, die ich Ihnen damals mitteilen konnte, mit den bisherigen Messungsresultaten[2]), sondern hauptsächlich auf den einfachen Bau der Formel und insbesondere darauf, dass dieselbe für die Abhängigkeit der Entropie eines bestrahlten monochromatisch schwingenden Resonators von seiner Schwingungsenergie einen sehr einfachen logarithmischen Ausdruck ergiebt, welcher die Möglichkeit einer allgemeinen Deutung jedenfalls eher zu versprechen schien, als jede andere bisher in Vorschlag gebrachte Formel, abgesehen von der Wien'schen, die aber durch die Thatsachen nicht bestätigt wird.

Entropie bedingt Unordnung, und diese Unordnung glaubte ich erblicken zu müssen in der Unregelmässigkeit, mit der auch im vollkommen stationären Strahlungsfelde die Schwingungen des Resonators ihre Amplitude und ihre Phase wechseln, sofern man Zeitepochen betrachtet, die gross sind gegen die Zeit einer Schwingung, aber klein gegen die Zeit einer Messung. Die constante Energie des stationär schwingenden Resonators

1) M. Planck, Verhandl. der Deutschen Physikal. Gesellsch. 2, p. 202. 1900.

2) Inzwischen haben die Herren H. Rubens und F. Kurlbaum (Sitzungsber. d. k. Akad. d. Wissensch. zu Berlin vom 25. October 1900, p. 929) für sehr lange Wellen eine directe Bestätigung gegeben.

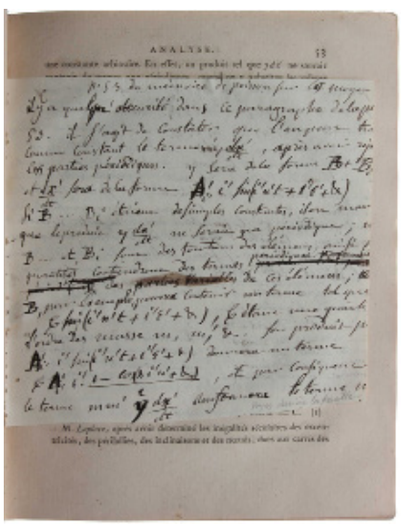
A fine copy, in contemporary binding, of the founding document of quantum theory, "marking the dividing line between classical and modern physics" (Norman). In this celebrated first announcement of quantum theory, Planck derived his radiation law based upon the assumption that energy is emitted and absorbed in discrete quanta. "In this important paper he stated that energy flowed not in continuous, indefinitely divisible currents, but in pulses or bursts of action [or quanta]" (Dibner). Planck determined a unit of energy in a system showing a natural frequency and proposed a constant of angular momentum, the value of which is known as 'Planck's constant.' This 'quantum' of energy led to explanations of the specific heats of solids, the photo-chemical effects of light, the orbits of electrons in the atom, the spectra of Röntgen rays, the velocity of rotating gas molecules, and the distances between the particles of a crystal. "It contradicted the mechanics of Newton and the electromagnetics of Faraday and Maxwell. Moreover it challenged the notion of the continuity of nature" (PMM). Published by the Berlin Physics Society, the first appearance of Planck's revolutionary work is very rare. (It was later published, in 1901, in the more widely distributed *Annalen der Physik*).

❧ *PMM 391, Dibner 166, Horblit 26a, Evans 47, Sparrow 162.*

Highly important collection of his main works in offprint form

48. POISSON, Siméon-Denis. *Exceptional collection of almost forty Poisson offprints assembled by the mathematician, and successor of Poisson, Jacques Philippe Marie Binet (1786-1856). The collection includes offprints of Poisson's most important papers in which he: created the mathematical theory of electrostatics; made his fundamental contributions to celestial mechanics; was a co-founder of the mathematical theory of elasticity; published his milestone investigations of definite integrals and Fourier series; first announced his 'law of large numbers'; and made significant contributions to the mathematical theory of heat.* Paris, 1808-1839.

£19,500



ANALYSE. 13

Simeon Dennis Poisson (1781–1840) was "one of the greatest of nineteenth century analysts and a first-class mathematical physicist" (Kline). He was principal successor to Laplace, both in interests and position. "There are few branches of mathematics to which he did not contribute something, but it was in the application of mathematics to physical subjects that his greatest services to science were performed. He considered such matters as physical astronomy, stability of planetary orbits, heat conduction, analytical mechanics, the attraction of ellipsoids, probability theory, definite integrals, Fourier series and theory of elasticity. One encounters Poisson Brackets, Poisson's Constant, Poisson Integral, Poisson Equation, Poisson Summation Formula and the Poisson Distribution. He was first to predict the existence of longitudinal and transverse elastic waves and deduced, in an alternative way to that of Navier, the basic equations of a viscous fluid. He also studied the propagation of waves in anisotropic media (crystals). He derived the equation satisfied by the gravitational potential within a distribution of matter, which now bears his name." (*HENMS*). *Provenance*: Book plates of the mathematician Jacques Binet (1786-1856); the French engineer and book collector Henri Viellard (1840-1886); and the Institut Catholique de Paris to whom Viellard's wife in 1902 donated his collection of important science books.

Presented by the author in the year of his death

49. RUINI, Carlo. *Dell'anatomia, et dell'infermita del cavallo.* Bologna: heirs of Giovanni Rossi, 1598.

£52,500

Exceptionally rare first issue of the first edition, presented by Ruini in the year of its publication and his own death. A magnificent copy of this foundation-stone of comparative anatomy and veterinary medicine – a work considered comparable to Vesalius' Fabrica, the illustrations of which strongly influenced those of Ruini. "In thoroughness of treatment and beauty of illustration, Ruini's study of the horse set a pattern in zoological anatomy" (Dibner). "Ruini deserves to be ranked among the founders of comparative anatomy, along with Vesalius, Belon, Rondelet, and Coiter" (DSB).

Provenance: inscribed on the front free end-paper: 'Questo libro du donato al S[igno]r. Ascani Cospi dall'Autore l'Anno 1598' (i.e., given by the author, a Senator of Bologna, to Acani Cospi in the year of its publication); 'Questo libro fu poi donato a Valerio Sampieri dal Sig[no]r Marchese Senatore Cospi l'Anno 1727' (i.e., given by a later Cospi, a Senatore of Bologna, to Sampieri); signed at the bottom of the title page: 'Valerio Sampieri' (The Sampierei were an influential Bolognese family, who had a well-known picture-gallery at their Palazzo Sampieri).

❧*Dibner 186 (second issue, 1599); Norman 1858; GM 285; Mortimer/Italian 448.*

Apparently the earliest Italian manuscript of Regiomontanus

50. Regiomontanus (Johannes Müller), *Calendarium*; [with other Astronomical and Prognostication Texts, in Latin Manuscript on paper and parchment. Northern Italy, probably Turin, probably 1475 or 1476].

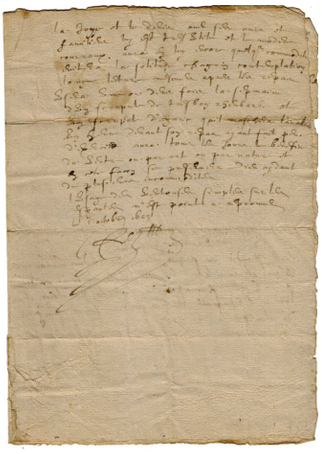
£92,000

Written for a member of the Augustinian order (San Christoforo, Turin); owned in the late 15th century by the Augustinian monastery of San Cristoforo Degli Umiliti, Turin, for the use of Brother Anthony de Lanteo (inscribed at the top of the calendar page for January); Giuseppe Gregori of Bologna, 16th century (inscribed on the back cover); **Guglielmo Libri** (the famous bibliophile and book-thief); **Sir Thomas Phillipps** (arguably the greatest book-collector ever to have lived); Thomas Fitzrot-Fenwick (Phillipps's grandson and heir of his vast library); Samuel Verplanck Hoffman (1866-1942).

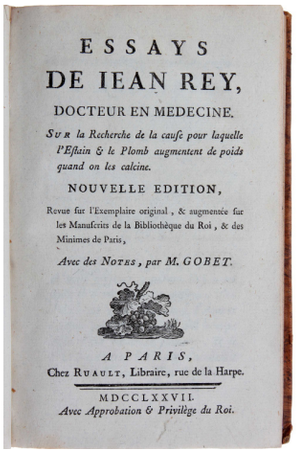
One of the rarest autographs in the history of science

51. REY, Jean. *Autograph document signed, in Latin and French. N.p., 1 October 1623. 2-1/2 pages. Offered here with the first obtainable edition of his only published work.*

£14,000



The only autograph in private hands from the hand of French physician and chemist Jean Rey, author of *Essays sur la recherche de la cause pour laquelle l'estain & le plomb augmentent de poids quand on les calcine* (1630). This extraordinarily rare book, of which only 7 copies are known, was Rey's only publication; it anticipated by more than one hundred years Lavoisier's discovery that the calcination of metals involves combination with air - a discovery fundamental to the overthrow of the phlogiston theory and the foundation of modern chemistry. Lavoisier published his discovery in 1774; the following year, chemist Pierre Bayen alerted Lavoisier to the existence of Rey's *Essays*. Lavoisier was so impressed with "the apparent modernity of Rey's ideas" (McKie) that he at first believed Rey's work to be a forgery; he later spoke of the work with admiration. McKie, in the historical introduction to his facsimile edition of Rey's Essays (1951), relates what little is known of Rey's life, describing in detail the scant documentary evidence that remains, and reproducing examples of Rey's handwriting. The University of Montpellier, where Rey studied medicine from 1605 to 1609, preserves a signed 6-line inscription in Latin written by Rey when he matriculated at the University (1605), as well as four other documents bearing Rey's signature: two consilia (1608 and 1609), Rey's licence en medicine (1609) and a document Rey signed upon receiving his doctorate (1609). Apart from these, the only other signed autograph document of Rey's is the one we are offering here, containing his signed prescriptions and dietary for a distinguished patient living near Toulouse, Baron de Fourquevaux.

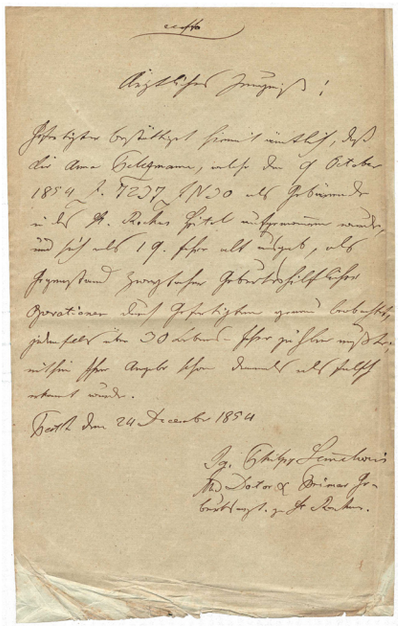


ESSAYS
DE IEAN REY,
DOCTEUR EN MEDECINE.
Sur la Recherche de la cauſe pour laquelle l'Eſtain & le Plomb augmentent de poids quand on les calcine.
NOUVELLE EDITION,
Revue ſur l'Exemplaire original, & augmentée ſur les Manuſcrits de la Bibliothèque du Roi, & des Minimes de Paris,
Avec des Notes, par M. GOBET.
A PARIS,
Chez RUAULT, Libraire, rue de la Harpe.
MDCCLXXVII.
Avec Approbation & Privilège du Roi.

Of legendary rarity

52. SEMMELWEIS, Ignaz Philipp. *Extremely rare autograph document in Semmelweis' hand, from his time at the St. Rochus Hospital in Pest were he eliminated childbed fever, medical testimony regarding a female patient, signed and dated 24. December 1854.*

£30,000

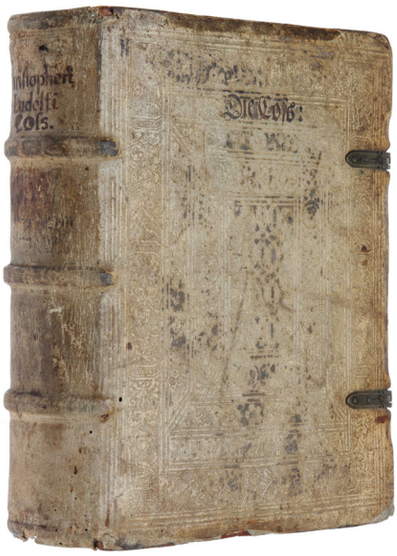


Despite the wide interest there has been for more than a century in Semmelweis' work and personality there are still today extremely few examples of autograph material by him. In their 1968 article on Semmelweis manuscripts the three authors Antall, Harko, and Vida note: "Researchers always attach great importance to the manuscripts of great personalities. Not only the contents of these manuscripts are of great value, but they are very valuable historical documents and museum pieces too. For this reason and on the occasion of the 150th anniversary of Semmelweis' birth we considered necessary to summarize what survived him in manuscript form. He left only few manuscripts; the first drafts of his published works are irretrievably lost. In 1940 György Korbuly summarized the number of the discovered Semmelweis manuscripts and he stated in his article: 'if we inquire, how many manuscripts of Semmelweis we know today, the reply is expressively depressing. We know today only 5 original letters of him". The authors continue to mention that since 1940 some new Semmelweis manuscripts had come to light in London and Budapest, but that still in 1966 when Ákos Palla described a newly discovered document he estimated a total number of documents known worldwide to be 20-30. We cannot locate any other autograph material in the auction records. The large and impressive document (380 x 240 mm) is a medical testimony done by Semmelweis when he was primary obstetrician at the St. Rochus Hospital in Pest.

Heavily annotated

53. STIFEL, Michael. *Die Coss Christoffs Rodolff; mit schönen Exempeln der Coss durch Michael Stifel gebessert und sehr gemehrt.* Königsberg: Alexandrum Behm von Lutomysl, 1553.

£18,250



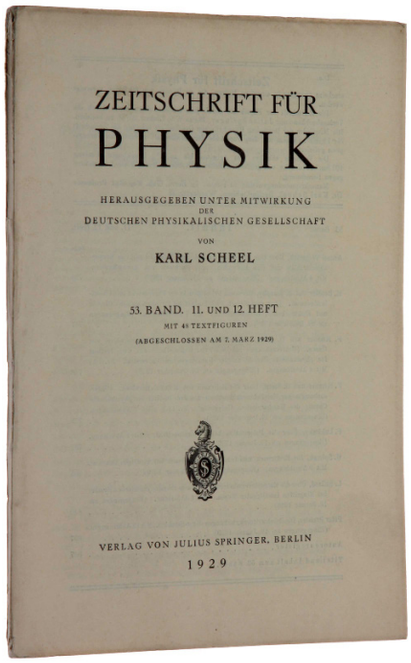
A magnificent copy, in contemporary blind stamped pigskin and heavily annotated, of the first edition of Stifel's *Coss*. "This work did for Germany what Cardan's and Tartaglia's did for Italy" (Smith). This is the first edition by Stifel of Rudolff's *Behend vnnd Hubsch Rechnung durch die kunstreichen regeln Algebre so gemeincklich die Coss genennt warden* (Strasbourg, 1525), the first German book on algebra, usually referred to simply as the *Coss*. Rudolff's book having become unavailable, Stifel took on the task of producing a new version, not only reproducing Rudolff's text in its entirety, but adding commentary and additions of his own, which more than doubled the length of the book (Rudolff's 208 pages grew to 494 in Stifel's edition). Stifel's work served for at least the next 150 years as the principal text from which many mathematicians learned their algebra, including Frans van Schooten (1615-1660) (DSB) and, as late as the eighteenth century, Leonhard Euler (1707-1783); in fact, it formed the basis of Euler's own algebra textbook, *Vollständige anleitung zur Algebra* (1770). "[Stifel] was, in fact, the greatest German algebraist of the sixteenth century" (DSB).

❧*Smith, Rara Arithmetica, pp. 258-260; Honeyman 2916.*

'Established the connection between entropy and information'

54. SZILARD, Leo. *Über die Entropieverminderung in einem thermodynamischen System bei Eingriffen intelligenter Wesen.* Berlin: Julius Springer, 1929.

£5,250

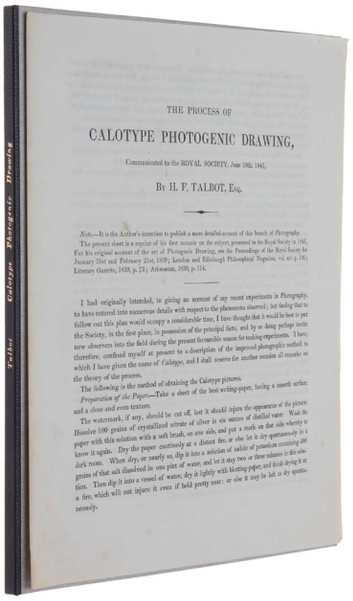


A very fine copy, in the original wrappers, of the founding document of information theory, "his famous paper of 1929, which established the connection between entropy and information, and foreshadowed modern cybernetic theory" (DSB). In this paper, 'On the reduction of entropy in a thermodynamic system by the intervention of intelligent beings,' Szilard described a theoretical model that served both as a heat engine and an information engine, establishing the relationship between information (manipulation and transmission of bits) and thermodynamics (manipulation and transfer of energy and entropy). He was one of the first to show that "Nature seems to talk in terms of information" (Seife, p. 77). In his paper Szilard addressed the problem of 'Maxwell's demon,' a thought experiment first mentioned by James Clerk Maxwell in a letter to Peter Guthrie Tait in 1867 as a challenge to the second law of thermodynamics. One of the most brilliant thinkers of the twentieth century, Szilard (1898-1964) is best known for his work in nuclear physics: he conceived the idea of a nuclear chain reaction in 1933, filed a patent for a simple nuclear reactor in 1934, and collaborated with Fermi in the first demonstration of a chain reaction in 1942. In 1939 Szilard wrote a confidential letter to President Roosevelt outlining the possibility of nuclear weapons; this letter, co-signed by Einstein, led directly to the foundation of the Manhattan Project.

First announcement of the Calotype process

55. TALBOT, William Henry Fox. *The Process of Calotype Photogenic Drawing, Communicated to the Royal Society, June 10th, 1841.* London: J.L. Cox & Sons, 1841.

£12,250



THE PROCESS OF

CALOTYPE PHOTOGENIC DRAWING,

Communicated to the ROYAL SOCIETY, June 10th, 1841,

BY H. F. TALBOT, Esq.

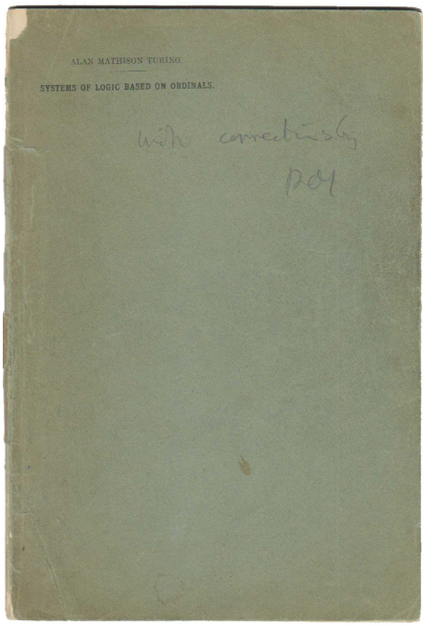
Extremely rare privately printed memoir in which the author first announced his invention of the Calotype (or Talbotype) process - the precursor to most photographic processes of the 19th and 20th centuries. We can find just two copies of this paper having been auctioned the past fifty years (both in the André Jammes Collection, Sotheby's 2002). "Nicephore Niépce produced the first photo-engraving in 1822, using bitumen of Judea on glass, and the first photographic image from nature in 1826 or 1827, on a pewter plate, but was reluctant to divulge the secret of his process and never published it. During the same period Louis Daguerre experimented with fixing images, first on paper and then on metal plates, joining forces with Niépce in 1829, and producing the first successful daguerrotype in 1837. Meanwhile, across the Channel, the mathematician and chemist William Henry Fox Talbot had been inspired by unsuccessful attempts to sketch landscapes using the camera obscura to seek a method of imprinting natural images on chemically sensitized paper... Talbot set aside his photographic work for other pursuits, and did not return to it until Dominique Arago's announcement of Daguerre's successful experiments, at the Academie des Sciences on January 7, 1839, prompted him to hurriedly claim priority of invention. He read … [a] hastily-written account of his own invention, outlining the process but withholding details of the chemicals used, to the Royal Society on January 31, and published it in February in [a] small edition, intended for private distribution.." (Norman).

❧*Norman Sales Catalogue 1315 for the 1839 paper*

Offprint of his PhD thesis - the copy of Robin Gandy

56. TURING, Alan Mathison. *Systems of Logic Based on Ordinals.*. London: C.F. Hodgson & Son, 1939.

£22,500



ALAN MATHISON TURING.

SYSTEMS OF LOGIC BASED ON ORDINALS.

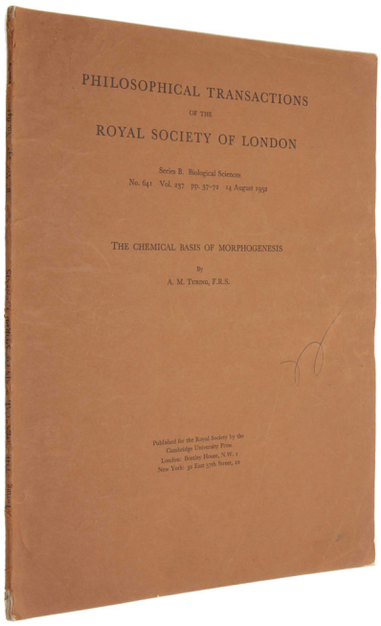
First edition, the incredibly rare offprint issue, and the copy of Robin Gandy, of Turing's PhD thesis, "one of the key documents in the history of mathematics and computer science" (Appel), and perhaps Turing's most formidable paper. "*Systems of logic based on ordinals* is a profound work of first 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). "Turing's 1938 Princeton PhD thesis, *Systems of logic* based on ordinals, which includes his notion of an oracle machine, has had a lasting influence on computer science and mathematics... A work of philosophy as well as mathematics, Turing's thesis envisions a practical goal – a logical system to formalize mathematical proofs so that they can be checked mechanically. If every step of a theorem could be verified mechanically, the burden on intuition would be limited to the axioms... Turing's vision of 'constructive systems of logic for practical use' has become reality: in the twenty-first century, automated 'formal methods' are now routine" (Appel). Offprints of Turing's papers are extremely rare in institutional holdings, and even more so in commerce. We have located only three copies: one in the Alan Turing Archive at King's College Cambridge (AMT/B/15), one at St. Andrew's, and one in the Max Newman collection at Bletchley Park.

A founding paper of mathematical biology

57. TURING, Alan Mathison. *The Chemical Basis of Morphogenesis.* London: Cambridge University Press, 1952.

£24,500

First edition, offprint issue, and the copy of Robin Gandy, of Turing's last major published work which has been 'hugely influential' (Maini), and 'in every respect ahead of its time' (Copeland). Taking his cue from the zoologist D'Arcy Thompson, who held that the forms of living things are to be explained in terms of the operation of physical forces and mathematical laws, Turing presents here the first mathematical theory of embryology. Offprints of Turing's papers are extremely rare in institutional holdings, and even more so in commerce. We have located only the copy in the Turing Archive at King's College, Cambridge and that in the Max Newman collection (now at Bletchley Park). The latter copy is the only other copy we are aware of having appeared in commerce. "Alan Turing's paper, 'The chemical basis of morphogenesis,' has been hugely influential in a number of areas. In this paper, Turing proposed that biological pattern formation arises in response to a chemical pre-pattern which, in turn, is set up by a process now known as diffusion-driven instability. The genius of this work was that he considered a system which was stable in the absence of diffusion and then showed that the addition of diffusion, which is naturally stabilizing, actually caused an instability. Thus, it was the integration of the parts that was as crucial to the understanding of embryological development as the parts themselves – patterns emerged or self-organized as a result of the individual parts interacting. To see how far ahead of his time he was, one has to note that it is only now in the post-genomic era of systems biology that the majority of the scientific community has arrived at the conclusion he came to 60 years ago..." (Philip K. Maini, in *Alan Turing: his work and impact*, p. 684).


PHILOSOPHICAL TRANSACTIONS
OF THE
ROYAL SOCIETY OF LONDON
Series B. Biological Sciences
No. 641 Vol. 237 pp. 37-72 14 August 1952
THE CHEMICAL BASIS OF MORPHOGENESIS
By
A. M. Turing, F.R.S.
Published for the Royal Society by the
Cambridge University Press
London: Bentley House, N.W. 1
New York: 32 East 57th Street, 22

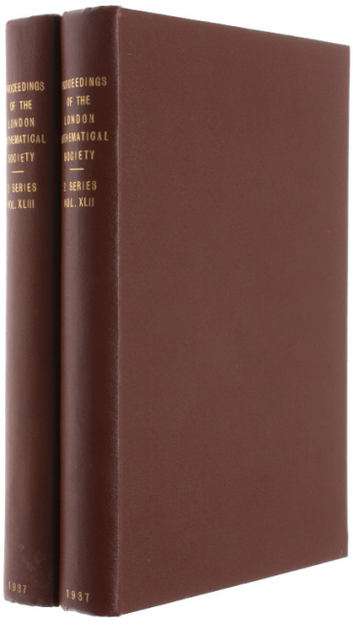
A fine and unrestored copy preserved in the original printed wrappers.

Arguably the single most important theoretical work in the history of computing

58. TURING, Alan Mathison. *On Computable Numbers, with an Application to the Entscheidungsproblem; [with correction].* London: C.F. Hodgson & Son, 1936-1937.

£14,650

First edition, a fine set (not ex-library). In this paper Turing introduced the concept of a 'universal machine', an imaginary computing device designed to replicate the mathematical 'states of mind' and symbol-manipulating abilities of a human computer. Turing conceived of the universal machine as a means of answering the last of the three questions about mathematics posed by David Hilbert in 1928: (1) is mathematics complete; (2) is mathematics consistent; and (3) is mathematics decidable. Hilbert's final question, known as the 'Entscheidungsproblem', is concerned with whether there exists a definite method, or 'mechanical process', that can be applied to any mathematical assertion, and which is guaranteed to produce a correct decision as to whether that assertion is true or not. The logician Kurt Gödel had already in 1931 shown that arithmetic (and by extension mathematics) could not be both consistent and complete. Turing showed, by means of his universal machine, mathematics is undecidable. To demonstrate this, Turing came up with the concept of 'computable numbers', which are numbers defined by some definite rule, and thus calculable on the universal machine. These computable numbers would include every number that could be arrived at through arithmetical operations, finding roots of equations, and using mathematical functions like sines and logarithms - every number that could possibly arise in computational mathematics. Turing then showed that these computable numbers could in turn give rise to uncomputable ones, ones that could not be calculated using a definite rule, and that therefore there could be no 'mechanical process' for solving all mathematical questions, since computing an uncomputable number was an example of an unsolvable problem. Turing's idea of a 'universal machine' was given the name 'Turing machine' by Church. ❧*OOC 394.*



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