Fifty Years: Our Fiftieth Catalogue

Mostly New Acquisitions

With an Afterword: Reflections on Fifty Years of Antiquarian Bookselling

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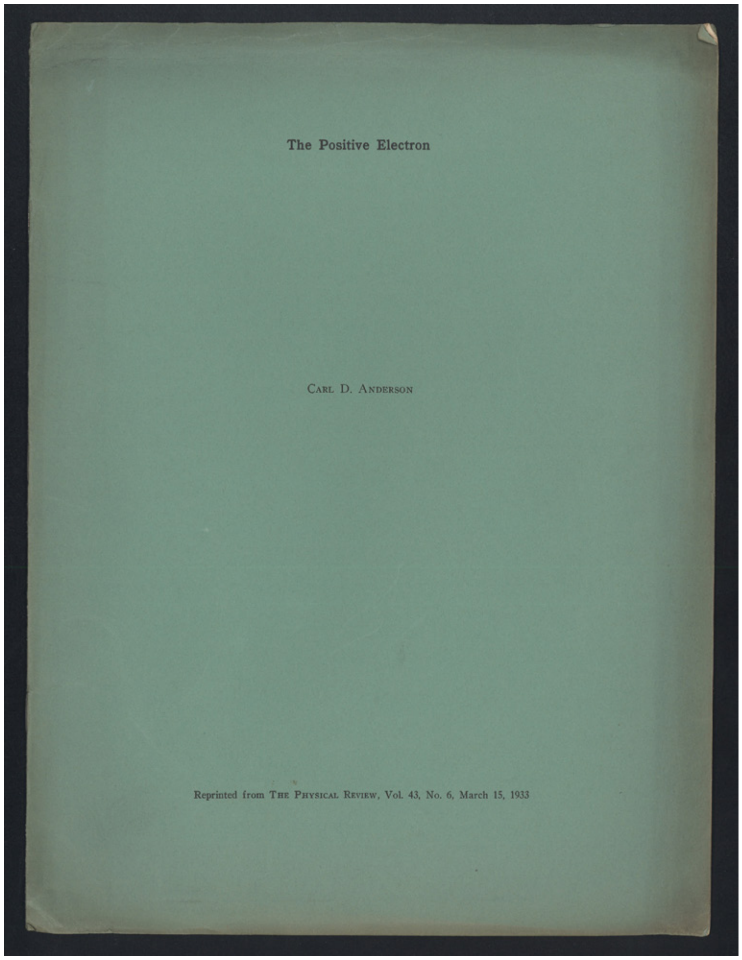


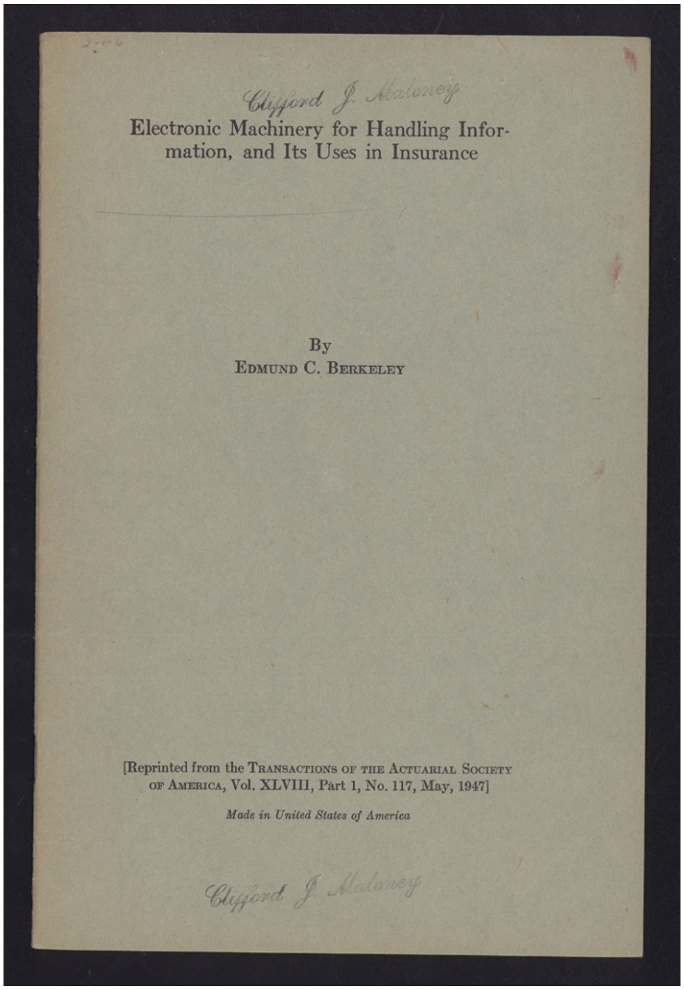
Discovery of the Positron

1. Anderson, Carl David (1905-91). The positive electron. Offprint from *The Physical Review,* 2nd series, 43, no. 6 (March 15, 1933). 491-494pp. Text illustrations. 268 x 203 mm. Original printed wrappers, a little creased at top margin and one corner, light dust-soiling at edges. Very good copy.

$7500

First Edition, Offprint Issue. Anderson discovered the positron, an elementary particle possessing a mass identical to that of the electron, but carrying a positive charge. Anderson's positron was the first example of a particle consisting of antimatter; it provided empirical support for Dirac's relativistic theory of the electron, which had predicted the existence of the positron as early as 1928.

Anderson made his discovery in 1932 while investigating the nature of the particles in cosmic rays. Using an improved version of Wilson's cloud chamber immersed in a strong magnetic field, Anderson found evidence suggesting the existence of a positively charged particle with the same mass as an electron. Following a brief preliminary announcement in which he set forth several possible interpretations of the evidence, Anderson published the present paper in which he provided further experimental proof of the particle's existence and coined the term "positron" to describe it. Anderson's discovery was first met with skepticism, but it was confirmed when Blackett and Occhialini published their own observations of the positron in 1933. For his discovery of the positron Anderson won a share of the 1936 Nobel Prize for physics. The offprint of Anderson's paper is **extremely rare** – this is the second copy we have handled in 50 years. Magill, ed., *The Nobel Prize Winners: Physics*, pp. 439-447. Weber, *Pioneers of Science*, pp. 106-8. 43252



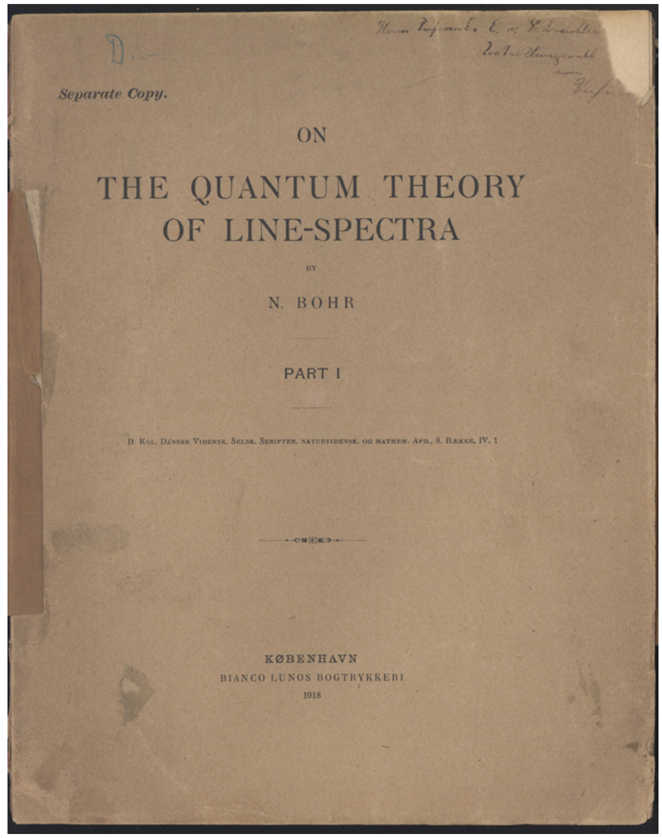
The First Paper on the Application of Electronic Computing to Industry

2. Berkeley, Edmund C. (1909-88). Electronic machinery for handling information, and its uses in insurance. Offprint from *Transactions of the Actuarial Society of America* 48 (1947). 36-52pp. 228 x 153 mm. Original printed wrappers, a few tiny spots, almost invisible staple-holes in front wrapper. Very good copy. Former owner's name-stamp (Clifford J. Maloney) on wrappers. $1500

First Edition, Offprint Issue. The first published paper on the proposed commercial application of electronic / electromechanical computing in private industry, published years before any commercial electronic computers were available. Drawing on material that he would later publish in his famous *Giant Brains or Machines that Think* (1949)—the first popular work on electronic computers—Berkeley described the four large-scale computing machines then in operation—MIT's Differential Analyzer; Harvard's Automatic Sequence Controlled Calculator; the Moore School's ENIAC; and Bell Laboratories' Relay Calculator—and discussed the machines' information-processing capabilities and their potential uses in the insurance industry. "It is natural to call these machines mechanical or electronic brains and to speak of them as machinery that thinks. This new machinery is certain to have far-reaching effects in all fields where the handling of information is the bulk of the work. . . . Much of the material in this paper is taken from a forthcoming book on the subject by the present writer, and is used by special permission of the publisher" (p. 36).

Berkeley was introduced to computing (using punched-card machine methods) while working as an actuary at Prudential Insurance. In 1942 he joined the Navy and was assigned to the Harvard Computation Laboratory, where he worked with Howard Aiken on the Harvard Mark II. In 1946 Berkeley returned to Prudential where he helped create a prototype premium billing trial for the Harvard Mark I and participated in studies that led to Prudential's purchase of one of the first UNIVAC I computers. He also began working on *Giant Brains* and in 1947 founded the Association for Computing Machinery. In 1948 he left Prudential to found his own company, and in 1951 he began editing and publishing *Computers and Automation* (later renamed *Computers and People*), the first periodical specifically devoted to electronic computing. He also headed his own publishing firm, consulted for industry, and invented and sold several build-it-yourself electronic computers and small robots (Simon, Squee, Tyniac, Brainiac, etc.) as educational tools. In his later years he became known as the conscience of the computer industry through his often-expressed belief that computers should be used not for military or destructive purposes, but only for the benefit of society. The offprint of Berkeley's paper is **extremely rare.** This is the first copy we have handled in 50 years. 43248

Inscribed to Egon von Schweidler



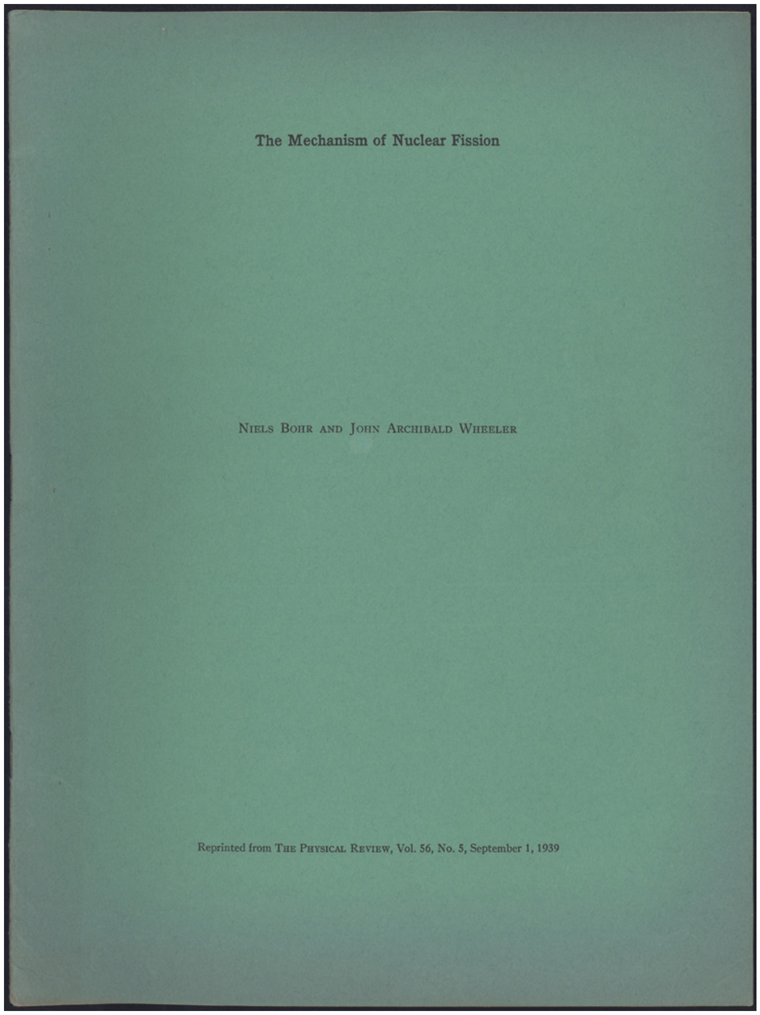
3. Bohr, Niels (1885-1962). On the quantum theory of line-spectra. 4to. 3 parts. 36; [37]-100; [101]-118pp. Copenhagen: Bianco Lunos, 1918-22. 268 x 214 mm. (parts 1 and 2 unopened). Original printed wrappers, some dust-soiling and chipping, wrappers of part 3 detached, tabs with punched holes pasted to spines of parts 1 and 2. Some toning but very good. *Presentation Copy, inscribed by Bohr* to Austrian physicist Egon von Schweidler (1873-1948) on the front wrapper of part 1: "Herrn Professor Dr. v. Schweidler Rechtachtungsvoll vom Verfasser" (inscription slightly affected by chip in upper right corner).

$15,000

First Edition. Bohr's revolutionary atomic theory, based on Planck's quantum theory, laid an entirely new foundation for understanding the processes within the world of matter. Bohr's *Quantum Theory of Line Spectra* represents perhaps his most sustained effort to set forth all of the aspects of his atomic theory. "By 1918 Bohr had visualized, at least in outline, the whole theory of atomic phenomena. . . . He at once started writing up [in the present paper] a synthetic exposition of his arguments and of all the evidence upon which they could have any bearing; in testing how well he could summarize what was known, he found occasion to check the soundness of his ideas and to improve their formulation. In the present case, however, he could hardly keep pace with the growth of the subject; the paper he had in mind at the beginning developed into a four-part treatise, publication of which dragged over four years without being completed; the first three parts appeared between 1918 and 1920, and the fourth, unfortunately, was never published" (*Dictionary of Scientific Biography*).

> The first part of Bohr's paper consists of a general introduction, recapitulating developments in quantum theory and announcing the main topics he intended to describe. The second and most important part "deals with the hydrogen atom including its fine structure and its behavior in external electric and magnetic fields. Here he also gave his own treatment of the phase integral method, including his 'perturbation theory' . . . Part III treats of the spectra of higher elements. It contains an appendix in which Bohr recapitulated developments since 1918 and retracted some earlier conclusions" (Pais, *Niels Bohr's Times*, pp. 192-93).

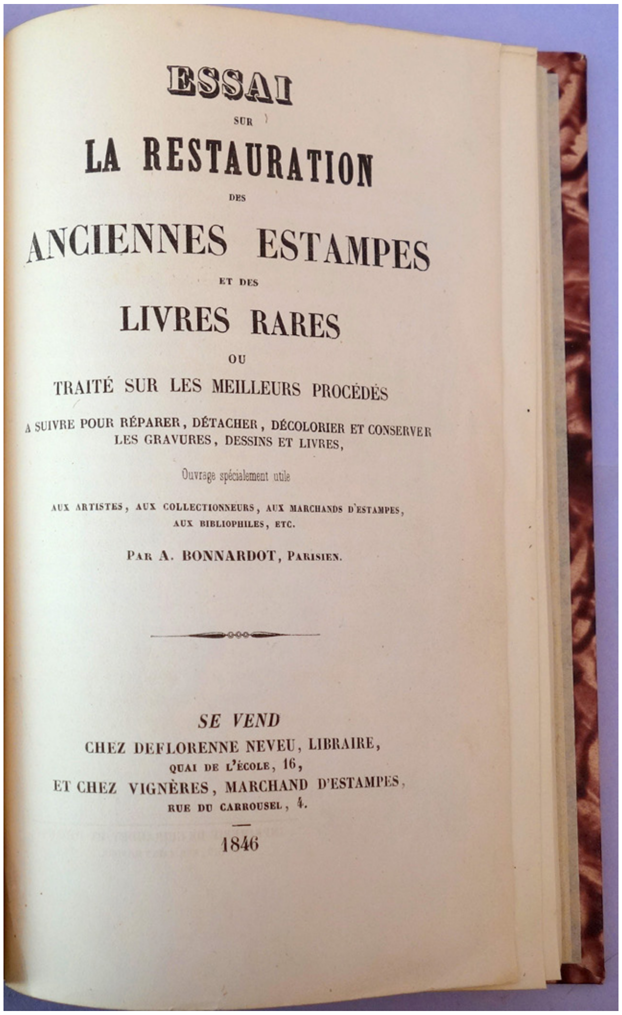
Bohr presented this copy to Austrian physicist Egon von Schweidler, head of the department of experimental physics at the University of Innsbruck and the author of several works on relativity. Segrè, *X-Rays to Quarks*, pp. 13-15; 119-30. *Nobel: The Man and his Prizes*, pp. 437-49. 43255

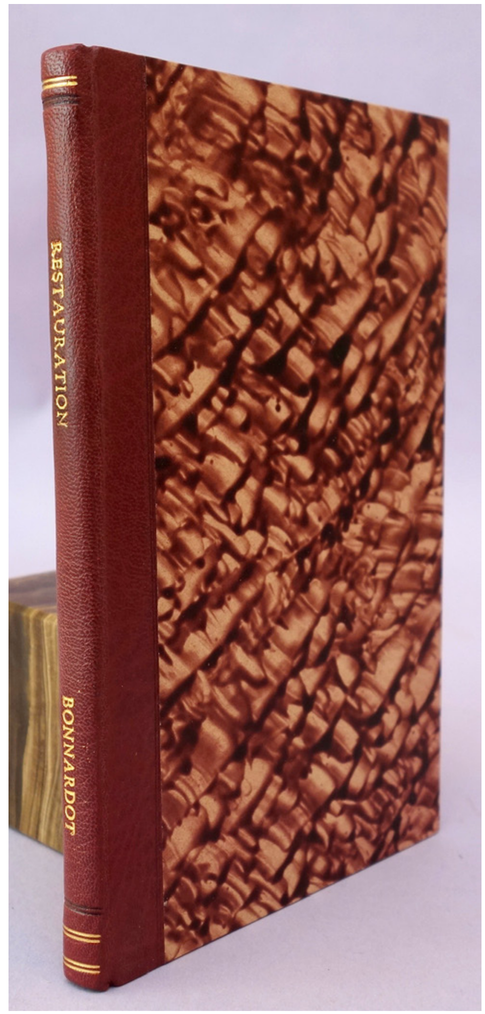


The First Theoretical Paper on Nuclear Fission

4. Bohr, Niels (1885-1962) and **John A. Wheeler** (1911-2008). The mechanism of nuclear fission. Offprint from *The Physical Review* 56 (1939). 426-450pp. 268 x 200 mm. Original printed wrappers. Fine copy. $6000

First Edition, Offprint Issue of the first theoretical paper on nuclear fission. In January 1939 Lise Meitner and Otto Frisch, with Bohr's encouragement, published a letter in *Nature* announcing the discovery of nuclear fission in uranium. The news took the scientific world by storm, with over 100 papers on uranium fission experiments appearing in the next twelve months, but Bohr was the only one during this period to publish on the theoretical aspects of this phenomenon. Collaborating with American physicist John A. Wheeler, Bohr worked out in great detail the complete theory of nuclear fission, publishing the results in the present paper. "In this work Bohr met with two old loves: the compound nucleus of 1936 and the study of the relation between surface tension and surface vibrations . . . Bohr and Wheeler discussed many other features: whether other nuclei can fission, the competition between fission and other possible fates of the compound nucleus, the fate of the fission fragments, the possibility of instantaneous neutron emission accompanying fission, etc. The work with Wheeler was the **last major novel contribution to physics by Bohr** [emphasis ours]" (Pais, *Niels Bohr's Times*, p. 458). "Though it would be refined further, the theory of Bohr and Wheeler was accepted, and continued to remain ever since, as the standard description of the mechanism of nuclear fission" (Mehra & Rechenberg, *The Historical Development of Quantum Theory,* 6, p. 1006). This offprint is **extremely rare;** it is the first copy we have handled in 50 years. 43259



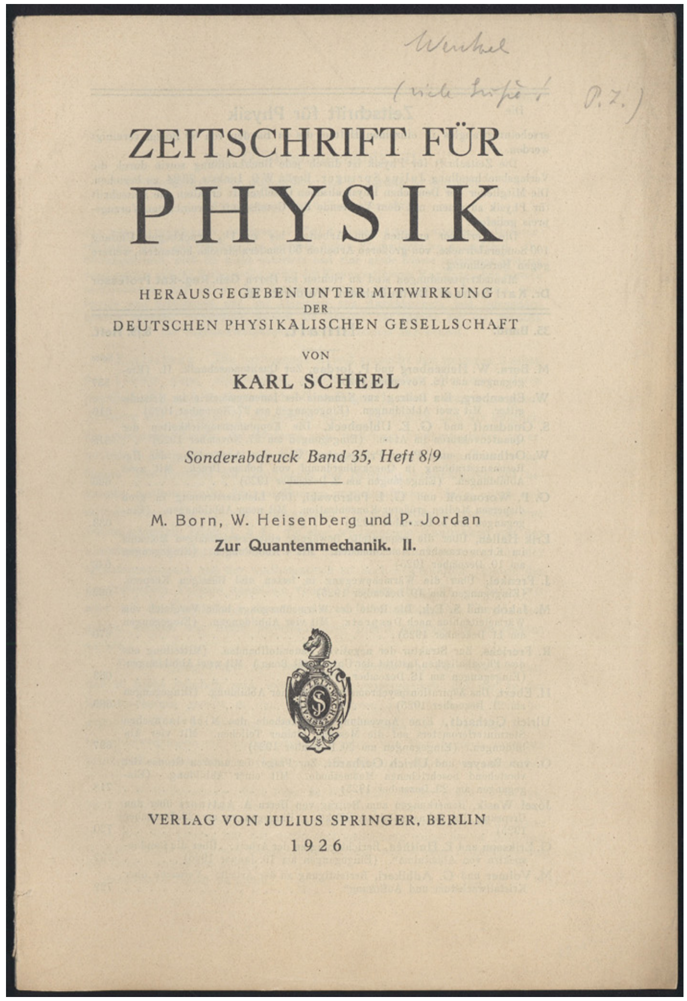


The First Book on Rare Book Restoration

5. Bonnardot, Alfred (1808-84). Essai sur la restauration des anciennes estampes et des livres rares . . . [4], 80pp. [Paris:] Chez Deflorenne neveu . . . et chez Vignères, 1846. **With:** Supplément a l'Essai sur la restauration des vielles estampes, etc. . . . contenant des corrections, notes, éclaircissements, et addition d'un chapitre sur la relieure des livres rares [caption title]. 31pp. Paris: Imprimerie de Guiraudet et Jouaust, n.d. Together 2 works in 1. 206 x 131 mm. 20th century quarter morocco, paste paper boards. Fine. $1500

First Edition of the first book on the restoration of rare books and their bindings. Bonnardot was a Parisian bookbinder and restorer; his work also covered the cleaning and repair of prints and other works of art on paper, and was intended for artists, collectors, print dealers and bibliophiles. The fourteen chapters in the work cover such topics as bleaching, spot removal, repair of tears and holes, restoring the blackness of an impression, print conservation and the particular issues associated with works printed on parchment, satin and other unusual materials. The *Essai* was printed in a small edition of 400 copies and quickly went out of print. Some time afterwards Bonnardot issued a supplement to the *Essai* containing 15 pages of revisions to his original text and a fifteenth chapter on "The restoration and provisional binding of rare books"; this supplement is included here. In 1858 Bonnardot published a revised and greatly enlarged second edition of the *Essai*, portions of which were translated into English in Alfred Buck's *Book Repair and Restoration* (1918). 42199

The "Three-Man Paper"—Foundation of Quantum Mechanics, Inscribed by Pascual Jordan to Gregor Wentzel



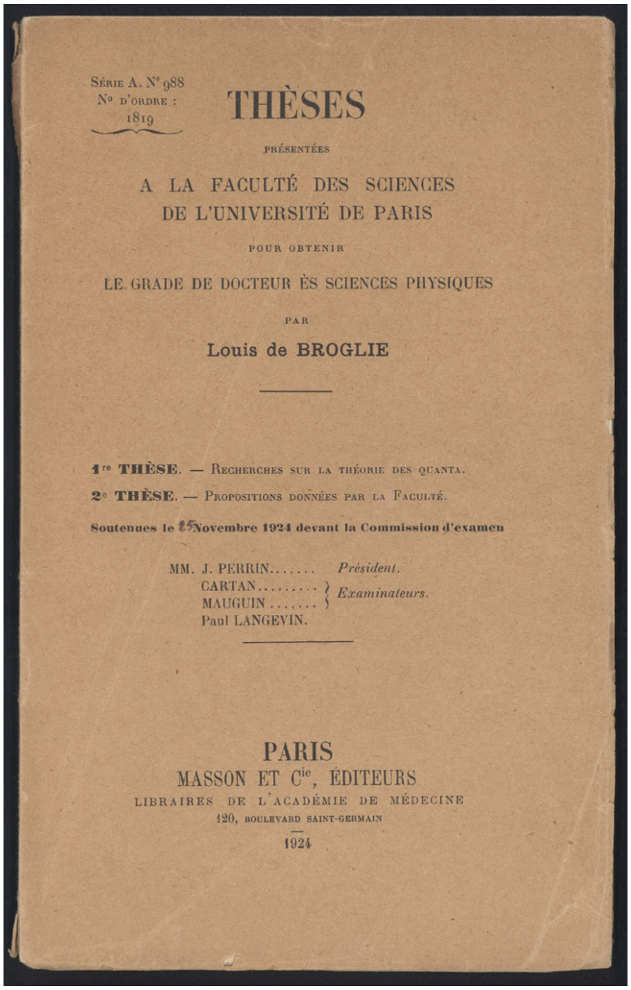
6. Born, Max (1882-1970); **Werner Heisenberg** (1901-76); and **Pascual Jordan** (1902-80). Zur Quantenmechanik. II. Offprint from *Zeitschrift für Physik* 35 (1926). 557-615pp. 230 x 157 mm. Original printed wrappers, small splits in upper and lower spine. Fine. *Presentation Copy, inscribed by Jordan* in pencil to physicist Gregor Wentzel (1898-1978) on the front wrapper: "Wentzel (viele Grüsse! P. J.)"

$17,500

First Edition, Offprint Issue of the famous and fundamental *Dreimännerarbeit* (three-man paper), containing the first complete, self-consistent description of quantum mechanics. The paper "contained the basic postulates of quantum mechanics in its very foundations—the existence of discrete stationary energy states in atoms and jumps between states accompanied by the emission or absorption of light. And it allowed calculation in principle of any periodic system, such as atoms, and in close analogy with classical mechanics. The previously puzzling properties of atoms were now subject to a new mechanics" (Cassidy, *Uncertainty: The Life and Science of Werner Heisenberg*, p. 207).

"Zur Quantenmechanik II" completed the work begun by Heisenberg in his "Über die quantentheoretische Umdeutung kinematischer und mechanischer Beziehungen" (1925), setting forth the quantum-theoretical reinterpretation of kinematic and mechanical relations, and in Born and Jordan's "Zur Quantenmechanik" (1925), which took Heisenberg's concepts and expressed them in terms of matrix mechanics. In the introduction to their paper, the authors stated their purpose: "To develop further the theory of a general quantum-theoretical mechanics whose physical and mathematical basis has been treated in two previous papers by the present authors . . . The quantum mechanics developed in Part I of this paper [Born and Jordan 1925] from Heisenberg's approach is here extended to systems having arbitrarily many degrees of freedom" (quoted in Mehra & Rechenberg, *The Historical Development of Quantum Theory*, 3, p. 101).

The present offprint of this paper was presented to theoretical physicist Gregor Wentzel by Pascual Jordan, whose pencil inscription to Wentzel, initialed "P. J.," is on the front wrapper. Wentzel also made contributions to quantum mechanics; he is best known for the Wentzel-Kramers-Brillouin approximation for finding approximate solutions to linear partial differential equations with spatially varying coefficients. 43263

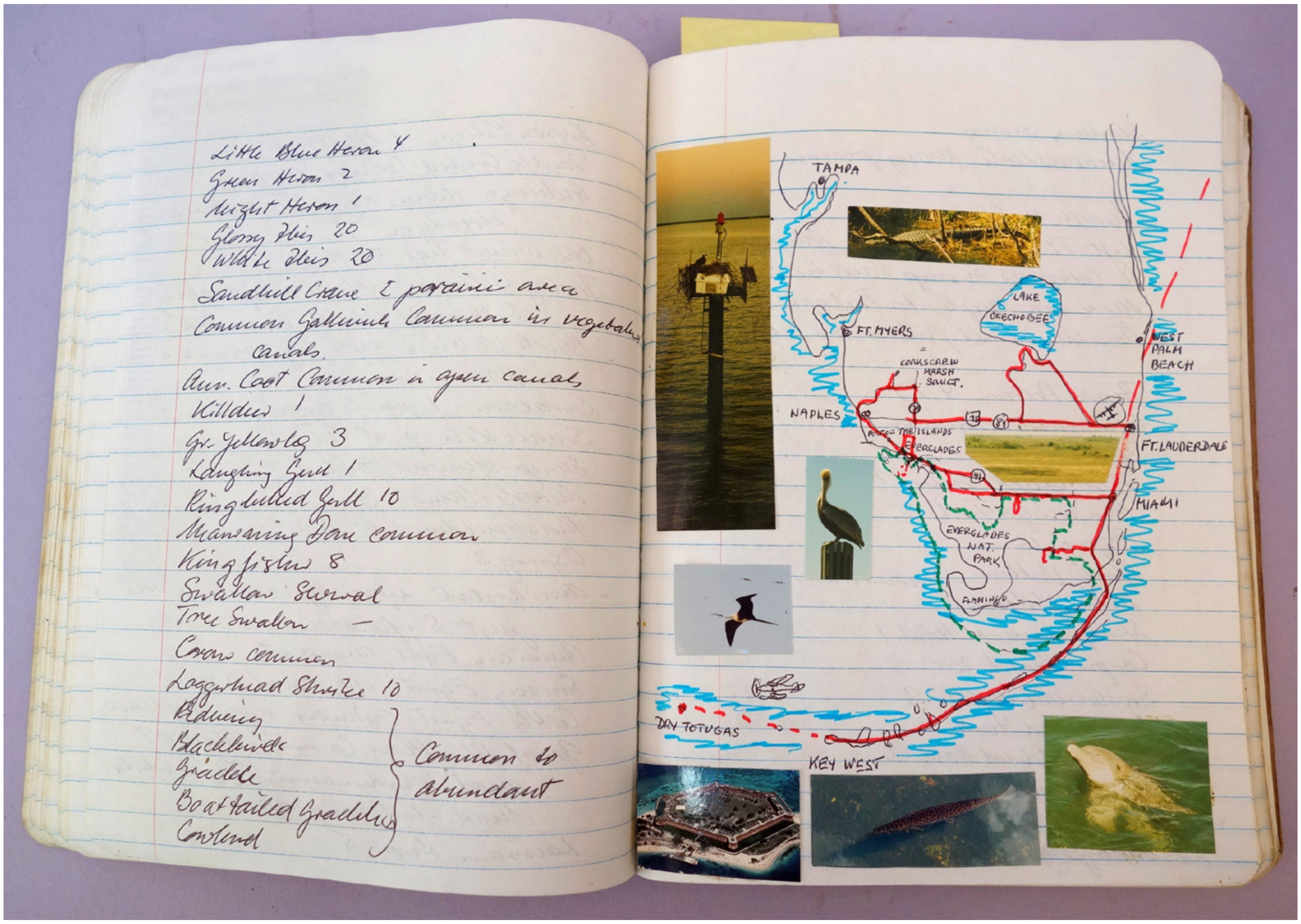


Matter Waves

7. Broglie, Louis V. P. R. (1892-1987). Recherches sur la théorie des quanta. 8vo. [4], 111, [1]pp. Paris: Masson et Cie., 1924. 228 x 144 mm. (uncut and unopened). Original printed wrappers, a little chipped and creased, small split in upper spine. First two leaves spotted, but a very good copy. $15,000

First Edition of Broglie's revolutionary doctoral thesis on the quantum theory, in which he developed the startling and revolutionary idea that material particles such as electrons have a wave as well as corpuscular nature, analogous to the dual behavior of light demonstrated by Einstein and others in the first two decades of the century. Broglie suggested that these particle or matter waves should be detectable experimentally, a suggestion confirmed in 1927 by the Americans Clinton Davisson and Lester Gerrner and the Scotsman G. P. Thomson (son of J. J. Thomson), who conclusively demonstrated the wave nature of electrons. For his discovery, Broglie was awarded the 1929 Nobel Prize in physics. Broglie's book *Ondes et mouvements* (1926), selected by Carter and Muir for the *Printing and the Mind of Man* exhibition and catalogue (1967), was an expansion of ideas first published in his thesis. Unlike his book, Broglie's thesis was issued in a very small edition.

"With his thesis, Louis de Broglie had tried to formulate consistently all of his ideas about what he considered to be the essentials of quantum theory. These essentials implied the existence of finite, discrete 'isolated bits of energy,' which had been introduced by Planck and Einstein . . . From the very beginning of his involvement with quantum theory, de Broglie had adopted Einstein's light-quantum hypothesis and had looked for some sort of unification of the dynamical description of light-quanta with that of atoms and electrons. This unification, which he had achieved by endowing the light-quantum with a mass, and considering it as a particle moving with relativistic velocity, had enabled him to approach the fundamental question posed by Henri Poincaré already at the first Solvay Conference in 1911: Can one construct a suitable dynamics of quanta? De Broglie had succeeded in doing so by inverting the method, through which Einstein had obtained the light-quantum; that is, he had associated with all material particles a wave motion. This phase-wave hypothesis allowed him indeed to formulate the principles of a new, quantum-theoretical dynamics describing particles and light-quanta" (Mehra & Rechenberg, *The Historical Development of Quantum Theory,* 1, pp. 601-2). Norman 347. 43253



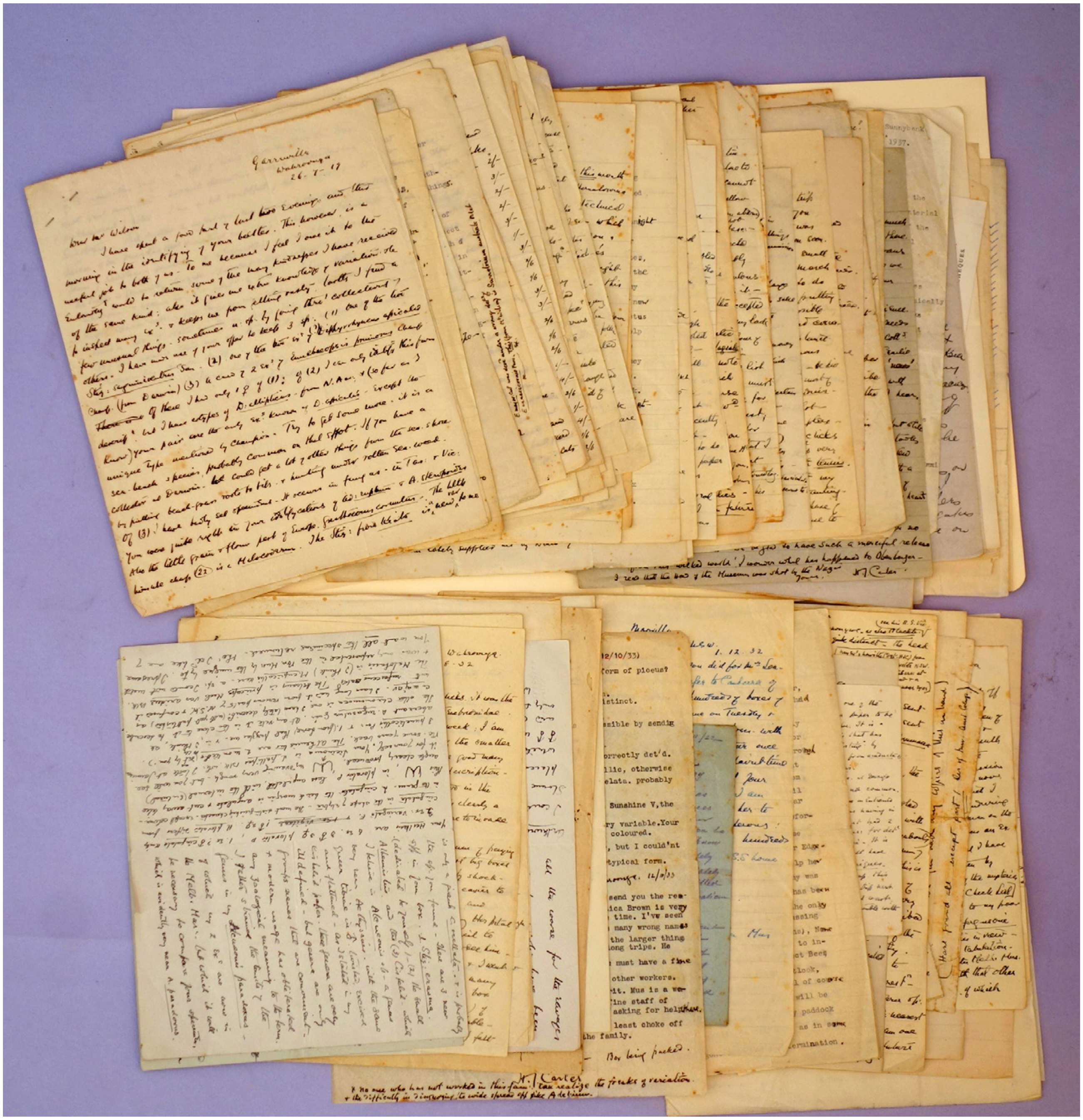
Natural History Notebooks Written by the Designer of "Birds of America"

8. Bruun, Bertel (1937-2011). Ten autograph manuscript field notebooks / natural history diaries, containing Bruun's handwritten records of his ornithological and natural history observations, over 800 original photographs (mostly in color), original sketches, hand-drawn maps and additional materials laid or tipped in, including letters, news clippings, photocopies and printouts, autograph manuscript documents, etc. V.p., 1951-2004. Notebooks are about 230 x 180 to 255 x 180 mm. (9 x 7 to 10 x 7 inches) in size and contain an average of 200 manuscript pages each (some notebooks with more, some with fewer). Moderate wear and soiling to covers, some photographs loose, minor spotting from clear tape and non-archival glue, a few photographs marred from having stuck together. Overall very good. $3750

A remarkable find—the natural history diaries / field notebooks of ornithologist Bertel Bruun, designer and co-author of the classic *Birds of North America* (first ed. 1966, with over 4 million copies sold to date) and pioneering international conservationist, particularly in the Middle East where he promoted wildlife preservation efforts in Israel, Egypt and Iran. The notebooks cover almost 50 years of Bruun's career as a natural historian, beginning in 1951, when he was still in his teens, and ending in 2004 (there is a gap in the notebooks spanning the years 1978 – 1982). The first three notebooks (1951 to 1967) are in Danish; the remaining are in English. They record Bruun's meticulous observations of birds and other wildlife, including numbers of individuals observed, their location and activities, the weather conditions and other pertinent information. The diaries contain as well Bruun's entertaining accounts of his work with fellow naturalists, his activities as a conservation-

ist, and his travels all over the world in pursuit of his passion. Also included in the notebooks are over 800 photographs taken by Bruun of birds and other animals (including alligators, buffalo, polar bears, etc.), along with Bruun's sketches, hand-drawn maps and other related materials.

Bruun, a native of Denmark, obtained his medical degree from the University of Copenhagen in 1964 and then moved to New York City where he became a practicing neurologist. He dedicated all his spare hours to ornithology, which remained a lifelong enthusiasm. In 1966 Brunn, Chandler Robbins and Herbert Zim co-authored *Birds of North America*, with Brunn contributing the book's most notable and revolutionary feature: An innovative layout design that presented all the pertinent information about a species, together with clear and vivid illustrations, on two facing pages. "Dr. Brunn's layout, though no longer considered unusual, was a breakthrough . . . 'In a way, even though he contributed the least amount of content, Bruun's contribution was the most important,' said Kenn Kaufman, a field editor for *Audubon* magazine. 'The design was just so convenient for field use that it became hugely popular right away and affected the design of almost all subsequent field guides—birds and other subjects'" (Hevesi). Brunn wrote or co-authored more than a dozen other books, including two award-winning science books for children. After the Camp David peace treaty of 1978 between Israel and Egypt, Bruun served as a liaison between the two countries to promote the preservation of wildlife in the Sinai Peninsula; he later became president of the Holy Land Conservation Fund, an organization devoted to protecting wildlife in Israel, and worked hard to advance conservation efforts in other areas of the Middle East. His *Common Birds of Egypt* (1985) remains the only field guide to the birds of that country. Hevesi, "Bertel Bruun, Birds of North America designer, dies at 73," *New York Times* (October 5, 2011). 43273



"You Might Send Along a List of Your Deretaphrus & Bothrideres"

9. Carter, Herbert James (1858-1940). Collection of 67 letters to Francis Erasmus Wilson (1888-1960), plus other related documents (calendar of all documents in the collection available on request). 82 documents in all, totaling 144 pages. 1919-63. Two of the letters are incomplete, lacking their following pages. A few documents torn, occasional minor spotting, some toning but altogether very good. $3750

Excellent scientific correspondence from H. J. Carter, an Australian entomologist specializing in Coleoptera (beetles and weevils). Carter, who made his living as a schoolmaster and educator, single-handedly discovered 44 new insect genera and 1167 new species during his long career, as well as an additional 11 genera and 67 species in partnership with E. H. Zeck. Carter's work on the families Tenebrionidae (darkling beetles), Buprestidae (jewel beetles), Cistelidae (comb claw beetles) and Dryopidae (long-toed water beetles), as well as on certain groups of Cerambycidae (longhorn beetles) and Colydiidae (cylindrical bark beetles), "has formed the basis of all future studies on these sections of the Australian fauna" (*Australian Dictionary of Biography*). He published 65 scientific papers (7 with Zeck), "and was a meticulous worker whose descriptions of new species were usually accompanied by revisionary work on the various families and genera, often by keys to assist other workers in determinations" (*ibid.*).

Carter's correspondent was F. E. Wilson, another Australian amateur entomologist with whom Carter began exchanging specimens around 1919. Wilson's collection of insects from Queensland, New South Wales, Victoria and South Australia is now at the National Museum of Victoria. Wilson formed a substantial library of natural history works, which was purchased after his death by bookseller Gaston Renard of Melbourne. Included in the present collection are several invoices and letters between Renard and Australian taxonomist B. W. Salkilld, who purchased several of Wilson's books in the 1960s.

This collection contains 67 letters from Carter to Wilson dating from 1919 to 1940, the year of Carter's death. Virtually all of the letters have substantial entomological content. Carter's skill and thoroughness as a taxonomist are evident throughout, as can be seen in the following example from October 1935:

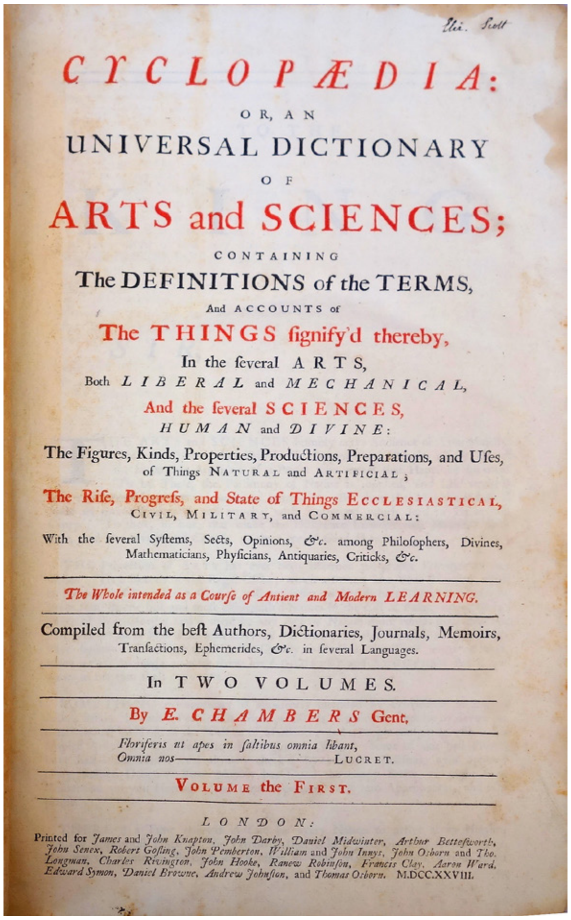
> I have now given the 'once over' to your very helpful box, & enclose my brief notes thereon. I can see a lot of work ahead if I want to make a good job revising this Fam. The distinction between Ditoma & Phormesa is very slight, depending only on 2 characters, (1) the presence of short antennary sulci, & (2) dilated margin of prothorax in Phormesa (none in Bitoma) . . . We have 4 new spp [species] to come out in the next Zoologist. I also want to copy some of those Grouvelle descriptions from the paper sent, after which will return it. You might send along a list of your Deretaphrus & Bothrideres, so that I can fill up gaps where possible. . . .

This letter, like several others in the collection, includes a list of described species. 43246

Subscriber's Copy of the First True General Encyclopedia—Introduction of the Cross-Reference

10. Chambers, Ephraim (1680 [?] – 1740). Cyclopaedia: Or, an universal dictionary of arts and sciences . . . 2 vols., folio. xxx, [2] subscriber list (including James Montgomery, Governor of New York, and a Mrs. Kennon, the only woman), 88, 97-128, *125-*128, 129-154, 161-184, 75-368, 161-380, 1-198, 197-252, 245-282; [2], 365-682, 733-1038, 1-392pp. Title pages printed in red and black. Double-page engraved frontispiece, 20 engraved plates (those of anatomy, architecture, astronomy, fortification, geometry, ship of war, and surveying are folding, the first one browned). Tables, woodcut heraldic illustrations, musical notations, mathematical equations, woodcut diagrams and tail-pieces in the text throughout. London: Printed for James & John Knapton, John Darby [etc.], 1728. 396 x 240 mm. Calf ca. 1728, rebacked preserving gilt spines, corners restored. Some dampstaining in both volumes, spotting throughout especially in the letters D and E in Vol. 1, but a very good copy. Engraved bookplate in each volume of John Williams, one of the original subscribers to the *Cyclopaedia*; subsequent inscription on Vol. 1 front endpaper by Williams' nephew, Ezra Williams, noting that he had received the book from Williams' wife, Eliza; signature of Thomas Williams dated 1822; other inscriptions presumably by Williams family members. $15,000

First Edition of the first true general encyclopedia. While working as an apprentice to John Senex, the London map and globe maker, Chambers "formed the plan of compiling a cyclopaedia on a larger scale than that of John Harris's *Lexicon technicum* (1704). . . . In 1726 he published Proposals for a 'cyclopaedia,' and it was this document that Samuel Johnson later claimed had partly 'formed his style' (Boswell, *Life*, 1.218). The work


Eliz. Scott

CYCLOPÆDIA:
OR, AN
UNIVERSAL DICTIONARY
OF
ARTS and SCIENCES;
CONTAINING
The DEFINITIONS of the TERMS,
And ACCOUNTS of
The THINGS ſignify'd thereby,
In the ſeveral ARTS,
Both LIBERAL and MECHANICAL,
And the ſeveral SCIENCES,
HUMAN and DIVINE:
The Figures, Kinds, Properties, Productions, Preparations, and Uſes, of Things NATURAL and ARTIFICIAL;
The Riſe, Progreſs, and State of Things ECCLESIASTICAL, CIVIL, MILITARY, and COMMERCIAL:
With the ſeveral Syſtems, Sects, Opinions, &c. among Philoſophers, Divines, Mathematicians, Phyſicians, Antiquaries, Criticks, &c.

The Whole intended as a Courſe of Antient and Modern LEARNING.

Compiled from the beſt Authors, Dictionaries, Journals, Memoirs, Tranſactions, Ephemerides, &c. in ſeveral Languages.

In TWO VOLUMES.

By E. CHAMBERS Gent.

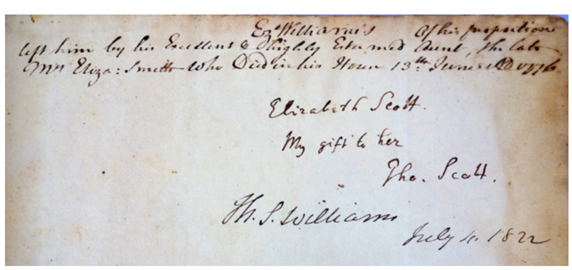
Floriferis ut apes in ſaltibus omnia libant,
Omnia nos——————LUCRET.

VOLUME the FIRST.

LONDON:
Printed for *James* and *John Knapton, John Darby, Daniel Midwinter, Arthur Bettesworth, John Senex, Robert Goſling, John Pemberton, William* and *John Innys, John Osborn* and *Tho. Longman, Charles Rivington, John Hooke, Ranew Robinſon, Francis Clay, Aaron Ward, Edward Symon, Daniel Browne, Andrew Johnſon,* and *Thomas Osborn.* M.DCC.XXVIII.

was published by subscription and appeared in 1728 in two folio volumes . . . It cost four guineas, was dedicated to the king, and opened with an elaborate preface explaining the plan of the work, and attempting a classification of knowledge. Partly adapted from the work of [French encyclopedists] Louis Moreri and Pierre Bayle, it introduced cross-references, which proved indispensable to every subsequent lexicographer. Because of this, combined with inclusion of more of the humanities, Chambers's work became the first true general encyclopaedia" (*Oxford Dictionary of National Biography*). Chambers's *Cyclopaedia* directly influenced Diderot and d'Alembert's famous *Encyclopédie* (which was originally planned as a translation of the *Cyclopaedia*), as well as the *Britannica*. "Thanks to [Chambers's] editorial accomplishments the *Cyclopaedia* was revised, translated, and imitated throughout the 18th century" (*Printing and the Mind of Man* 171).

The *Cyclopaedia* had 375 subscribers who purchased a total of 399 copies; the print run was probably 500 to 600 copies. It is likely that the remaining copies took nearly a decade to sell, as an "Addenda to the First Edition" was printed by Charles Akers in September 1738, ten years after the *Cyclopaedia*'s publication. The "Addenda" is found bound in some copies (not this one), but the *Cyclopaedia* was obviously originally sold without it. The second edition of the *Cyclopaedia* was published in November 1738 (two months after the appearance of the "Addenda"), and subsequent editions appeared in 1739, 1741 and 1743. 43242



One of the Greatest 16th-Century Illustrated Medical Books

11. Croce, Giovanni Andrea della (1514–75). Cirugia universale e perfetta . . . Folio. [8], 100, 109, [1, blank], 59, [1, blank], 13, 54, 24, 41, [1, blank], 35, [1, colophon]ff. Numerous woodcut illustrations of surgical instruments and operations. Venice: Giordano Ziletti, 1583. 287 x 198 mm. Old vellum, title hand-lettered on spine, hinges cracking, a few stains. First and last few leaves frayed, some marginal worming (not affecting text), marginal repairs to two leaves, outer margins of a few larger illustrations trimmed, some staining. Good copy. "Ex libris Sebastiani Cremona" in early hand on title; 20th century bookplate. $4500

Second edition in Italian (first Italian edition 1574; first Latin edition 1573). One of the most important iconographic sources on early surgical instruments, and one of the great illustrated medical books of the sixteenth century, showing in about five hundred woodcut figures nearly all of the best known and most frequently used surgical instruments from antiquity to the time of publication. Kirkup, in his *Evolution of Surgical Instruments*, notes Croce's descriptions and illustrations of amputation knives, cylindrical saws, surgical scissors, venesection instruments and instruments for extracting foreign bodies.

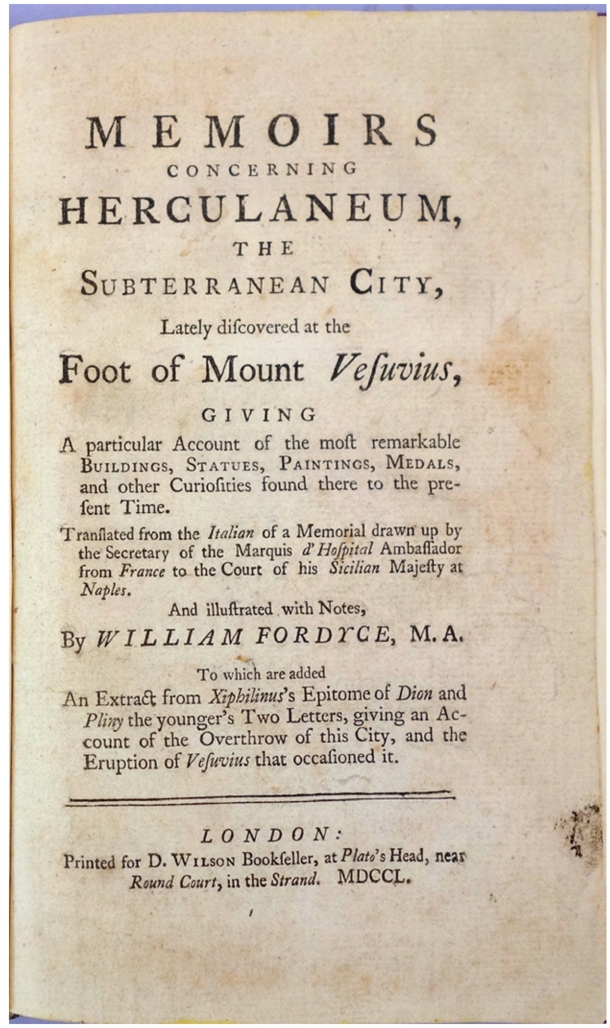
CIRVGIA
VNIVERSALE
E PERFETTA
Di tutte le parti pertinenti all'ottimo Chirurgo.
DI GIO. ANDREA DALLA CROCE
MEDICO VINITIANO.
NELLAQVALE SI CONTIENE LA THEORICA,
& Prattica di ciò che può essere nella Cirugia necessario: come
più ampiamente nel Sommario si dichiara.
Di nuouo con li dissegni di tutti gl'istromenti antichi & moderni
in tal'arte necessarij, posta in luce.
CON LA TAVOLA DE' CAPITOLI
DI CIASCVN LIBRO.
CON PRIVILEGIO.
IN VENETIA,
Presso Giordano Ziletti. MDLXXXIII.

Three half-page illustrations show surgery of the head in progress; these are the first illustrations to show the stages of such an operation, and the typical room in which it was carried out—at home in a canopied bed with family, servants, cats, dogs and rats attending the surgeon. Croce improved the trephine; his descriptions of cranial and cerebral disease are important.

Croce also gave excellent recommendations for wound management, and commented extensively on gunshot wounds. Two full-page woodcuts show battlefield operations; Croce was one of the most successful surgeons in Venice during years of warfare with the Turks. First published in Latin in 1573, Croce's surgical treatise went through several Latin and Italian editions in the 16th and 17th centuries, and was translated into German. Garrison-Morton 4850.4 (1573 Latin edition). 43240

The First Book in English on Herculaneum

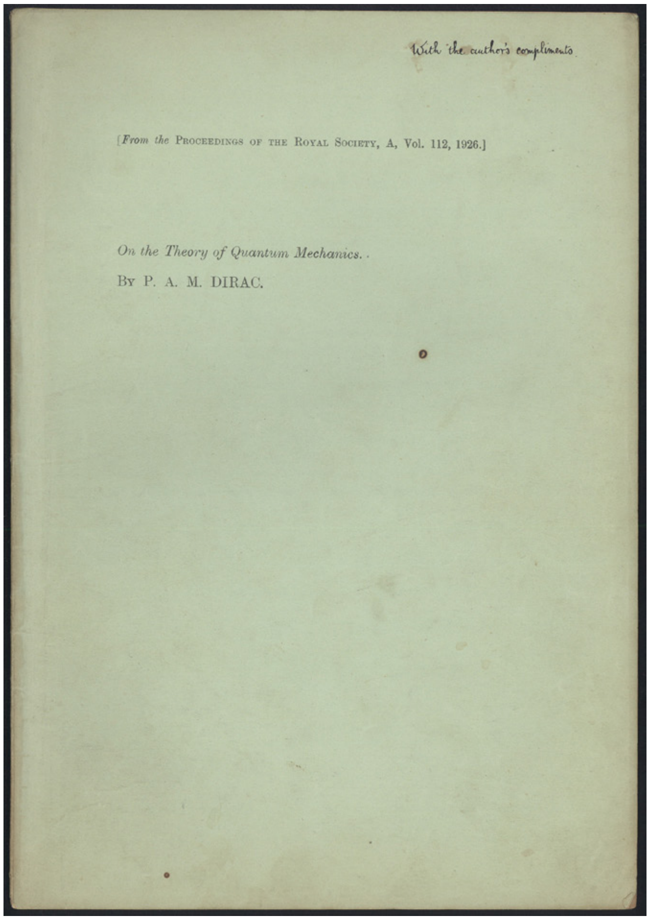
12. [D'Arthenay, Guillaume Marie.] Fordyce, William (translator and editor). Memoirs concerning Herculaneum, the subterranean city, lately discovered at the foot of Mount Vesuvius . . . 8vo. 4, 68pp. London: Printed for D. Wilson, 1750. 202 x 123 mm. Modern full morocco, gilt-lettered front cover. Minor dampstaining and toning, small spot on title, but very good. $1250



First Edition in English of d'Arthenay's *Mémoire sur la ville souterraine découverte au pied du Mont Vésuve* (1748), and the first separate publication in English on the then-recently discovered lost city of Herculaneum, the ancient Roman city buried in ash during the eruption of Mt. Vesuvius in 79 A.D.

D'Arthenay's pamphlet is one of the early unauthorized memoirs on the official excavation of Herculaneum, which had begun in 1738 under the patronage of King Charles VII of Naples. The Neapolitan government, anxious to prevent theft and to exploit the site's prestige value, severely restricted access to the buried city to all but its own hired scholars and prohibited the publication of any unauthorized descriptions, so despite intense international interest in the site only a few scattered reports of the excavation's findings leaked out over the following decade. The "Secret of Herculaneum" proved to be too big to keep, however, and starting in the late 1740s a number of unauthorized works on Herculaneum began to be published, written both by Neapolitan scholars and by foreigners such as D'Arthenay, a volcanologist and amateur antiquarian who was then serving as secretary to the French ambassador at Naples.

Fordyce, a Scotsman about whom little else is known, was inspired to make his translation of d'Arthenay's work after visiting Herculaneum in 1749 and "examining the Curiosities they had found there." Fordyce's *Memoir*, which also includes Xiphilinus's and Pliny's accounts of Vesuvius's eruption, appears to be just the second work in English on Herculaneum, preceded only by Allan Ramsay's translations of letters from the Italian painter Camillo Paderni published in the *Philosophical Transactions* in 1740. *Edinburgh History of the Book in Scotland, vol. 2: Enlightenment and Expansion* (2011). Gordon, "Subverting the secret of Herculaneum: Archaeological espionage in the Kingdom of Naples," in Coates and Seydl, eds., *Antiquity Recovered: The Legacy of Pompeii and Herculaneum* (2007), pp. 37-57. 43269



Derivation of Fermi-Dirac Statistics—Presentation Copy

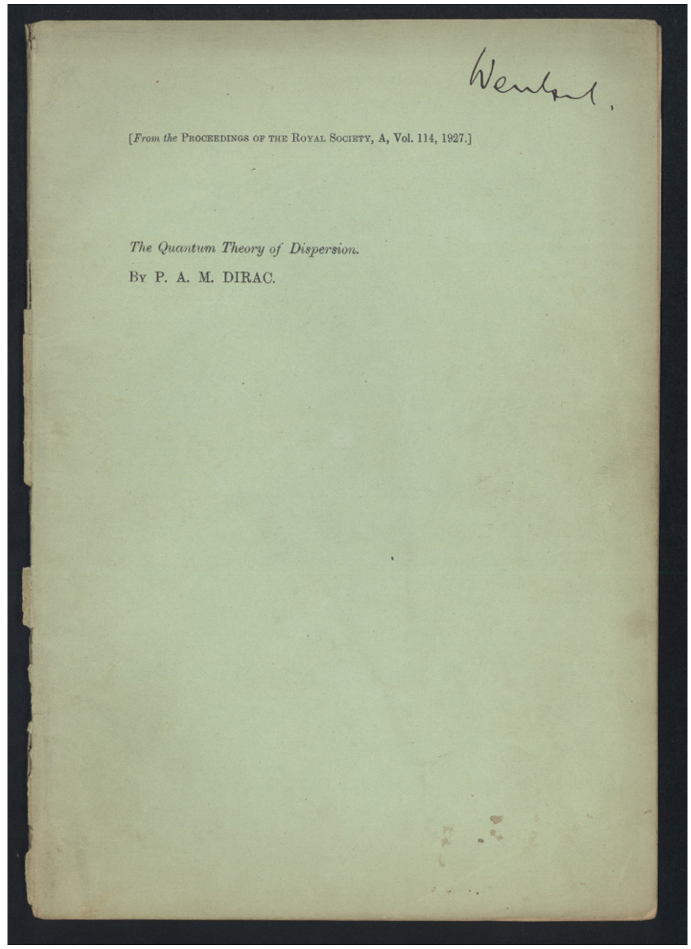
13. Dirac, Paul A. M. (1902-84). On the theory of quantum mechanics. Offprint from *Proceedings of the Royal Society* A, 112 (1926). 661-677pp. 254 x 179 mm. Original printed wrappers, light soiling, two small burn-holes in front wrapper (not affecting text). *Presentation Copy, inscribed by Dirac* on the front wrapper: "With the author's compliments." $7500

First Edition, Offprint Issue of Dirac's paper introducing his derivation of what is now called Fermi-Dirac statistics, which describes a distribution of particles (now known as fermions, a name coined by Dirac in 1945) in certain systems containing many identical particles that obey the Pauli exclusion principle—meaning that no two of the particles can occupy the same quantum state simultaneously. Dirac's paper was the first in which he applied Schrödinger's wave mechanics. The paper

> will be remembered as the first in which quantum mechanics is brought to bear on statistical mechanics. Recall that the earliest work on quantum statistics, by Bose and by Einstein, predates quantum mechanics. Also, Fermi's introduction of the exclusion principle in statistical problems, though published after the arrival of quantum mechanics, is still executed in the context of the "old" quantum theory. All these contributions were given their quantum mechanical underpinnings by Dirac, who was, in fact, the first to give the correct justification of Planck's law, which started it all (Pais, p. 6).

As indicated in the above citation, Dirac and Enrico Fermi discovered Fermi-Dirac statistics independently of one another. Several months before the appearance of Dirac's paper, Fermi had published his own in which he applied Pauli's exclusion principle to his theory of an ideal gas. "When he was asked about it several decades later, [Dirac] remarked: 'I had read Fermi's paper on Fermi statistics and had forgotten it completely. When I wrote my work on the anti-symmetric wave functions, I did not refer to it at all. Then Fermi wrote and told me and I remembered that I had previously read about it' . . . Fermi's letter had the effect that Dirac later on never forgot to mention the priority of his Italian colleague when referring to the statistics obeyed by electrons and the like. In spite of this admitted priority of Fermi **it was essentially Dirac's paper that helped the physicists tremendously in understanding the meaning of the new statistical methods** [emphasis ours]" (Mehra & Rechenberg, *The Historical Development of Quantum Theory*, 5, p. 767). Dirac's paper "is justly seen as a major contribution to quantum theory" (Kragh, *Dirac: A Scientific Biography*, p. 36). Pais, "Paul Dirac: Aspects of his life and work," in *Paul Dirac: The Man and his Work*, ed. P. Goddard, pp. 1-45. 43258

Quantum Theory of Dispersion-- One of the Foundations of Quantum Electrodynamics

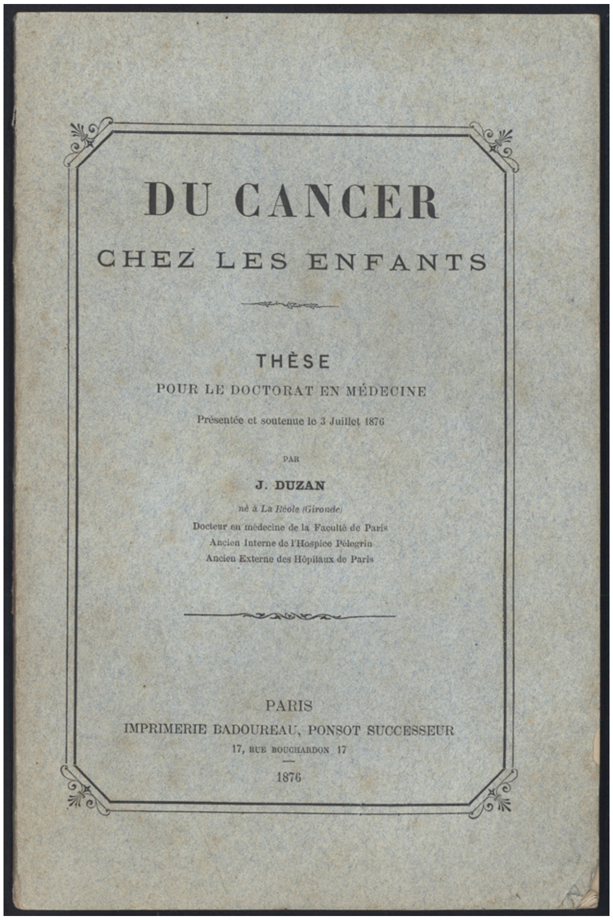


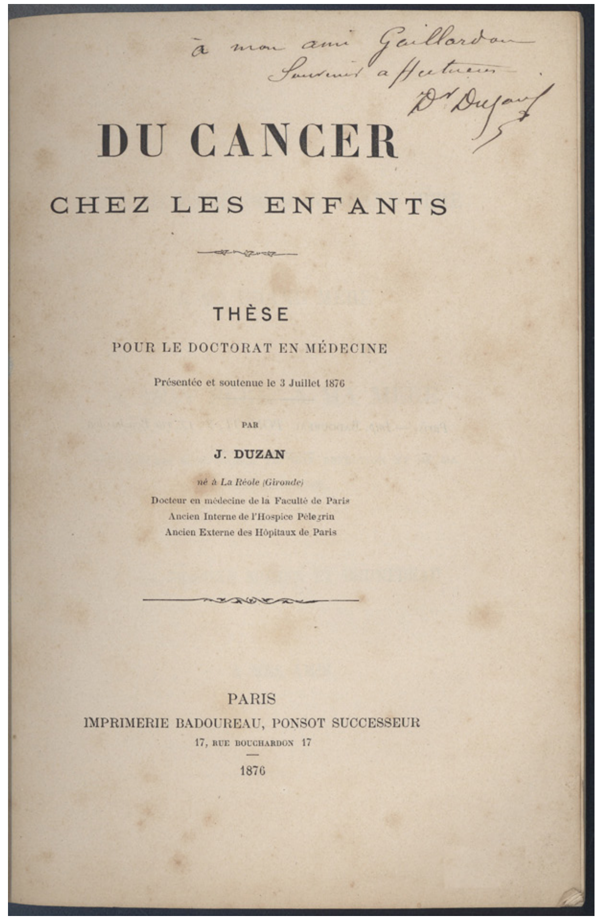
14. Dirac, Paul A. M. (1902-84). The quantum theory of dispersion. Offprint from *Proceedings of the Royal Society*, A, 114 (1927). 710-728pp. Original printed wrappers, lower two-thirds of spine split, light soiling. Light toning but very good. From the library of physicist Gregor Wentzel (1898-1978), with his signature on the front wrapper.

$5000

First Edition, Offprint Issue. "Dirac presented a complete theory of dispersion [the scattering of a photon by an electron], including derivations of the Kramers-Heisenberg formula and the Thomson formula for scattering of radiation by atoms. He was also able to treat the case of resonance, which theretofore had eluded quantum radiation theory . . . Dirac's publications on quantum electrodynamics in 1927 completed the scheme of quantum mechanics. At the same time, they initiated a new field of research that soon was to move to the forefront of theoretical physics" (Kragh, *Dirac: A Scientific Biography*, pp. 125-127). This is the second of Dirac's two 1927 papers (the first being "The quantum theory of the emission and absorption of radiation") in which Dirac "laid the foundations of quantum electrodynamics" (Pais, p. 7).

This copy of the offprint of Dirac's paper is from the library of theoretical physicist Gregor Wentzel, who was also involved in the development of quantum mechanics in the 1920s. In 1960 Wentzel described the effect of Dirac's two 1927 papers as follows: "Today the novelty and boldness of Dirac's approach to the radiation problem may be hard to appreciate . . . Dirac's explanation in terms of the quantized vector potential came as a revelation" (quoted in Kragh, p. 126). Pais, "Paul Dirac: Aspects of his life and work," in *Paul Dirac: The Man and his Work*, ed. P. Goddard, pp. 1-45. 43261

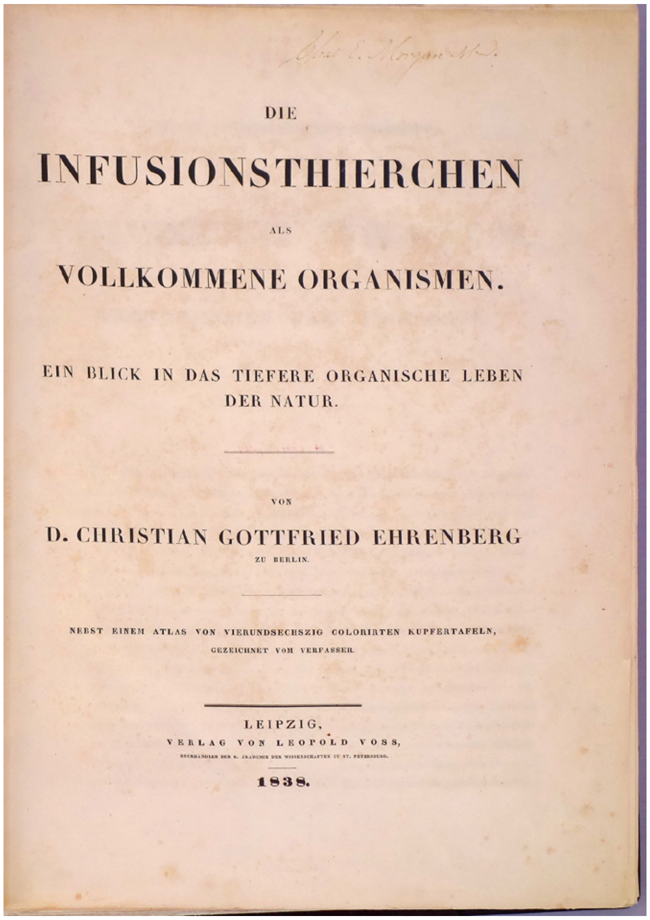




First Collected Report on Childhood Cancer

15. Duzan, J. Du cancer chez les enfants. Thèse pour le doctorat en médecine. [4], iv, 70pp. Paris: Imprimerie Badoureau, 1876. 238 x 157 mm. Original printed wrappers, a little worn and spotted. Corner of one leaf torn not affecting text, but very good. *Presentation Copy, inscribed by Duzan* on the title: "A mon ami Gaillardan Souvenir affectueux Dr. Duzan." $1250

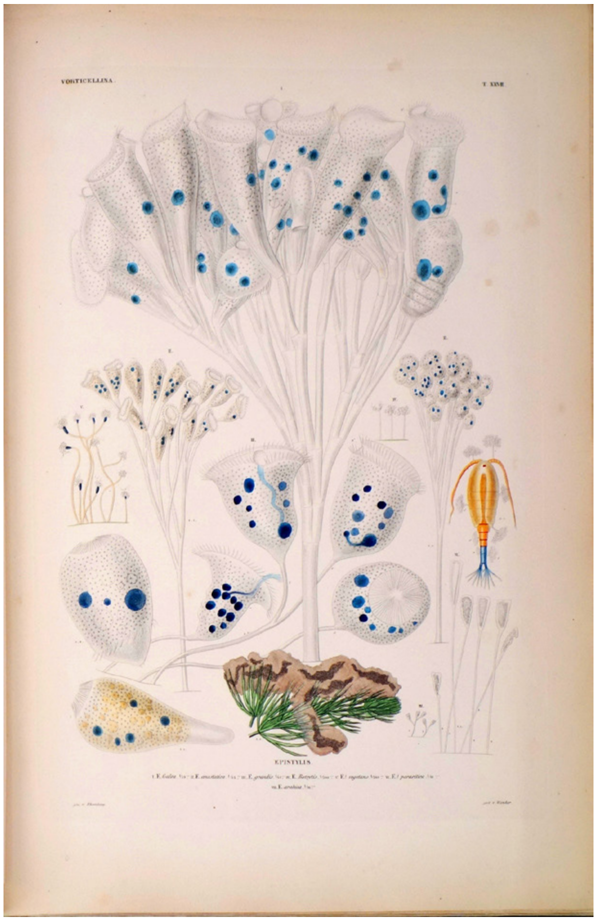
First Edition of the **First Collected Report on Childhood Cancer.** "Before the thesis of Duzan (1876), there was no collected report of the forms of cancer occurring in childhood. Lebert (1851) mentions them in his work upon malignant diseases, but out of 471 cases notes only 15 as belonging to childhood. This, however, directed the attention of authors to the subject, and Duzan was able to collect 182 cases" (*American Journal of Obstetrics and Diseases of Women and Children* 17 [1884]: 333). All 182 cases were of pediatric sarcoma: 70 of the eye, 45 of the kidney, 11 of the testicle, 8 of the prostate, and the remainder divided among the bones, tongue, abdomen, brain and dura mater, lung, pancreas, liver, tonsils, rectum and stomach. Oddly, Duzan's thesis is not noted in our printed histories of cancer or of pediatrics. Rodman, "The influence of age, sex and race in surgical affections," *Journal of the American Medical Association* 31 (1898): 491–503; Duzan's thesis is cited on p. 493. 43170

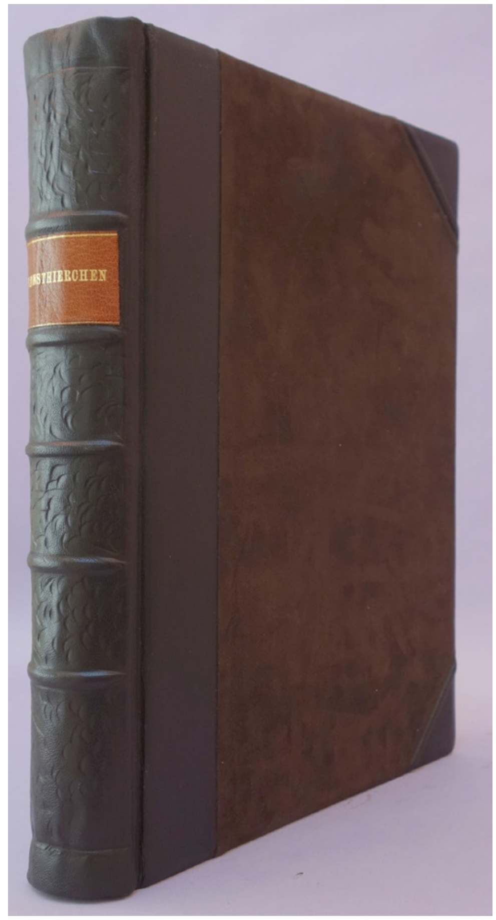

DIE
INFUSIONSTHIERCHEN
ALS
VOLLKOMMENE ORGANISMEN.
EIN BLICK IN DAS TIEFERE ORGANISCHE LEBEN DER NATUR.
VON
D. CHRISTIAN GOTTFRIED EHRENBERG
ZU BERLIN.
NEBST EINEM ATLAS VON VIERUNDSECHSZIG COLORIRTEN KUPFERTAFELN, GEZEICHNET VOM VERFASSER.
LEIPZIG,
VERLAG VON LEOPOLD VOSS,
1838.

Strikingly Beautiful Treatise on Bacteriology and Protozoology

16. Ehrenberg, Christian Gottfried (1795-1976). Die Infusionsthierchen als vollkommene Organismen. 2 vols. in 1, large folio. xviii, [4], 547, [1]pp. [Text]; engraved title and 64 hand-colored engraved plates after Ehrenberg's drawings [atlas]. Leipzig: Leopold Voss, 1838. 462 x 330 mm. Modern half morocco, reverse morocco boards. Faint occasional foxing on plates, small marginal tear in one plate unobtrusively repaired, but a very good copy. 19th century ownership signature of Chas. E. Morgan M.D. $7500

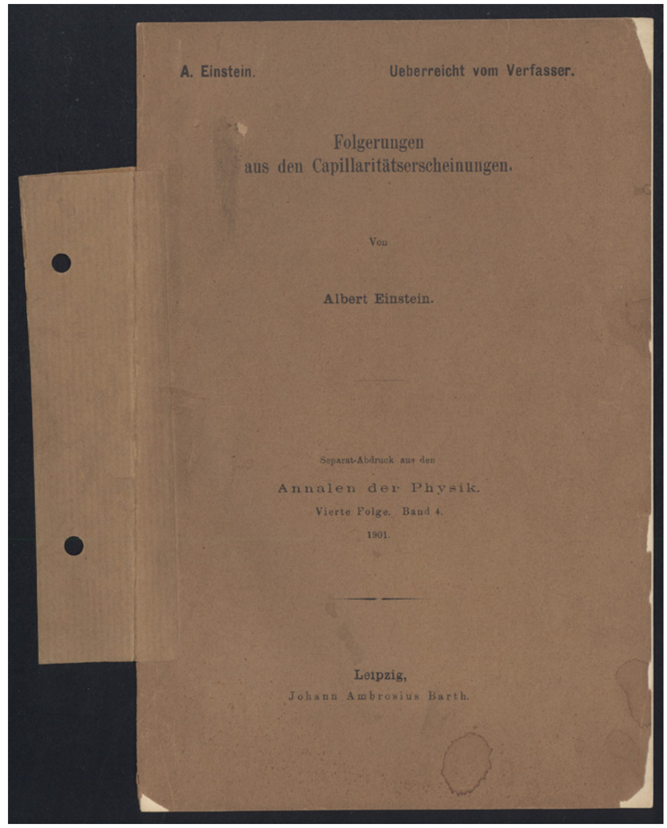
First Edition. Ehrenberg's monumental treatise on microscopic organisms (Infusoria), with beautiful hand-colored illustrations after his own drawings, is one of the foundation works of bacteriology and protozoology. The class of Infusoria, as defined by Cuvier, consisted of an eclectic group of organisms including bacteria, all single-celled animals, many-celled rotatoria and several worms. Ehrenberg was the first to make a systematic study of these creatures, taking advantage of recent improvements in microscopy that for the first time permitted the construction of high-power microscopes. "The famous pictures of the microscopic sea creatures





that he drew, engraved with subtle coloring and fine detail, captured the imagination of scientists, artists and architects as well as the general public. His descriptions of the infusoria incited lively discussions among botanists, zoologists, and paleontologists. They pondered the true nature of the infusoria and how they ought to be classified" (Sapp, *The New Foundations of Evolution,* p. 18). Ehrenberg believed that all animals, no matter how small, possessed all of the important organs of life such as nervous and circulatory systems, digestive and sexual organs, etc. He carried out a pioneering series of experiments using electricity to ascertain the nervous capacity of echinoderms and medusae, and explored the structure of digestive organs in infusoria using food colored with indigo or carmine. "Ehrenberg did not yet separate the many-celled animals from the single-celled ones, a concept that became current in systematic zoology only after 1850; rather, he believed that he could demonstrate the presence of complete organ systems in single-celled animals. This was for him an important argument against spontaneous generation and the 'chain of being'" (*Dictionary of Scientific Biography*). It was through Ehrenberg's writings that Charles Darwin learned of the extremely high reproductive rate of protozoa; see Mayr, *Growth of Biological Thought*, p. 482. Garrison-Morton 111. 43184

Rare Offprint of Einstein's First Published Paper



17. Einstein, Albert (1879-1955). Folgerung aus den Capillaritätserscheinungen. Offprint from *Annalen der Physik*, 4th series, 4 (1901). 513-523pp. 222 x 146 mm. Original printed wrappers, a little chipped and stained, front hinge tender, tab extension with punched holes pasted to spine. Very good. $4500

First Edition, Extremely Rare Offprint Issue of Einstein's first published paper, on the thermodynamics of liquid surfaces, which Einstein completed in December 1900. In both this and his second published paper (1902), "Einstein was looking for experimental support for a hypothesis concerning molecular forces. Making an analogy with gravitation, he conjectured that the potential between two molecules of species i and j is of the form $c_i c_j \phi(r)$, where the c's are characteristic for the species and $\phi(r)$ is a universal function of distance" (Pais, *Subtle is the Lord*, p. 56). Einstein's hypothesis was incorrect, and he later condemned this paper as "worthless"; however, Einstein's biographer Abraham Pais characterized this and Einstein's other pre-1905 papers as "important warming-up exercises in Einstein's own development" (Pais, p. 18).

The rarity of this offprint is very great as Einstein was unknown at the time, and recipients would have been less inclined to save his papers published before 1905. Shields, "Writings of Albert Einstein" (in *Albert Einstein: Philosopher-Scientist* [1948], pp. 689-758), no. 1. Weil, *Albert Einstein: A Bibliography,* no. 1. 43214

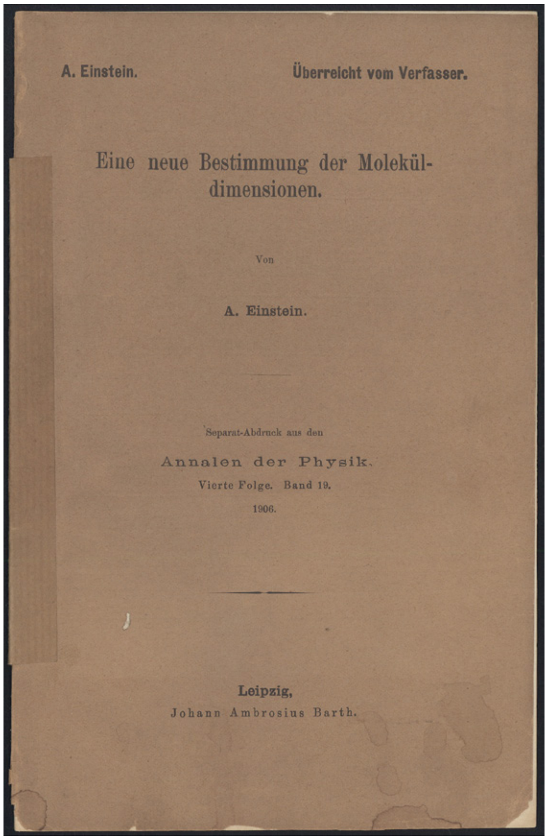
Einstein's Doctoral Thesis

18. Einstein, Albert (1879-1955). Eine neue Bestimmung der Moleküldimensionen. Offprint from *Annalen der Physik*, 4th series, 19 (1906). 224 x 145 mm. Original printed wrappers, a bit chipped and stained, small split in spine, extension tab punched with holes pasted to spine. Very good copy. $6000

First Edition, Rare Offprint Issue of the expanded version of Einstein's doctoral thesis, ranked by his biographer as being on the same level as his 1905 papers on relativity, the light quanta and Brownian motion. In his thesis Einstein presented a new theoretical method for determining molecular radii and Avogadro's number (the number of atoms or molecules needed to make up a mass equal to a substance's atomic or molecular weight, in grams). The unexpanded version of the thesis was first published as a pamphlet in the spring of 1905. In the version he submitted to the Annlen der Physik, published at the beginning of 1906, Einstein added a brief appendix containing an improved value of Avogadro's number.

Einstein's biographer, Abraham Pais, wrote of Einstein's thesis as follows:

> It is not sufficiently realized that Einstein's thesis is one of his most fundamental papers. Histories and biographies invariably refer to 1905 as the miraculous year because of his article on relativity, the light-quantum, and Brownian motion. **In my opinion, the thesis is on a par with the Brownian motion article. In fact, in some—not**



all—respects, his results on Brownian motion are by-products of his thesis work (emphasis ours). This goes a long way toward explaining why the paper on Brownian motion was received by the Annalen der Physik on May 11, 1905, only eleven days after the thesis had been completed.

Three weeks after the thesis was accepted, this same journal received a copy [of the thesis] for publication. It was published only after Einstein supplied a brief addendum in January 1906. . . . As a result of these various delays, the thesis appeared as a paper in the Annalen der Physik only after the Brownian motion article had come out in the same journal. This may have helped create the impression in some quarters that the relation between diffusion and viscosity—a very important equation due to Einstein and Sutherland—was first obtained in Einstein's paper on Brownian motion. **Actually, it first appeared in his thesis** (emphasis ours). . . .

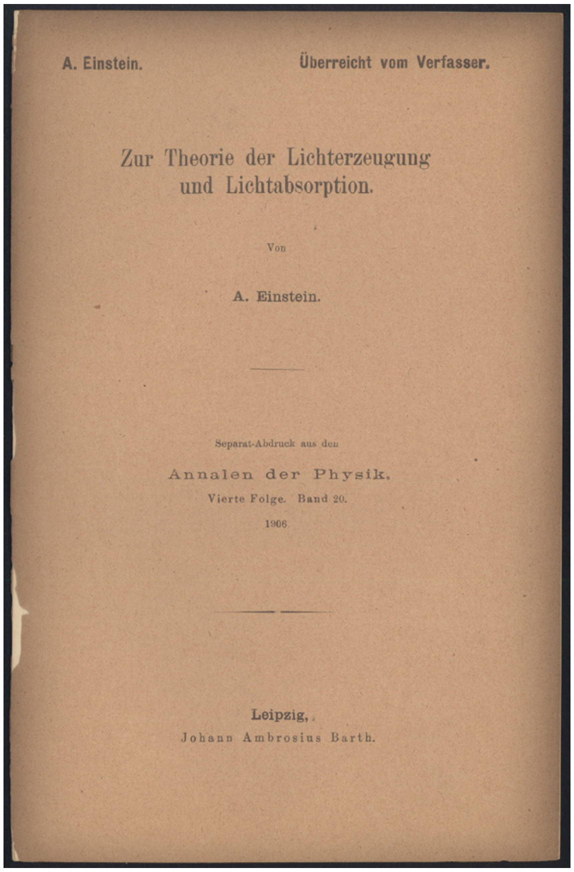
Quite apart from the fundamental nature of some results obtained in the thesis, there is another reason why this paper is of uncommon interest: **it has had more widespread practical applications than any other paper Einstein ever wrote** (emphasis ours). . . . [T]he thesis, dealing with bulk rheological properties of particle suspensions, contains results which have an extraordinarily wide range of applications. They are relevant to the construction industry (the motion of sand particles in cement mixes), to the dairy industry (the motion of casein micelles in cow's milk), and to ecology (the motion of aerosol particles in clouds), to mention but a few scattered examples. Einstein might have enjoyed hearing this, since he was quite fond of applying physics to practical situations (Pais, *Subtle is the Lord*, pp. 89-90).

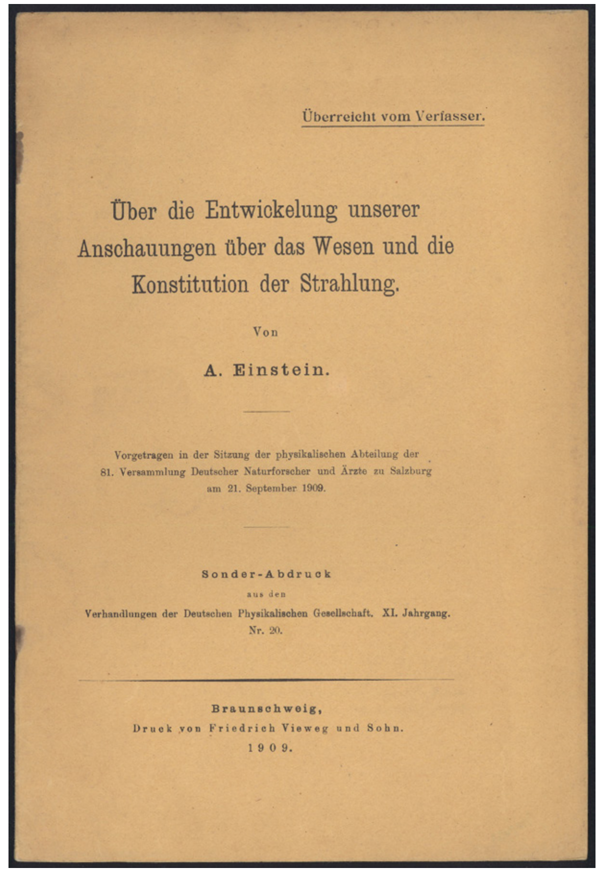
Pais notes that during the period 1970-1974, the 1906 expanded version of Einstein's thesis was cited four times more often than his 1916 paper on general relativity, and eight times more often than his 1905 paper on light quanta. Boni 6.1. Shields, "Writings of Albert Einstein" (in *Albert Einstein: Philosopher-Scientist [*1948], pp. 689-758), no. 11. Weil, *Albert Einstein: A Bibliography,* 7a. 43219

Einstein on Light Quanta

19. Einstein, Albert (1879-1955). Zur Theorie der Lichterzeugung und Lichtabsorption. Offprint from *Annalen der Physik*, 4th series, 20 (1906). 199-206pp. 222 x 144 mm. Original printed wrappers, "Überreicht vom Verfasser" printed in the upper right corner, a little chipped and sunned, spine partly split. Very good. $9500

First Edition, Rare Offprint Issue. The brilliant follow-up to Einstein's landmark 1905 paper on the photoelectric effect. In the 1905 paper Einstein had explained the photoelectric effect—the emission of electrons from a metal when irradiated by light—by making the revolutionary proposal that light, rather than consisting of continuous waves, was instead made up of discrete particles of energy ("light quanta"), which transferred their entire payload of energy to an electron on impact. In the 1905 paper Einstein made use of Planck's mathematical formula for blackbody radiation, which had introduced the concept of energy quanta, but he was only able to derive part of the formula. In his 1906 paper Einstein "used his statistical mechanics to demonstrate that when light interacts with matter, Planck's **entire formula can arise only from the existence of light quanta—not from waves**" (Cassidy; emphasis ours). Einstein had realized, as he stated in the present paper, that "'Planck's theory makes implicit use of the . . . light-quantum hypothesis' . . . his acceptance of Planck's [formula], albeit as a hypothesis, led to a major advance in his own work" (Pais, *Subtle is the Lord,* p. 378). In 1921



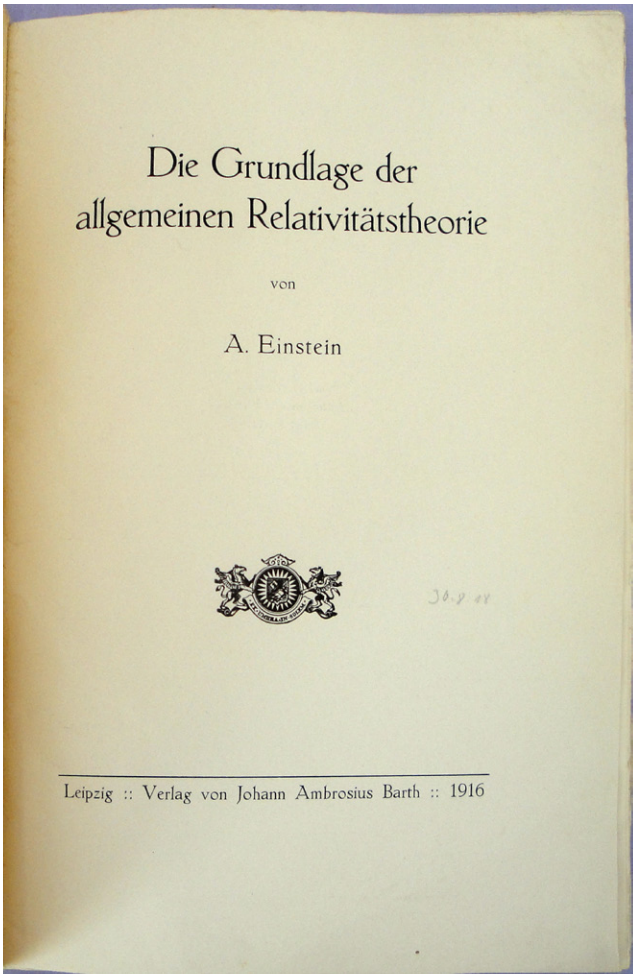


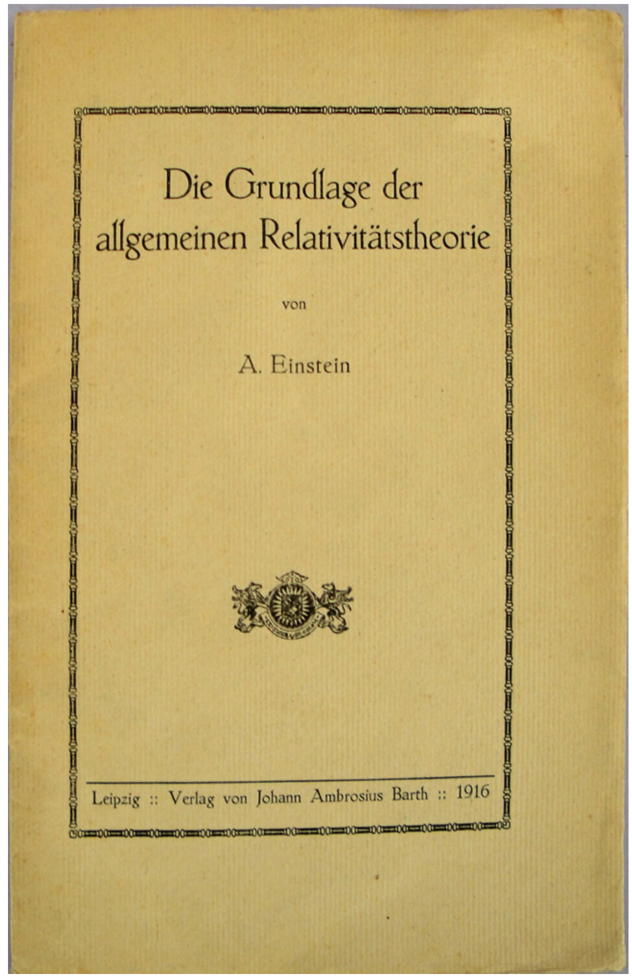
Einstein was awarded the Nobel Prize in physics for his work on the photoelectric effect. Cassidy, David, "Einstein on the Photoelectric Effect." Einstein: Image and Impact. American Institute of Physics, n.d. Web. Accessed 09 July 2014. Shields, "Writings of Albert Einstein" (in *Albert Einstein: Philosopher-Scientist* [1948], pp. 689–758), no. 13; also included in Shields' "Chronological list of principal works" on p. 757. Weil, *Albert Einstein: A Bibliography*, no. *12. 43212

"One of the Landmarks in the Development of Theoretical Physics"

20. Einstein, Albert (1879-1955). Über die Entwickelung unserer Anschauungen über das Wesen und die Konstitution der Strahlung. Offprint from *Verhandlungen der Deutschen Physikalishcen Gesellschaft* 11 (1909). 482–500pp. 233 x 158 mm. Original printed wrappers, "Überricht vom Verfasser" printed in the upper corner. Fine. $7500

First Edition, Offprint Issue. The second of two "profound papers on radiation" (Pais, *Subtle is the Lord*, p. 402) that Einstein published in 1909, which Pais characterized as "Einstein's most important contributions in the period from 1908 to 1911" (Pais, p. 185). The papers summarized Einstein's views on the status of radiation theory, including his opinion that "the next phase in the development of theoretical physics will bring us a theory of light that can be interpreted as a kind of fusion of the wave and the emission theory" (quoted in Pais, p. 404); here Einstein anticipated the principle of complementarity, one of the fundamental principles of quantum mechanics. Pauli said of the present paper that it "can be considered as one of the landmarks in the development of theoretical physics" (quoted in Pais, p. 185). The paper, originally delivered in September 1909 as an address before the Gesellschaft Deutscher Naturforscher, was also published in the *Physikalische Zeitschrift* 10 (1909). **Extremely rare**. Shields, "Writings of Albert Einstein" (in *Albert Einstein: Philosopher-Scientist* [1948], pp. 689–758), no. 30. Weil 30. 43215

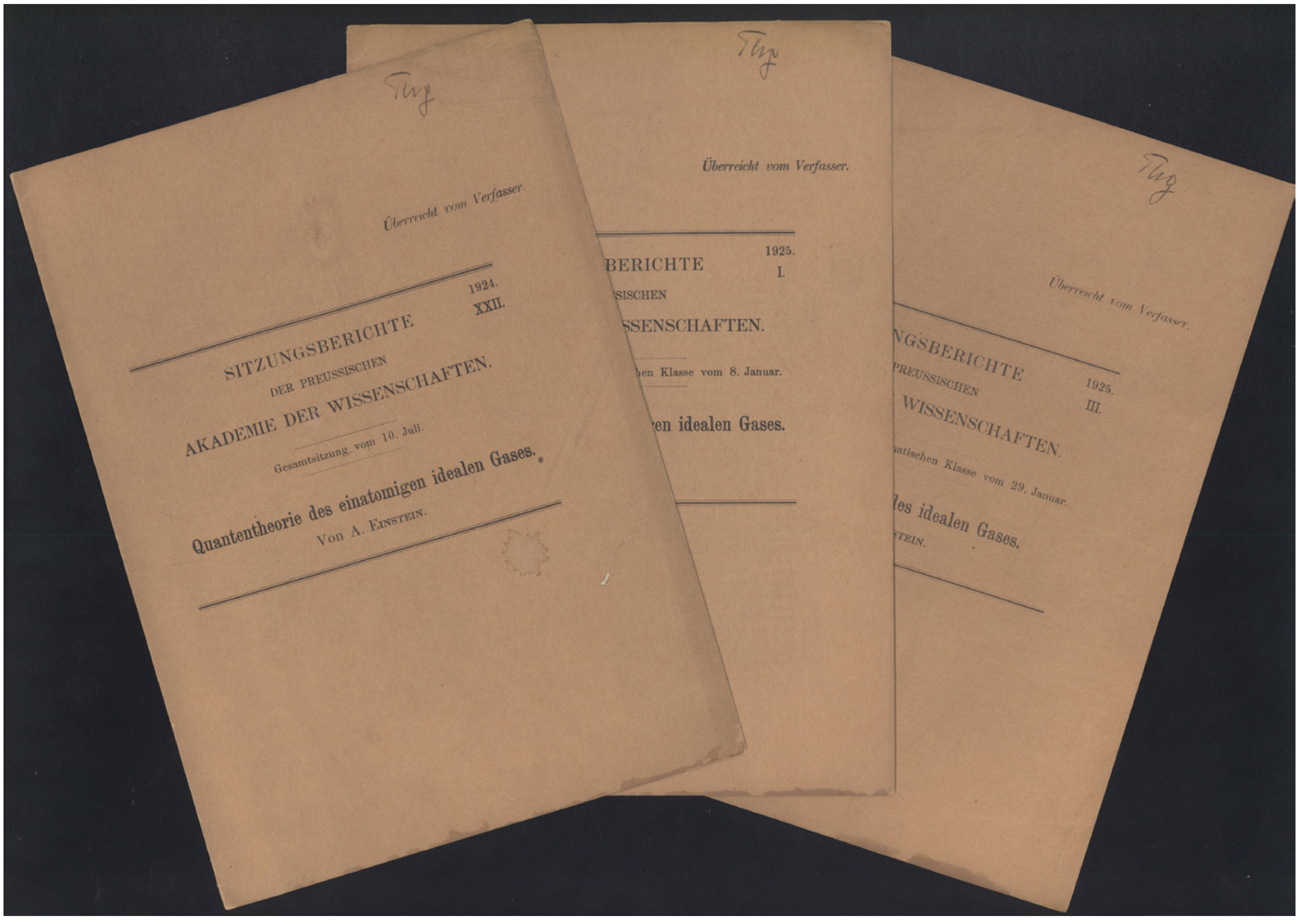




General Relativity

21. Einstein, Albert (1879-1955). Die Grundlage der allgemeinen Relativitätstheorie. 8vo. 64pp. Leipzig: J. A. Barth, 1916. 244 x 163 mm. Original buff wrappers, spine very skillfully repaired; preserved in a cloth drop-back box. Very good copy. $8500

First Separate Edition of Einstein's paper announcing his general theory of relativity. This is not an offprint of the journal issue in the *Annalen der Physik*, but a completely new setting of type with significant additions and revisions, including an introduction published here for the first time. "This separate edition is printed on good, strong paper, the wrappers are of strong material too, and it is described now as 'the original edition' of this classic paper" (Weil). *Printing and the Mind of Man* 408. Horblit 26c. Dibner 167. Weil 80a. Boni 78.1. 41457



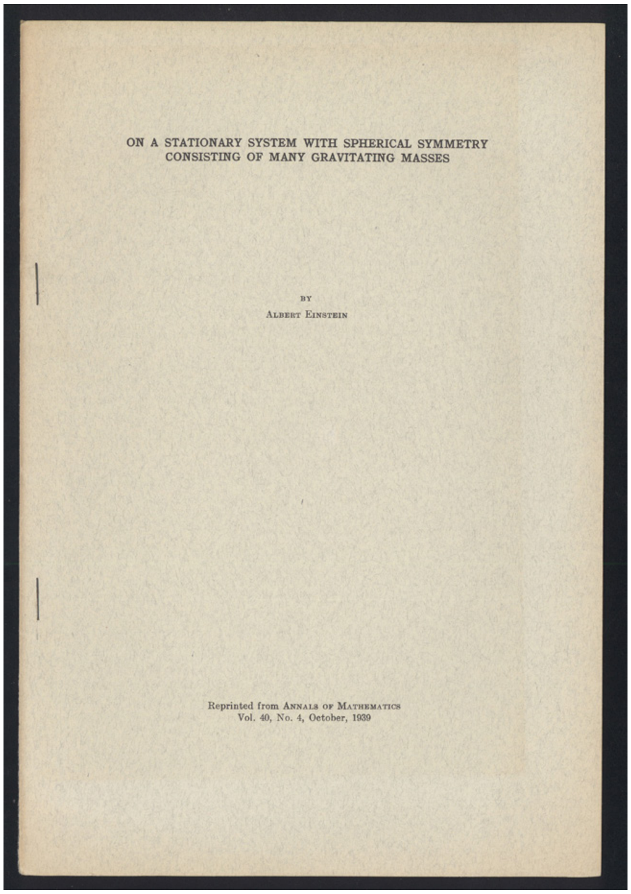
Bose-Einstein Statistics—Einstein's "Last Major Innovative Contribution to Physics"

22. Einstein, Albert (1879-1955). **(1)** Quantentheorie des einatomigen idealen Gases. Offprint from *Sitzungsberichte der Preussischen Akademie der Wissenschaften* 22 (1924). 261-267pp. **(2)** Quantentheorie des einatomigen idealen Gases. Zweite Abhandlung. Offprint from *Sitzungsberichte der Preussischen Akademie der Wissenschaften* 1 (1925). 3-14pp. **(3)** Zur Quantentheorie des idealen Gases. Offprint from *Sitzungsberichte der Preussischen Akademie der Wissenschaften* 3 (1925). 18-25pp. Together 3 items. 255 x 183 mm. Original printed wrappers, very slight soiling, tiny stains in lower margins. Very good to fine. Former owner's signature on front wrappers. $6000

First Editions, Offprint Issues of Einstein's three papers on the Bose-Einstein statistics, Einstein's "last major innovative contribution to physics" (Pais, *Subtle is the Lord*, p. 343), containing, among other things, Einstein's derivation of the Bose-Einstein condensate. Einstein wrote these papers after translating and publishing S. N. Bose's "Planck's law and the hypothesis of light quanta," which Bose had sent him from India in 1924. The Bose-Einstein statistics laid the foundation of quantum statistics; they mark the transition between the old quantum theory of Planck, Bohr and Einstein and the new quantum mechanics developed by Dirac, Schrödinger, Heisenberg and others.

> As long as Einstein lived, he never ceased to struggle with quantum physics. As far as his constructive contributions to this subject are concerned, they came to an end with a triple of papers, the first published in September 1924, the last two in early 1925. In the true Einsteinian style, their conclusions are once again reached by statistical methods, as was the case for all his important earlier contributions to the quantum theory. **The best-known result is his derivation of the Bose-Einstein condensation phenomenon** . . .

> After the papers by Bose and the first one by Einstein came out, Ehrenfest and others objected (so we read in Einstein's second paper) that "the quanta and molecules, respectively, are not treated as statistically independent, a fact



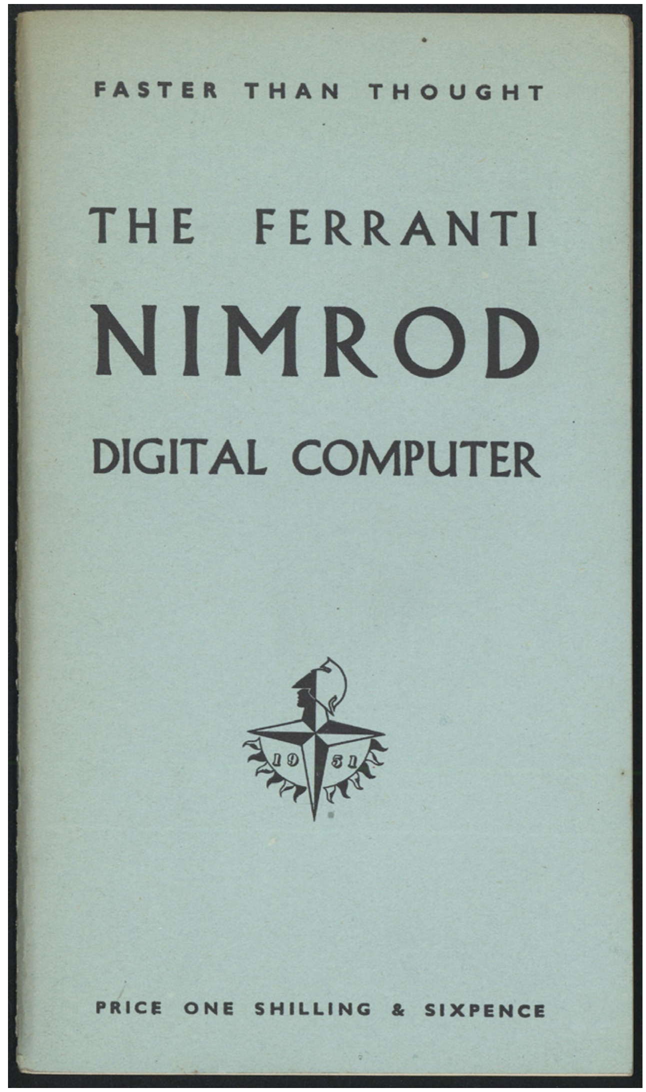
that is not particularly emphasized in our papers." Einstein replied, "This [objection] is entirely correct." He went on to stress that the differences between the Boltzmann and the BE counting "express indirectly a certain hypothesis on a mutual influence of the molecules which for the time being is of a quite mysterious nature." **With this remark, Einstein came to the very threshold of the quantum mechanics of identical particle systems** (Pais, pp. 428, 430; emphasis ours).

Shields, "Writings of Albert Einstein" (in *Albert Einstein: Philosopher-Scientist* [1948], pp. 689–758), nos. 185, 194, 195; nos. 185 and 194 also included in Shields' "Chronological list of principal works" on p. 757. Weil, *Albert Einstein: A Bibliography*, no. *142, *144, 145. 43216

23. Einstein, Albert (1879–1955). On a stationary system with spherical symmetry consisting of many gravitating masses. Offprint from *Annals of Mathematics* 40 (1939). 922–936pp. 251 x 176 mm. Original printed wrappers. Fine. $3750

First Edition, Offprint Issue. Einstein was philosophically opposed to the idea of "singularities"; that is, the possibility, as described by Schwartzschild in his "Über das Gravitationsfeld eines Massenpunktes nach der Einstein'schen Theorie" (1915), that "black hole"-type objects with large mass but infinitesimal volume can exist in nature. "His belief in the inadmissibility of singularities was so deeply rooted that it drove him to publish a paper purporting to show that 'the "Schwartzschild singularity" does not appear [in nature] for the reason that matter cannot be concentrated arbitrarily . . . because otherwise the constituting particles would reach the velocity of light'" (Pais, *Subtle is the Lord,* p. 289). Einstein's paper, "On a stationary system with spherical symmetry consisting of many gravitating masses," appeared two months before Oppenheimer and Snyder published their "On continual gravitational contraction" (1939), which marks the beginning of the modern theory of black holes. Shields, "Writings of Albert Einstein" (in *Albert Einstein: Philosopher-Scientist* [1948], pp. 689–758), no. 53; also included in Shields' "Chronological list of principal works" on p. 757. Weil, *Albert Einstein: A Bibliography*, no. *204. 43213

Ancestor of Nintendo, Xbox and PlayStation—The World's First Game-Playing Computer



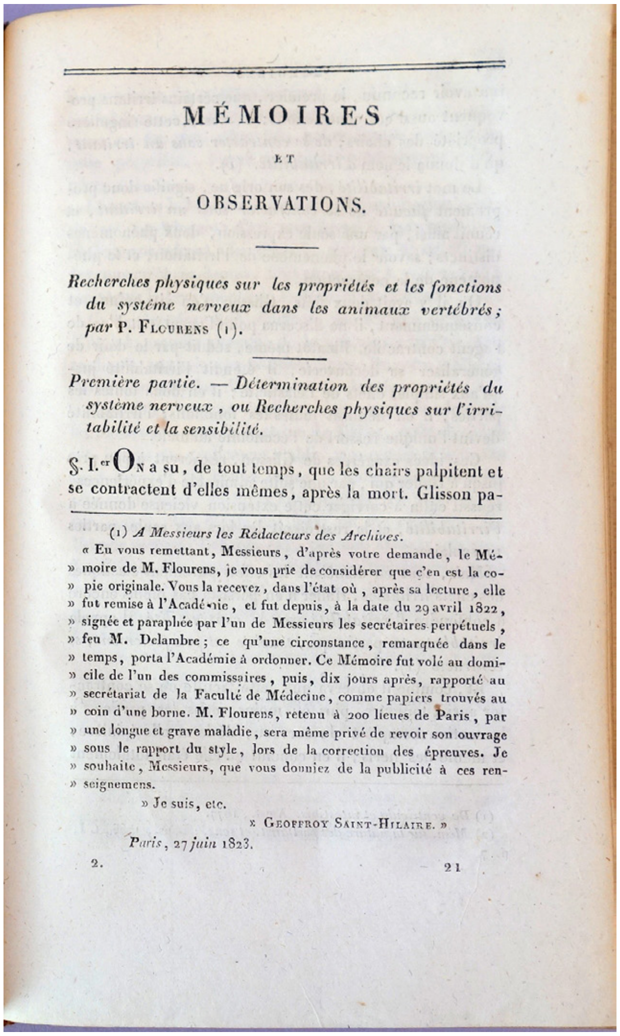
24. Ferranti Ltd. Faster than thought: The Ferranti Nimrod digital computer. 40pp. Hollinwood: Ferranti Ltd., [1951]. 180 x 106 mm. Original printed wrappers, very slight wear along spine. Fine copy. $4500

First Edition of the original guidebook to the **world's first game-playing digital computer**, a special-purpose computer called Nimrod designed to play the ancient logic-based game of Nim. Built by Ferranti Ltd. for exhibition at the 1951 Festival of Britain, the Nimrod was the first digital computer designed specifically to play a game, though its actual purpose was to illustrate the principles of electronic digital computers to the public at a time when almost no one had ever seen or interacted with these machines.

The Nimrod was conceived by Ferranti employee John M. Bennett, who received his doctorate in computing at Cambridge under Maurice Wilkes and later became Australia's first professor of computer science. Bennett's aim in designing the Nimrod was to highlight the mathematical capabilities of electronic digital computers.

> Indeed, the guide book produced to accompany the Nimrod, as the computer exhibit was named, was at pains to explain that it was maths, not fun, that was the machine's purpose: "It may appear that, in trying to make machines play games, we are wasting our time. This is not true as the theory of games is extremely complex and a machine that can play a complex game can also be programmed to carry out very complex practical problems."
>
> Work to create the Nimrod began on the 1st December 1950 with Ferranti engineer Raymond Stuart-Williams turning Bennett's designs into reality. By the 12th April 1951 the Nimrod was ready. It was a huge machine — 12 feet wide, 5 feet tall and 9 feet deep — but the actual computer running the game accounted for no more than 2 percent of its size. Instead the bulk of the machine was due to the multitude of vacuum tubes used to display lights, the electronic equivalent of the matches used in Nim.
>
> The resulting exhibit, which made its public debut on the 5th May 1951, boasted that the Nimrod was "faster than thought" and challenged the public to pit their wits against Ferranti's "electronic brain." The public was won over, but few showed any interest in the maths and science behind it. They just wanted to play (Tristan Donovan, R*eplay: The History of Video Games*, quoted in Baker).

The guidebook includes a brief history of the development of computing machines, as well as instructions for playing the computer game and a glossary of terms. Rare—not in *Origins of Cyberspace*. Baker, Chris, "Nimrod, the World's First Gaming Computer." Wired.com. Conde Nast Digital, 31 May 2010. Web. Accessed 20 Aug. 2014. 43249



MÉMOIRES

ET

OBSERVATIONS.

Recherches physiques sur les propriétés et les fonctions du système nerveux dans les animaux vertébrés; par P. Flourens (1).

Première partie. — Détermination des propriétés du système nerveux, ou Recherches physiques sur l'irritabilité et la sensibilité.

§. I.er On a su, de tout temps, que les chairs palpitent et se contractent d'elles mêmes, après la mort. Glisson pa-

(1) *A Messieurs les Rédacteurs des Archives.*

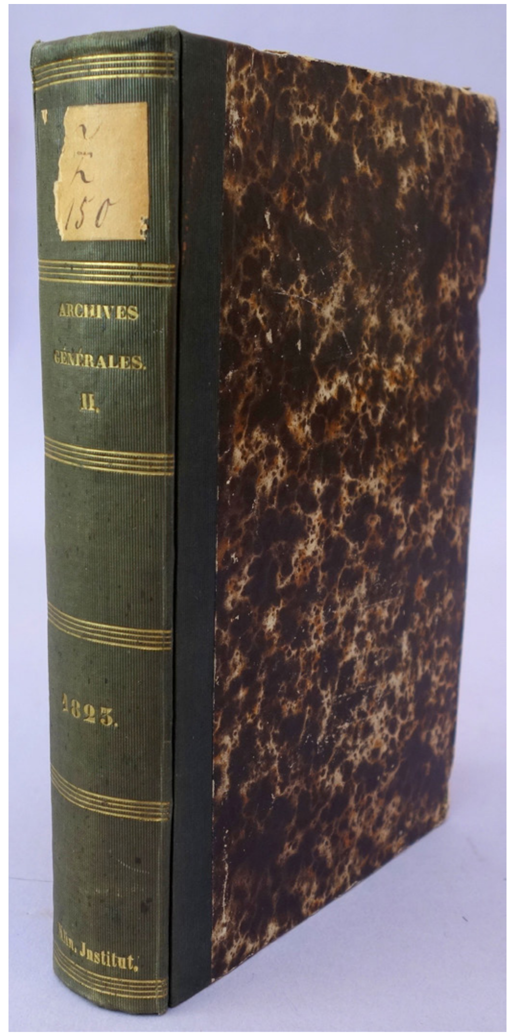
« En vous remettant, Messieurs, d'après votre demande, le Mémoire de M. Flourens, je vous prie de considérer que c'en est la copie originale. Vous la recevez, dans l'état où, après sa lecture, elle fut remise à l'Académie, et fut depuis, à la date du 29 avril 1822, signée et paraphée par l'un de Messieurs les secrétaires perpétuels, feu M. Delambre; ce qu'une circonstance, remarquée dans le temps, porta l'Académie à ordonner. Ce Mémoire fut volé au domicile de l'un des commissaires, puis, dix jours après, rapporté au secrétariat de la Faculté de Médecine, comme papiers trouvés au coin d'une borne. M. Flourens, retenu à 200 lieues de Paris, par une longue et grave maladie, sera même privé de revoir son ouvrage sous le rapport du style, lors de la correction des épreuves. Je souhaite, Messieurs, que vous donniez de la publicité à ces renseignemens.

» Je suis, etc.

« Geoffroy Saint-Hilaire. »

Paris, 27 *juin* 1823.

2. 21



Cerebral Function

25. Flourens, Pierre (1794-1867). Recherches physiques sur les propriétés et les fonctions du systême nerveux dans les animaux vertébrés. In *Archives générales de médecine* 2 (1823): 321-370. Whole volume. 647pp. 2 plates. 19th century quarter cloth, mottled boards, remains of library shelf-label on spine, minor edgewear. Stamps (some Nazi-era) of the Bibliothek des Med.-Klin. Institut, Munich on title, verso half-title and endpapers. $2750

First Edition, journal issue of Flourens' first paper on cerebral function. In an effort to refute Gall's theory of cerebral localization, Flourens carried out a famous series of experiments on pigeons in which he selectively removed either the cerebral lobes or the cerebellum in order to demonstrate their roles in brain physiology. The pigeons deprived of their cerebral lobes retained their sense of equilibrium, but lost all sense of volition and showed no sensory awareness of their surroundings; in contrast, those deprived of their cerebellums lost all ability to coordinate their muscular motions, but retained their ability to initiate movement and process sensory information. Flourens concluded from these experiments that the cerebral lobes were the seat of intelligence and perception while the faculty of muscular coordination resided in the cerebellum; however, he insisted that the entire brain acted as a whole with respect to each of its functions. Garrison-Morton 1391. Norman 803 (offprint issue). Clarke & O'Malley, *The Human Brain and Spinal Cord*, pp. 483-488; 656-660. 43262

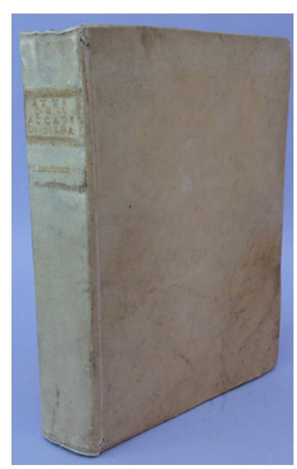
Fontana's Laws of Irritability—
First Publication

26. Fontana, Felice (1730-1805). De irritabilitatis legibus . . . In : *Atti dell'Accademia delle Scienze di Siena* 3 (1767): 205-31. Whole volume, 4to. viii, 317, [1], blank; 165, [3]pp. (A2, contents, bound at end). 19 folding plates. 264 x 192 mm. Contemporary vellum, gilt spine lettering, hinges repaired. Some dampstaining & light foxing, 1 or 2 minor tears but a very good copy. From the library of Walter Pagel (1898-1982), with his bibliographical note on pastedown & marker slips. 1 or 2 notes in a contemporary or 19th century hand laid in.

$2750

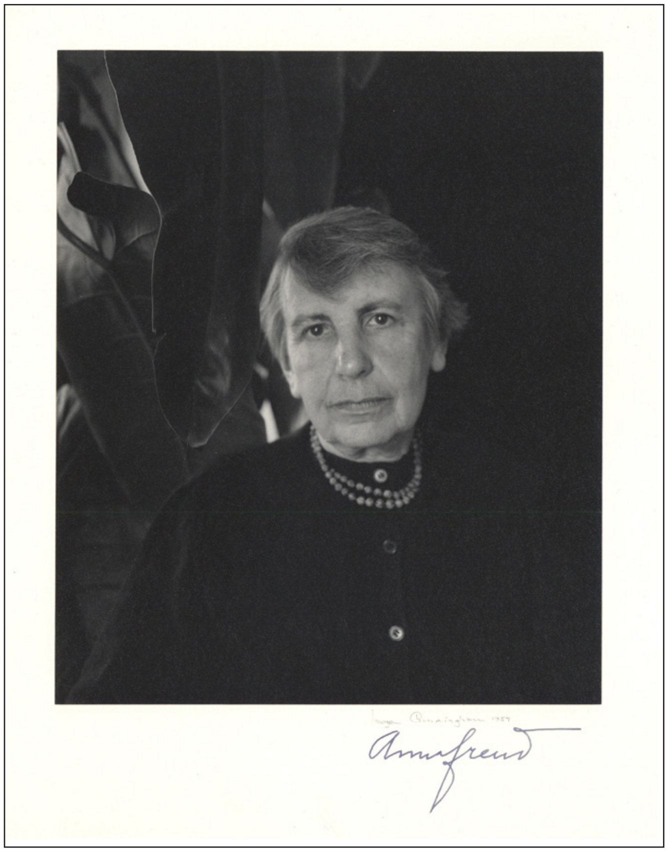
First Edition, journal issue, of the first publication of Fontana's laws of irritability, preceding the book-form edition published in Lucca the same year. Like his mentor Albrecht Haller, who had set forth the groundbreaking theory of "sensibility" and "irritability" in his *De partibus corporis humani sensibilibus et irritabilibus* (1752), Fontana used experimental evidence to show that irritability, or muscular contractility, was an intrinsic property of muscle tissue independent of the nerves; he also discovered the existence of the physiological refractory period, i.e., the amount of time it takes for an excitable membrane to be ready for a second stimulus after returning to its resting state. He used this evidence to vigorously denounce the traditional doctrine of "animal spirits," which medical writers from Galen to Boerhaave had used to explain both sensation and muscular motion. The work of Fontana and other followers of Haller "marked the onset of irreversible decline for the time-honored idea of animal spirit" (Smith et al., *The Animal Spirit Doctrine and the Origins of Neurophysiology*, p. 194) and introduced a new era of experimental neuromuscular physiology.

Fontana published his first three laws of irritability in the present paper, which includes a preface dated 1765; it is likely that he submitted his paper to the Siena Academy of Sciences in that year. "The first law concerned Haller's concept of contractility as a property of muscle fiber itself, and pointed out that a contraction follows only after some stimulus. The discussion displayed insight into the underlying nature of tetanic muscular contraction. The second principle was the refractory period discovered by Fontana in heart muscle and applied to better understanding of the function of other muscles. The original third principle was a disproof of the efficacy of a theoretical entity, the 'animal spirits'" (Marchand and Hoff, p. 202). Fontana followed this paper with an expanded book-form edition in which he added thee more laws.



The appendix to this volume of the *Atti* contains anatomical studies by Pietro Tabarrani (1702-80), the teacher of Paolo Mascagni. These are illustrated with 10 folding plates. Mascagni must have begun his studies at Siena shortly after this publication. In 1774 he succeeded to his teacher Tabarrani's chair.

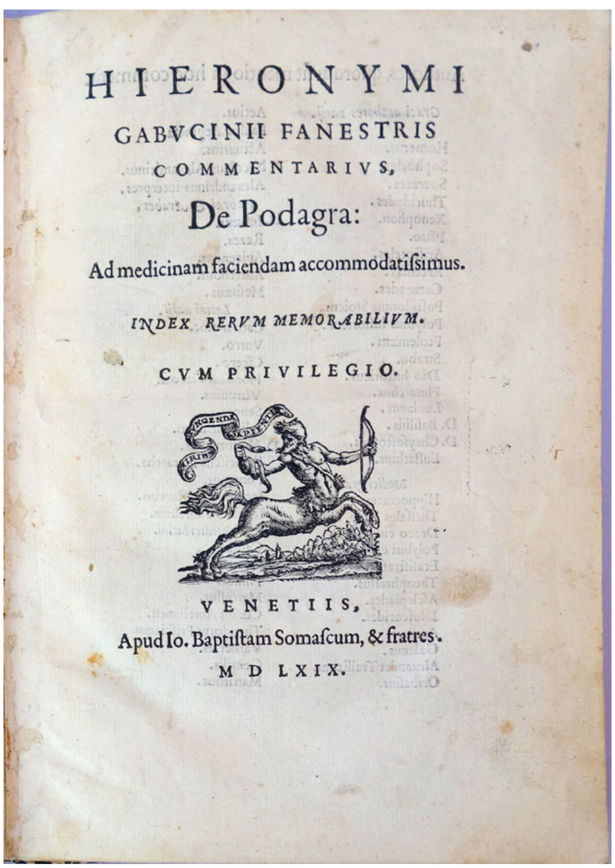
This copy is from the library of Walter Pagel, the noted historian of Renaissance medicine and biology (see Garrison-Morton 57, 3240, 3242), whose notes about both these texts are inserted on separate leaves. (Marchand & Hoff, "Fontana's laws of irritability," *Journal of the History of Medicine* 10 [1955]: 197-206, 302-326, 399-420 with translation and bibliography). Knoefel, *Felice Fontana 1730-1805: An Annotated Bibliography*, 4. Choulant/Frank, p. 315 for Tabarrani. 7024



Signed by Imogen Cunningham and Anna Freud

27. Freud, Anna (1895-1982). Fine portrait photograph by **Imogen Cunningham** (1883-1976), with Freud's signature ("Anna Freud") in ink on the mount. Signed and dated by the photographer in pencil on the mount. San Francisco, 1957. 192 x 162 mm. (image); 291 x 245 mm. (mount). Cunningham's San Francisco studio label on the verso, with "Neg. No. 12" in pencil; reproduction rights stamp. Fine. $2750

Freud's daughter and intellectual heir, as captured by one of the foremost photographers of the 20th century. 43238

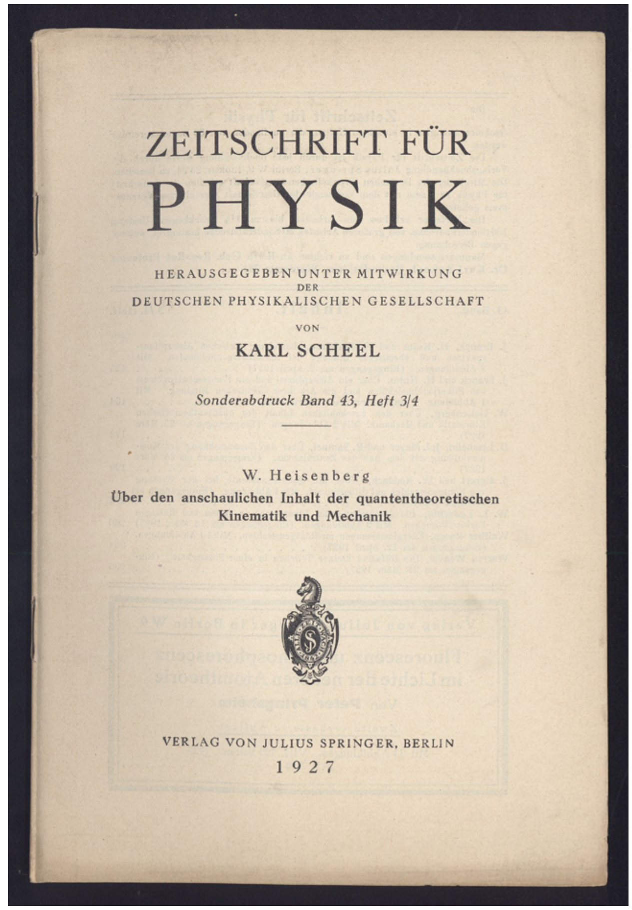


HIERONYMI
GABVCINII FANESTRIS
COMMENTARIVS,
De Podagra:
Ad medicinam faciendam accommodatissimus.
INDEX RERVM MEMORABILIVM.
CVM PRIVILEGIO.
VENETIIS,
Apud Io. Baptistam Somascum, & fratres.
M D LXIX.

28. Gabucini [or Gabuccini], Girolamo (fl. mid-16th century). Commentarius de podagra: Ad medicinam faciendam accommodatissimus. 4to. [8], 59, [1, blank], [10, index]ff. Venice: apud Io. Baptistam Somascum & fratres, 1569. 209 x 151 mm. 20th century boards, spine partly defective. Minor marginal dampstaining, inner margin of first leaf repaired, but very good. $1250

First Edition of this scarce 16th-century commentary on gout, which draws from the writings of classical, Hebrew and Arabic authorities. OCLC cites six copies in libraries: Leiden (2), National Library of Sweden, Oxford, Erlangen University and the University of Manchester. Hirsch. 43232

Heisenberg's Uncertainty Principle
The Extremely Rare Offprint

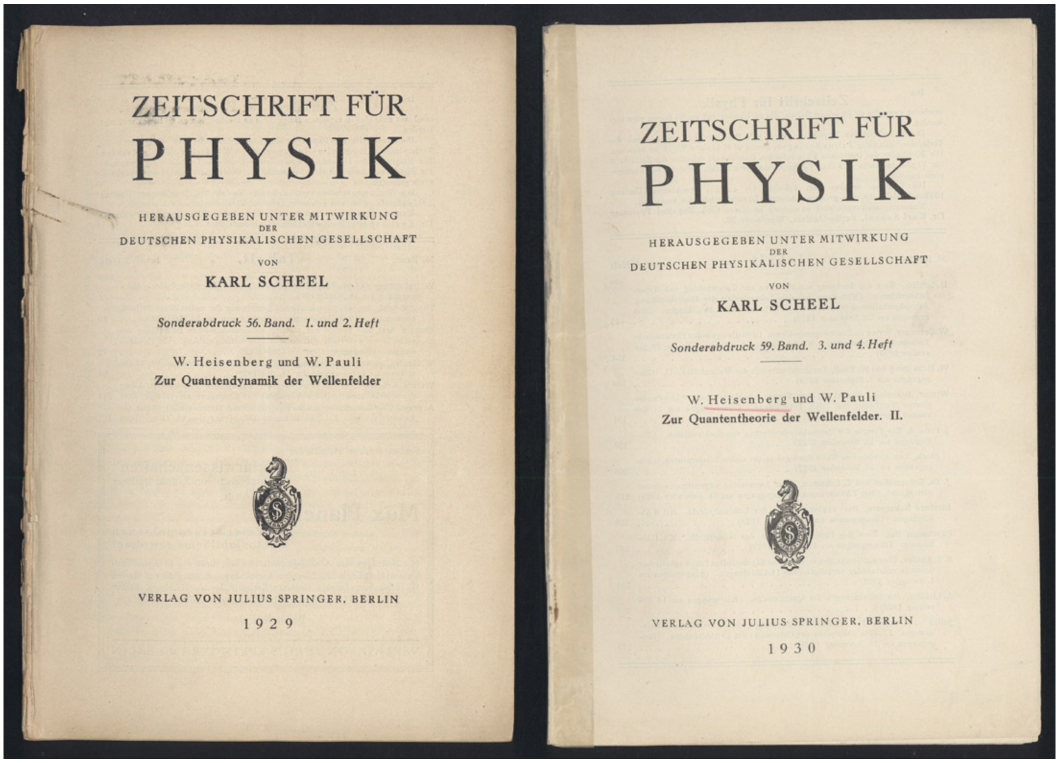


29. Heisenberg, Werner (1901-76). Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik. Offprint from *Zeitschrift für Physik* 43 (May-July 1927). 172-198pp. 232 x 156 mm. Original printed wrappers, slight soiling. Very light toning, otherwise fine. $37,500

First Edition, Extremely Rare Offprint Issue of the paper articulating Heisenberg's famous Uncertainty Principle in quantum mechanics. "Together with Bohr's complementarity principle, enunciated later that year, and Born's statistical interpretation of Schrödinger's wave mechanics, Heisenberg's uncertainty principle formed a fundamental component of the so-called Copenhagen interpretation of quantum mechanics—an explication of the uses and limitations of the mathematical apparatus of quantum mechanics that fundamentally altered our understanding of nature and our relation to it. . . .

"Previously [using classical physics] one could always describe the motion of an electron by noting its position and velocity at any given moment. Now, Heisenberg argued in his essay, such concepts are meaningful only when they are referred to or defined by the actual experimental operations used to measure them. The physicist cannot know any more than what he or she can actually measure. Here a puzzle arises. If one seeks to measure the exact position of an electron, he explained, one could use a microscope of very high resolving power, which would require the illumination of the electron with light of very short wavelengths. But the shorter the wavelength, the greater the energy of the light quantum (or the greater the pressure of the light wave) hitting the electron—thus the greater the recoil velocity of the electron. Because of this, Heisenberg noted, there seems to be a reciprocal relationship between the imprecisions, or uncertainties, with which one can simultaneously measure the velocity and the position of an electron at any given instant: 'The more precisely we determine the position, the more imprecise is the determination of velocity in this instant, and vice versa.' And this reciprocal relationship between uncertainties in measurement also holds for other conjugate pairs of variables, such as energy and time. . . ." (Cassidy, *Uncertainty: The Life and Science of Werner Heisenberg*, pp. 227-28).

The implications of Heisenberg's uncertainty principle were profound and far-reaching, particularly in its denial of the law of causality: Heisenberg declared that "'in the strict formulation of the causal law—if we know the present, we can calculate the future—it is not the conclusion that is wrong but the premise.' Not knowing both the present position and the present velocity of an electron with absolute precision, one can calculate only a range of possibilities for the position and velocity of the electron at any future time, one of which will result from the actual motion of the electron. Because of this uncertainty about the future motion of an individual electron, Heisenberg continued, the laws and predictions of quantum mechanics 'are in general only of a statistical type.' . . . When joined with Bohr's notion of complementarity in the Copenhagen interpretation, this profound assertion would gain even greater impact in the months and years following Heisenberg's submission of his uncertainty paper in the spring of 1927" (Cassidy, pp. 228-29). *Extremely rare.* This is the first copy of this offprint we have handled in 50 years. Mehra & Rechenberg, *History of the Development of Quantum Theory*, 6, pp. 157-63. 43251

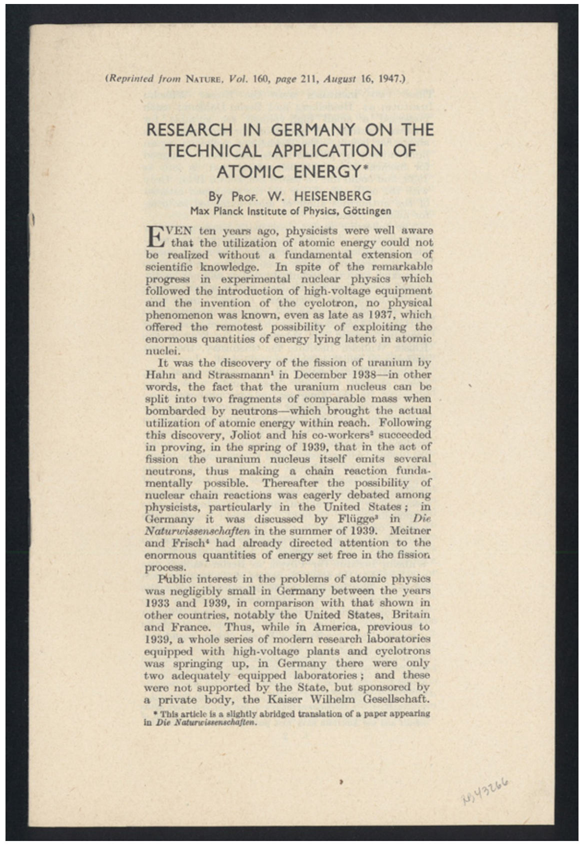


The Formal Invention of Quantum Electrodynamics

30. Heisenberg, Werner (1901-76) and **Wolfgang Pauli** (1900-1958). (1) Zur Quantendynamik der Wellenfelder. Offprint from *Zeitschrift für Physik* 56 (1929). 61pp. 231 x 160 mm. Original printed wrappers, spine repaired. (2) Zur Quantentheorie der Wellenfelder. II. Offprint from *Zeitschrift für Physik* 59 (1930). 168-190pp. 231 x 160 mm. Original printed wrappers, spine repaired with clear tape. Together 2 items. Small mark from paper clip on wrappers of no. (1), small tear in front wrapper of no. (2), but very good. $12,500

First Editions, Offprint Issues. Heisenberg and Pauli's two-part paper contains the first full-fledged relativistic quantum field theory, representing the "formal invention of quantum electrodynamics" (Miller, *Early Quantum Electrodynamics: A Source Book*, p. xiii). "This extremely technical and mathematical branch of quantum physics, the foundations of which were laid by Heisenberg, Dirac, Pauli, Jordan, and their colleagues during the late 1920s and early 1930s, continues to this day with much the same program and approach . . . [Heisenberg was] a leading member of the small band of abstract theorists who established the program and laid the foundations of relativistic quantum field theory as it has been pursued ever since" (Cassidy, *Uncertainty: The Life and Science of Werner Heisenberg*, p. 276).

In this paper—the only one that Heisenberg and Pauli ever wrote together—the two physicists attempted to establish "a consistent extension of the quantum formalism that would yield a satisfactory unification of quantum mechanics and relativity theory . . . In 1929, drawing upon the work of Dirac, Jordan, Oskar Klein, and others, Heisenberg and Pauli succeeded in formulating a general gauge-invariant relativistic quantum field theory by treating particles and fields as separate entities interacting through the intermediaries of field quanta. The formalism led to the creation of a relativistic quantum electrodynamics, equivalent to that developed by Dirac, which, despite its puzzling negative energy states, seemed satisfactory at low energies and small orders of interaction. But at high energies, where particles approach closer than their radii, the interaction energy diverges to infinity. Even at rest, a lone electron interacting with its own field seemed to possess an infinite self-energy . . . Attention was directed to the resolution of such difficulties for more than two decades" (*Dictionary of Scientific Biography*). Mehra & Rechenberg, *The Historical Development of Quantum Theory*, 6, pp. 312-26. 43254



(*Reprinted from* NATURE, *Vol.* 160, *page* 211, *August* 16, 1947.)

RESEARCH IN GERMANY ON THE TECHNICAL APPLICATION OF ATOMIC ENERGY*

By PROF. W. HEISENBERG
Max Planck Institute of Physics, Göttingen

EVEN ten years ago, physicists were well aware that the utilization of atomic energy could not be realized without a fundamental extension of scientific knowledge. In spite of the remarkable progress in experimental nuclear physics which followed the introduction of high-voltage equipment and the invention of the cyclotron, no physical phenomenon was known, even as late as 1937, which offered the remotest possibility of exploiting the enormous quantities of energy lying latent in atomic nuclei.

It was the discovery of the fission of uranium by Hahn and Strassmann[1] in December 1938—in other words, the fact that the uranium nucleus can be split into two fragments of comparable mass when bombarded by neutrons—which brought the actual utilization of atomic energy within reach. Following this discovery, Joliot and his co-workers[2] succeeded in proving, in the spring of 1939, that in the act of fission the uranium nucleus itself emits several neutrons, thus making a chain reaction fundamentally possible. Thereafter the possibility of nuclear chain reactions was eagerly debated among physicists, particularly in the United States; in Germany it was discussed by Flügge[3] in *Die Naturwissenschaften* in the summer of 1939. Meitner and Frisch[4] had already directed attention to the enormous quantities of energy set free in the fission process.

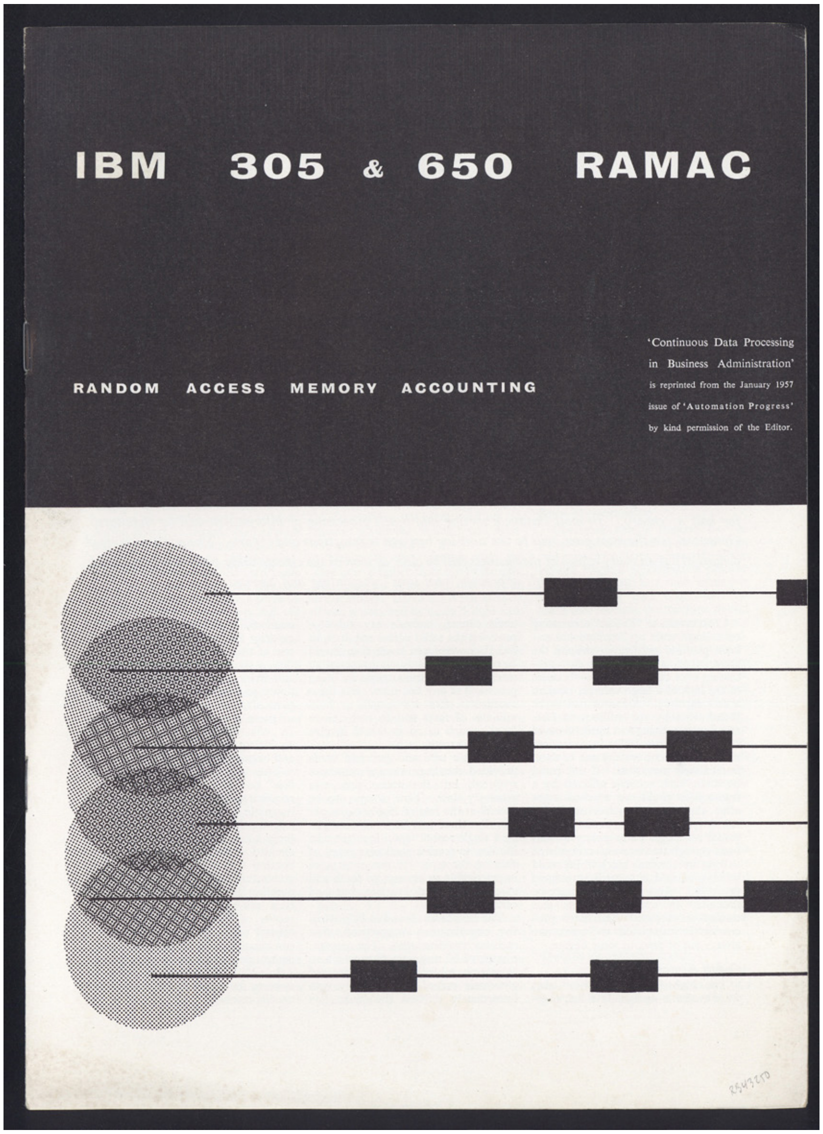
Public interest in the problems of atomic physics was negligibly small in Germany between the years 1933 and 1939, in comparison with that shown in other countries, notably the United States, Britain and France. Thus, while in America, previous to 1939, a whole series of modern research laboratories equipped with high-voltage plants and cyclotrons was springing up, in Germany there were only two adequately equipped laboratories; and these were not supported by the State, but sponsored by a private body, the Kaiser Wilhelm Gesellschaft.

* This article is a slightly abridged translation of a paper appearing in *Die Naturwissenschaften*.

31. Heisenberg, Werner (1901-76). Research in Germany on the technical application of atomic energy. Offprint from *Nature* 160 (1947). 10, [1]pp. 212 x 145 mm. Without wrappers as issued. Fine copy. $2750

First Edition in English, Offprint Issue. During World War II Heisenberg was one of the principal scientists in charge of research and development in Germany's nuclear energy program. Prior to the end of the war in Europe the Allies had no idea how far Germany had progressed in the quest to build a nuclear reactor, but given Germany's leading role in the advancement of nuclear physics they had every reason to believe that the Nazis were ahead of the game—in fact, the fear of a German "atom bomb" was one of the main reasons behind the establishment of the Manhattan Project. The Allies' fear turned out to be groundless: Due to a combination of factors, including Hitler's dislike of "Jewish science" and the "White Jew" Heisenberg, Germany had fallen well behind the United States in the development of nuclear energy.

After the bombing of Hiroshima Heisenberg became one of the primary crafters of Germany's official account of its wartime nuclear energy program. In December 1946 he published his first postwar summary of the program in the journal *Naturwissenschaften*; the present English translation, slightly abridged from the German, appeared in *Nature* the following August. In the summary Heisenberg argued that Germany's failure to advance its nuclear program was due both to enormous technical difficulties and to the lack of political and financial support; he also played up his own role in slowing down the project by quashing Nazi officials' hopes for the imminent development of atomic weapons. "Heisenberg's self-serving account parallels but overinterprets actual events. He especially did try to maintain scientific control over the [nuclear energy] project. He was also aware of the theoretical possibility of a nuclear explosive by late 1941, he did not demand a crash research and development program to build one, and he did seem content to work for the rest of the war on the more modest program of building a reactor. It is difficult to assess his intentions and motives beyond that. But from what we know of his activities and research, there is nothing to support the notion that Heisenberg actually hindered the project in any way to keep an explosive out of Hitler's hands or even that he himself had that much control of the situation" (Cassidy, *Uncertainty: The Life and Science of Werner Heisenberg*, p. 510). 43266



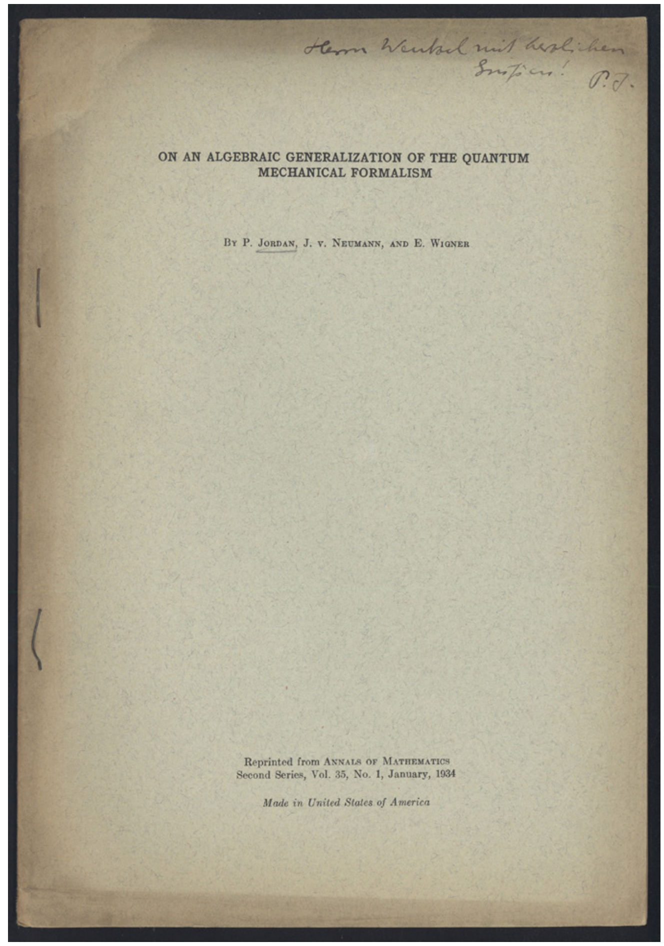
The First Hard Drive System

32. IBM. IBM 305 & 360 RAMAC. Random access memory accounting. 7, [1]pp., including wrappers. Text illustrations. London: IBM United Kingdom Ltd., [1957]. Original printed self-wrappers. Fine copy. $950

First Edition. IBM's RAMAC (*R*andom *A*ccess *M*emory *AC*counting) was the first hard-drive system, and the IBM 305 RAMAC, introduced in September 1956, was the first commercial computer to use a moving-head hard disk drive for secondary storage of information. A RAMAC unit was also added to IBM's popular 650 computer, which had begun manufacture three years earlier. Each RAMAC unit contained 50 24-inch disks and could store five megabytes of information; it weighed over a ton and took up 1.5 square meters (16 square feet) of space. The RAMAC greatly increased the speed of data access and eliminated the need for sorting and batch processing of information, thus allowing businesses to approach "real time" accounting and administration.

The present brochure reprints an article titled "Continuous data processing in business administration," which had originally appeared in the January 1957 issue of *Automation Progress*. The brochure was issued by the British branch of IBM. 43250

Inscribed by Pascual Jordan



33. Jordan, Pascual (1902-80); **John von Neumann** (1903-57); and **Eugene Wigner** (1902-95). On an algebraic generalization of the quantum mechanical formalism. Offprint from *Annals of Mathematics*, second series, 35 (1934). 29-64pp. 254 x 176 mm. Original printed wrappers, margins a bit dust-soiled. Very good. *Presentation Copy, Inscribed by Jordan* to physicist Gregor Wentzel (1898-1978) on the front wrapper: "Herrn Wentzel mit hertzlichen Grüssen! P. J."

$3750

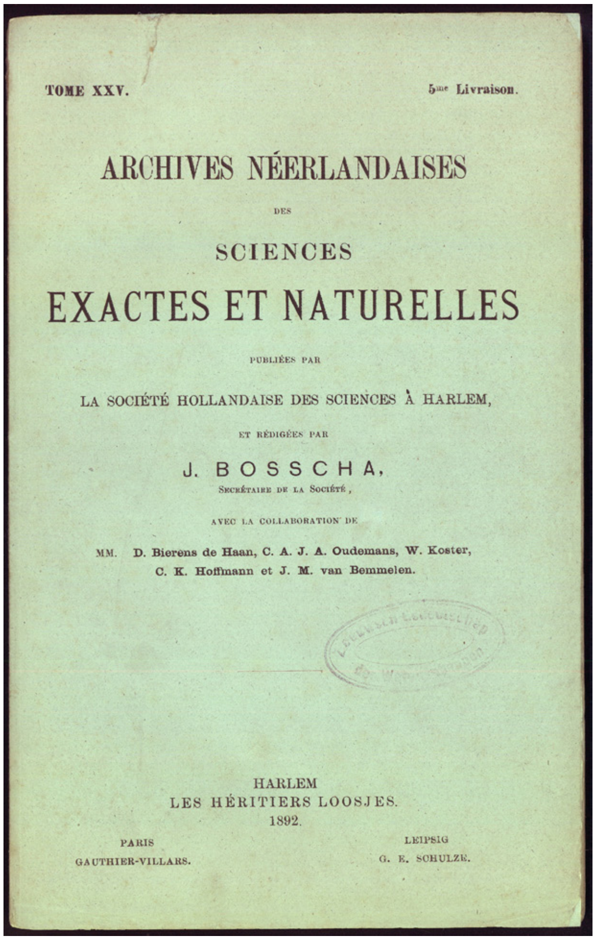
First Edition, Offprint Issue of Jordan, von Neumann and Wigner's classic paper on one of the mathematical foundations of quantum mechanics, introducing what are now known as the "formally real Jordan algebras." "When [the real numbers, the complex numbers and the quaternions] were sent down from platonic heaven to tell the world about the algebraic structure of quantum mechanics, they took on human avatars and wrote this paper" (Baez).

In an earlier paper Jordan had introduced the "Jordan algebras," a special type of non-associative algebra, to formalize the notion of an algebra of observables in quantum mechanics.

> In 1932, Pascual Jordan tried to isolate some axioms that an "algebra of observables" should satisfy. The unadorned phrase "algebra" usually signals an associative algebra [i.e., one in which $(a + b) + c = a + (b + c)$], but this is not the kind of algebra Jordan was led to. In both classical and quantum mechanics, observables are closed under addition and multiplication by real scalars. In classical mechanics we can also multiply observables, but in quantum mechanics this becomes problematic. . . .
>
> However, in quantum mechanics one can still raise an observable to a power and obtain another observable. From squaring and taking real linear combinations, one can construct a commutative product . . . This led Jordan to define what is now called a formally real Jordan algebra . . . **In 1934, Jordan published a paper with von Neumann and Wigner classifying finite-dimensional formally real Jordan algebras** (Baez; emphasis ours).

The formally real Jordan algebras correspond to various spin factors, which in turn "have an intriguing relation to special relativity" (Baez). Jordan algebras also play important roles in other branches of mathematics: Lie groups and algebras, differential geometry, projective geometry, probability and statistics.

Jordan presented this copy of his paper to theoretical physicist Gregor Wentzel, who also made contributions to quantum mechanics: He is best known for the Wentzel-Kramers-Brillouin approximation for finding approximate solutions to linear partial differential equations with spatially varying coefficients. Baez, John, "State-Observable Duality (Part 2)." The N-category Cafe: A Group Blog on Math, Physics and Philosophy. N.p., 27 Nov. 2010. Web. Accessed 12 Sept. 2014. 43272



The Electron Theory

34. Lorentz, Hendrik Antoon (1853-1928). La théorie électromagnétique de Maxwell et son application aux corps mouvants. In *Archives néerlandaises des sciences exactes et naturelles* 25 (1892): 363-551 [Lorentz's paper occupies the entire number]. 8vo. Harlem: Les héritiers Loosjes, 1892. 241 x 152 mm. (uncut & unopened). Original printed wrappers, a bit worn and chipped, small marginal tear repaired; boxed. Library stamp on front wrapper and first leaf. Fine, uncut and unopened copy. $8500

First Edition of Lorentz's seminal paper on the relationship of matter to electricity, which appeared in journal form prior to the book-form version cited as *Printing and the Mind of Man* 378a (the book-form version appeared later in 1892, not in 1893 as PMM states). This paper and Lorentz's paper of 1895 (PMM 378b; see the following item in this catalogue) embodied the first systematic appearance of the electrodynamic principle of relativity. In applying Maxwell's electromagnetic theories to moving bodies Lorentz made the fundamentally new assumption that the behavior of light and matter could be understood in terms of charged particles. Maxwell (1864) had argued that radiation was produced by the oscillation of electric charges, and in 1887 Hertz showed this to be true for radio waves, which he formed by causing electric charges to oscillate. But if light was an electromagnetic radiation after the fashion of radio waves, where were the electric charges that did the oscillating?

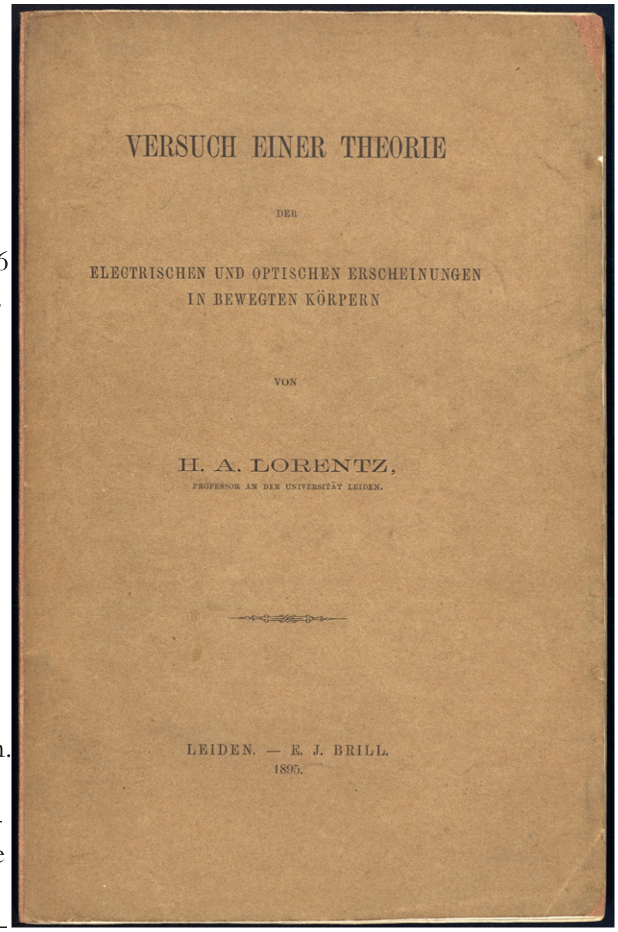
By 1890 it seemed quite likely that electric current was made up of charged particles, and Lorentz thought it quite possible that atoms of matter might also consist of charged particles. He hypothesized that visible light was produced by the oscillation of charged particles within the atom; if this was so, then placing a light in a strong magnetic field ought to affect the nature of the oscillations—and therefore the wavelength—of the light emitted. In 1896 Lorentz's hypothesis was demonstrated experimentally by his pupil Pieter Zeeman, who shared the Nobel Prize with Lorentz in 1902.

Lorentz also postulated that there are contractions of length with motion, and that the mass of a charged particle such as an electron depends upon its volume—the smaller the volume, the greater the mass. Arguing that mass increases with velocity led to the conclusion that the velocity of light in a vacuum is the greatest velocity at which any object can travel. Lorentz's equation describing how mass varies with velocity was adopted by Einstein in his *Special Theory of Relativity* (1905), in which he showed that the Lorentz mass-increase with velocity holds not only for charged particles but for all objects, charged or uncharged. *Dictionary of Scientific Biography*. Weber, *Pioneers of Science*, pp. 12-14. Magill, ed., *The Nobel Prize Winners: Physics*, pp. 35-42. 41098

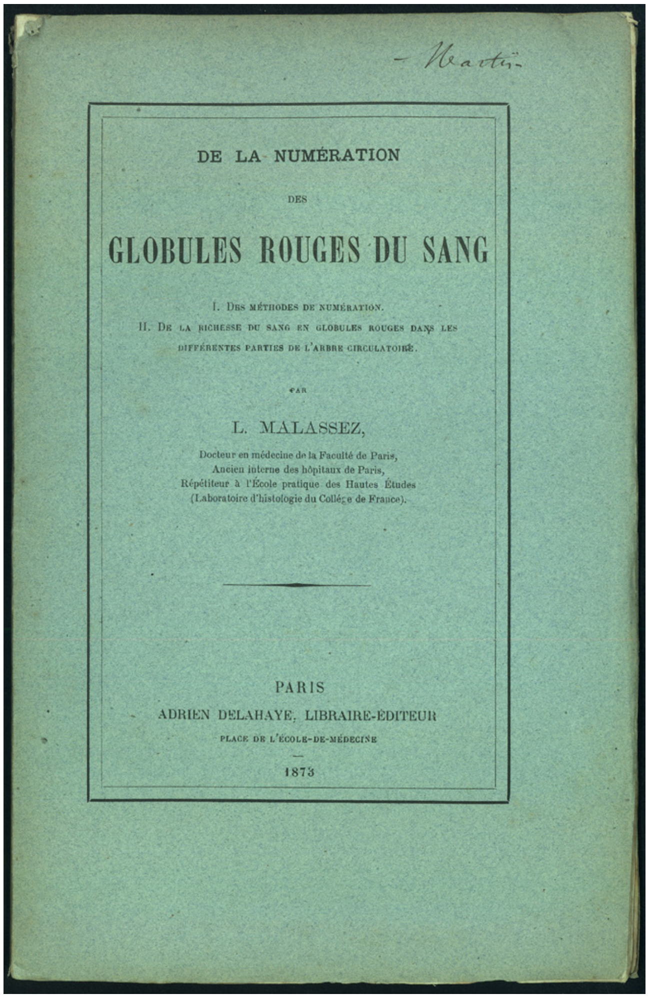
Lorentz's Second Key Paper on the Electron Theory of Matter

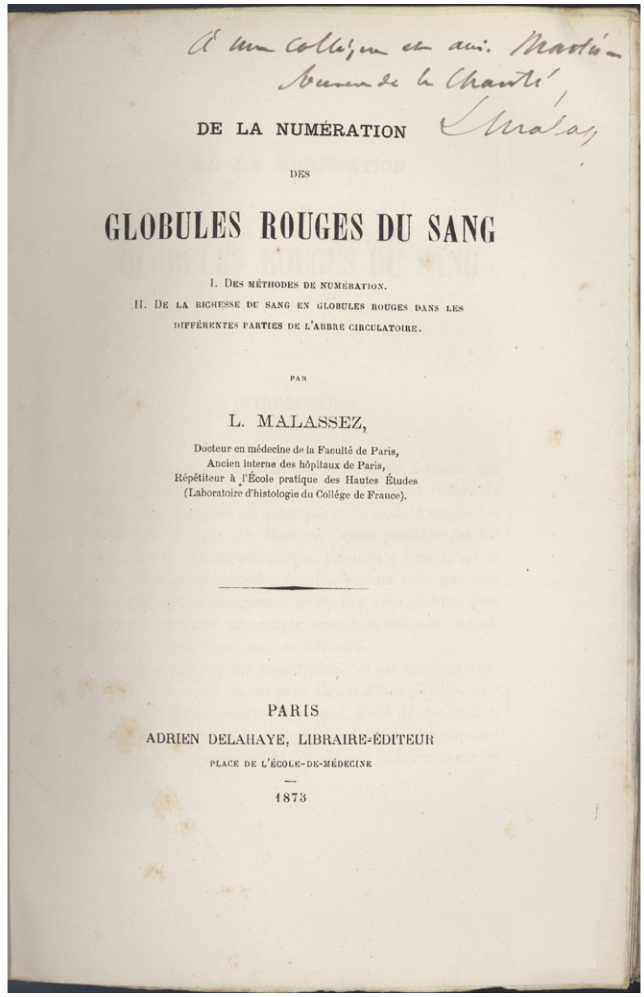
35. Lorentz, Hendrik Antoon (1853-1928). Versuch einer Theorie der electrischen und optischen Erscheinungen in bewegten Körpern. 8vo. [4] 138 [2]pp. Leiden: E. J. Brill, 1895. 235 x 156 mm. Original printed wrappers, a few minor chips to edges repaired, spine restored. Occasional very minor foxing, but a very good copy. Boxed.

$7500



First Edition of the second of Lorentz's seminal papers on the relationship of matter to electricity, following the publication in 1892 of his *Théorie électromagnétique de Maxwell* (see the preceding item in this catalogue). "Lorentz's next major exposition of his electron theory was *Versuch einer Theorie der electrischen und optischen Erscheinungen in bewegten Körpern* (1895). He no longer derived the basic equations of his theory from mechanical principles, but simply postulated them. . . . In 1892 Lorentz had briefly discussed the problem of the effects of the earth's motion through the stationary ether; in the *Versuch* he systematically went over the whole problem. Since the ether is not dragged, a moving body such as the earth has an absolute velocity relative to it. The question arises whether or not the earth's absolute velocity is detectable through optical or electromagnetic effects of the accompanying ether 'wind.' . . . The effects of the wind, however, were not observed; and for his theory to be credible Lorentz had to explain why. He showed that, according to the theory, an unexpected compensation of actions eliminates all effect of the ether wind to first-order approzimation . . . By introducing transformations for the field magnitudes, spatial coordinates and a 'local time,' Lorentz showed that in first-order approximation the equations describing an electric system in a moving frame were identical with those describing the corresponding electric system at rest in the ether" (*Dictionary of Scientific Biography*). Lorentz's *Versuch* contains the first publication of his equation for what is now known as the Lorentz force, as well as the exact form of his equation for the contraction hypothesis he had proposed to explain why experiments such as those performed by Mitchell and Morley had failed to produce evidence of the second-order ether wind effects predicted by Lorentz's theory. *Printing and the Mind of Man* 378b. Magill, *The Nobel Prize Winners: Physics*, pp. 35-42. 41145



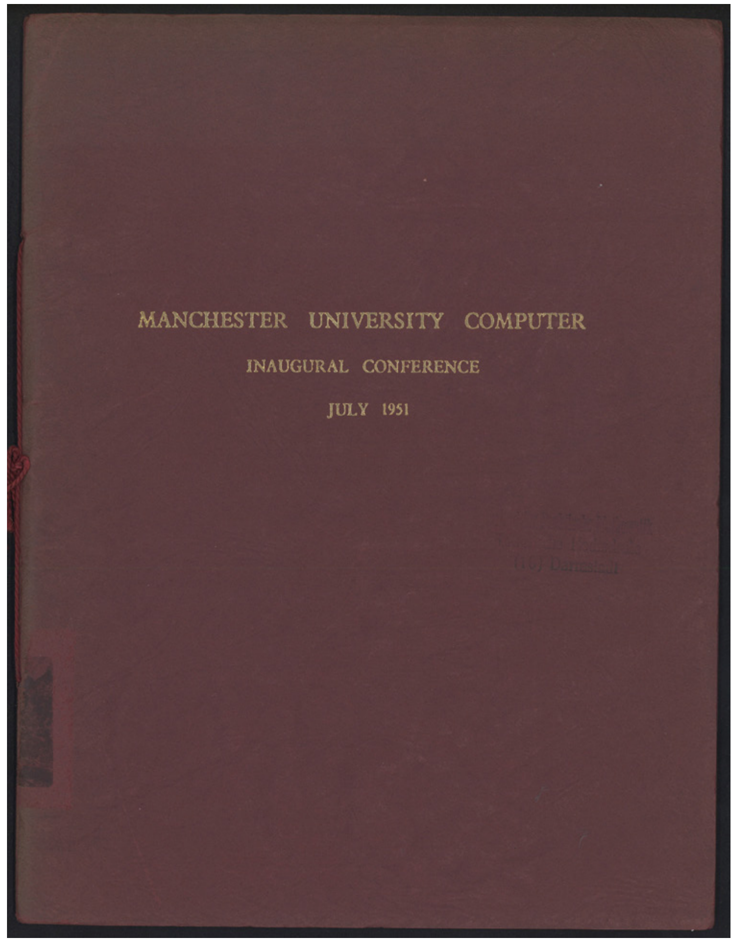


The Hemocytometer

36. Malassez, Louis-Charles (1842-1909). De la numeration des globules rouges du sang. 74pp. Paris: Adrien Delahaye, 1873. Text illustrations. 253 x 165 mm. (uncut and unopened). Original printed wrappers, minor wear and chipping at extremities, ownership inscription ("Martin") on front wrapper. Light foxing but very good. *Presentation Copy, inscribed by Malassez* to "Martin" on the title: "A mon collègue et ami Martin [. . .] de la Charité, L. Malassez." $2500

First Edition. Malassez, a pupil of Claude Bernard, invented the hemocytometer, a device originally designed to count red blood cells; it is now used to count other types of cells as well. He first described the hemocytometer in the present pamphlet, which was published a year before the journal article by Malassez cited in Garrison-Morton (no. 876). The instrument, illustrated on page 24, consists of a thick glass microscope slide with a rectangular indentation that creates a chamber; this chamber is engraved with a grid of perpendicular lines. The area bounded by the lines is known and the depth of the chamber is also known; it is therefore possible to count the number of cells in a given volume of fluid, and thus to determine the concentration of cells in the fluid overall. Malassez's treatise also contains the first published description of the diluting pipette invented in 1867 by his colleague Pierre Potain (1825-1901); an illustration of this device is on page 13. These two inventions led to greater facility in counting both red and white blood cells. *Histoire illustrée de l'hématologie,* pp. 20, 36. Wintrobe, *Hematology: The Blossoming of a Science,* p. 52. 43171

The First Application of an Electronic Computer to Molecular or Structural Biology

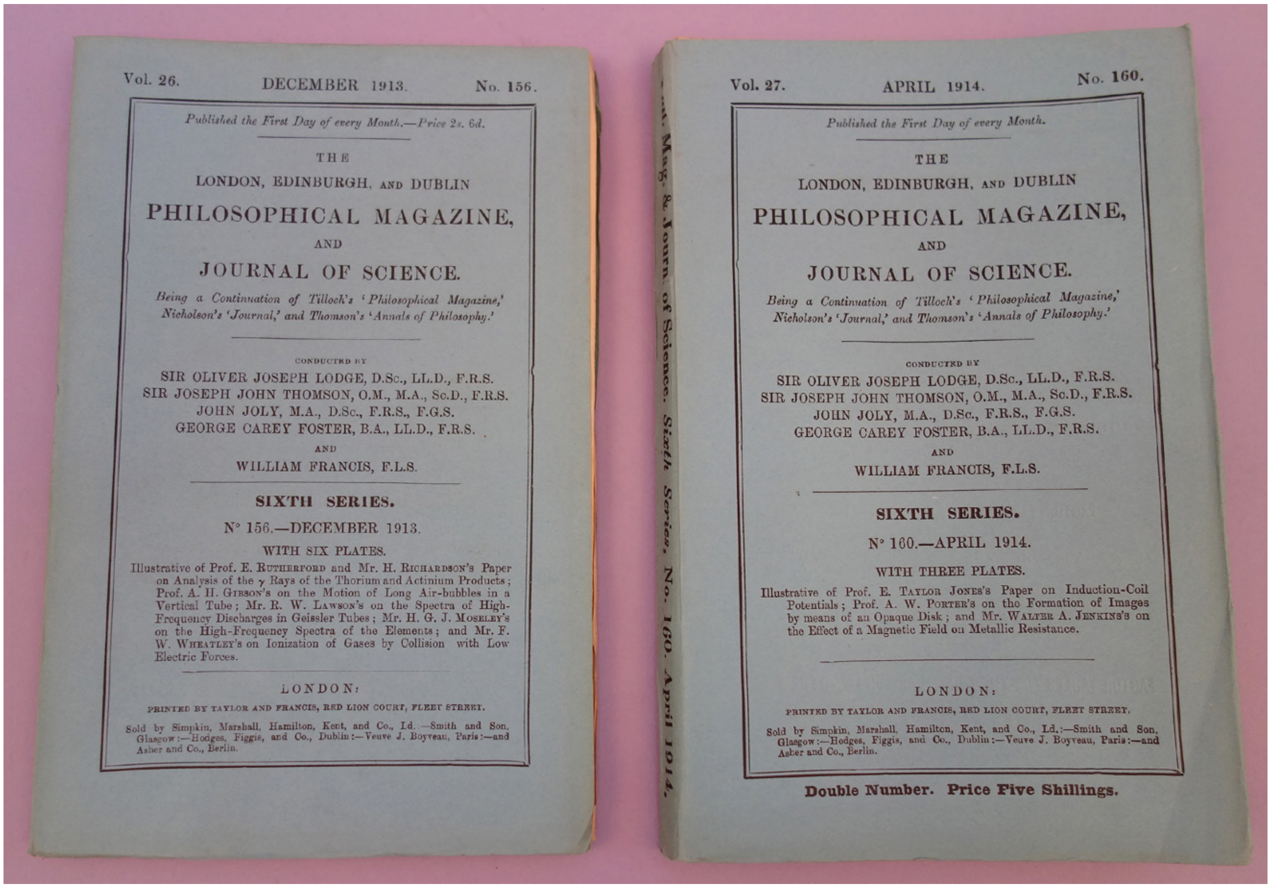


37. Manchester University. Manchester University computer. Inaugural conference. July [9-12] 1951. [Bolton: Tillotson's, 1951.] 40pp. Text illustrations. 282 x 215 mm. Original maroon printed stiff wrappers, title gilt-stamped on upper wrapper, bound with a maroon cord at the spine. Label removed from spine, light edgewear, but very good. From the library of the Institut für Praktische Mathematik, Technische Hochschule, Darmstadt, with library stamps on front wrapper and title-leaf. $7500

First Edition of the very rare program / proceedings from the Manchester University Computer Inaugural Conference, the second of the early British computer conferences after the Cambridge University conference held in June 1949. "The Manchester University Conference was held to inaugurate the Ferranti Mark I computer. The machine had been delivered to the University in February 1951 and by the time of the conference it was at the center of a flourishing computer laboratory. The Ferranti Mark I was the first commercially manufactured computer in Britain (and arguably in the world). To commemorate the event Ferranti underwrote the cost of the slim but elegant conference proceedings. . . . The Mark I itself was described by F. C. Williams, and the corresponding paper in the proceedings, which is superbly illustrated, is the best single account of the Ferranti Mark I computer" (Williams and Campbell-Kelly, *The Early British Computer Conferences* [1989], xiii).

At this Manchester conference computer scientist John Makepiece Bennett and biochemist John Kendrew described their use of the Cambridge EDSAC for the computation of Fourier syntheses in the calculation of structure factors of the protein molecule myoglobin. This was the first application of an electronic computer to computational biology or structural biology. Using this computational technique Kendrew solved the three-dimensional structure of myoglobin, the first protein to be so analyzed. In 1951 Cambridge University was one of only three or four places in the world with a high-speed stored-program electronic computer, and Kendrew took full advantage of the speed of Cambridge's EDSAC computer and its more powerful successors, to execute the complex mathematical calculations required to solve the structure of myoglobin. Kendrew was the first to apply an electronic computer to the solution of a complex problem in biology. In 1962 Kendrew received a share of the Nobel Prize in chemistry for his use of x-ray crystallography to determine the atomic structure of proteins.

The first published account of Kendrew and Bennett's research appeared on page 35 of the Manchester University Computer Conference program. The following year Kendrew and Bennett published an extended version of their paper as "The computation of Fourier syntheses with a digital electric calculating machine" (*Acta Crystallographica* 5 [1952]: 109-116). *Origins of Cyberspace* 774 (this copy). 43247

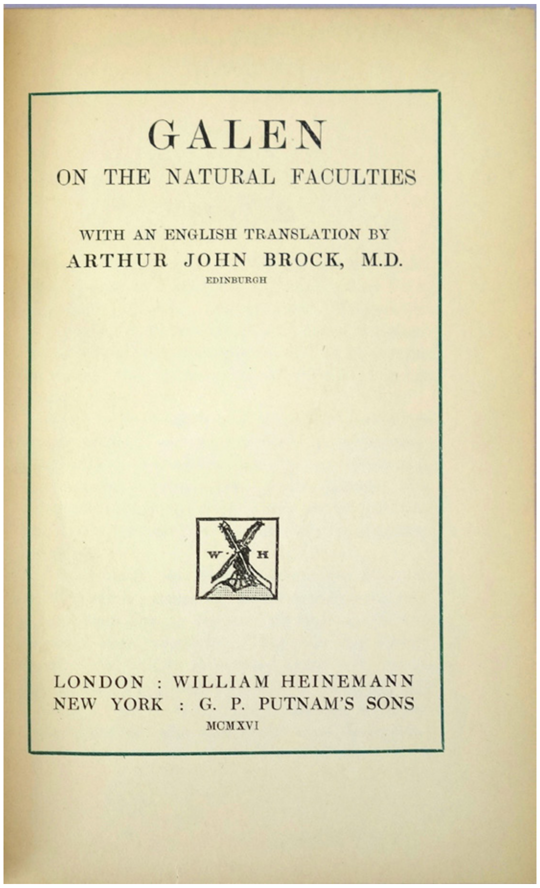


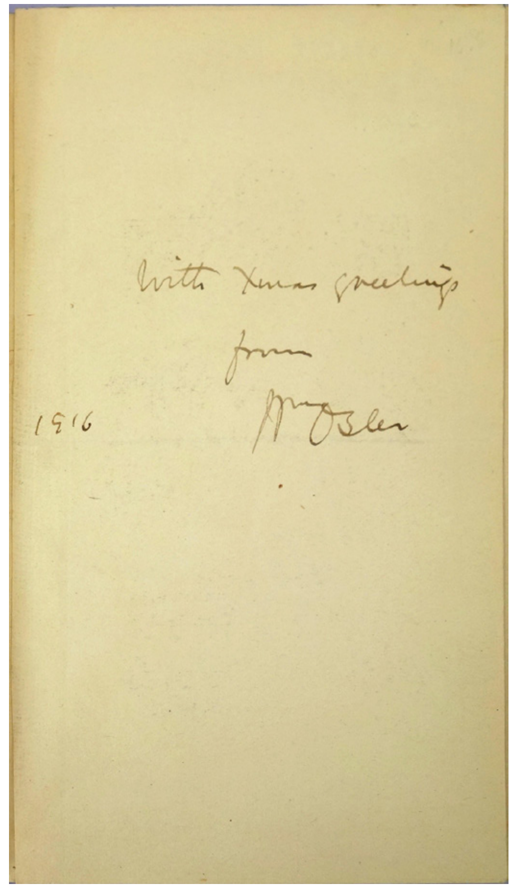
Moseley's Law in X-Ray Spectra

38. Moseley, Henry G. J. (1887-1915). The high-frequency spectra of the elements. **In**: *Philosophical Magazine,* sixth series, 26 (1913): 1024-34; 27 (1914): 703-13. 1 plate. The complete nos. 156 & 160, 8vo. London: Taylor & Francis, 1913-14. 226 x 147 mm., first number uncut & unopened. Original printed wrappers, advertising circular laid into second number. Very fine. $7500

First Edition. Moseley's outstanding contribution to physics was the justification from physical laws of the previous empirical and chemical concept of the atomic number. This stemmed from his development of Moseley's Law concerning the characteristic x-rays that are emitted by atoms, published in his paper of 1913. "It is historically important in quantitatively justifying the conception of the nuclear model of the atom, with all, or nearly all, positive charges of the atom located in the nucleus, and associated on an integer basis with atomic number. Until Moseley's work, 'atomic number' was merely an element's place in the periodic table, and was not known to be associated with any measureable physical quantity. Moseley was able to show that the frequencies of certain characteristic X-rays emitted from chemical elements are proportional to the square of a number which was close to the element's atomic number; a finding which supported van den Broek and Bohr's model of the atom in which the atomic number is the same as the number of positive charges in the nucleus of the atom" (Wikipedia article on Moseley's Law, accessed 07-10-2011).

When World War I broke out Moseley left his research work at the University of Oxford to volunteer for the Royal Engineers of the British Army. He was assigned as a telecommunications officer to the fighting force that invaded the region of Gallipoli, Turkey, in April 1915. On August 10, 1915, during the Battle of Gallipoli, Moseley was shot and killed at the age of 27. Some prominent authorities have speculated that Moseley would have been deserving of the Nobel Prize in Physics in 1916—which went unawarded—had he not died the previous year. *Printing and the Mind of Man* 407. *Twentieth Century Physics* I, pp. 158-59 42707



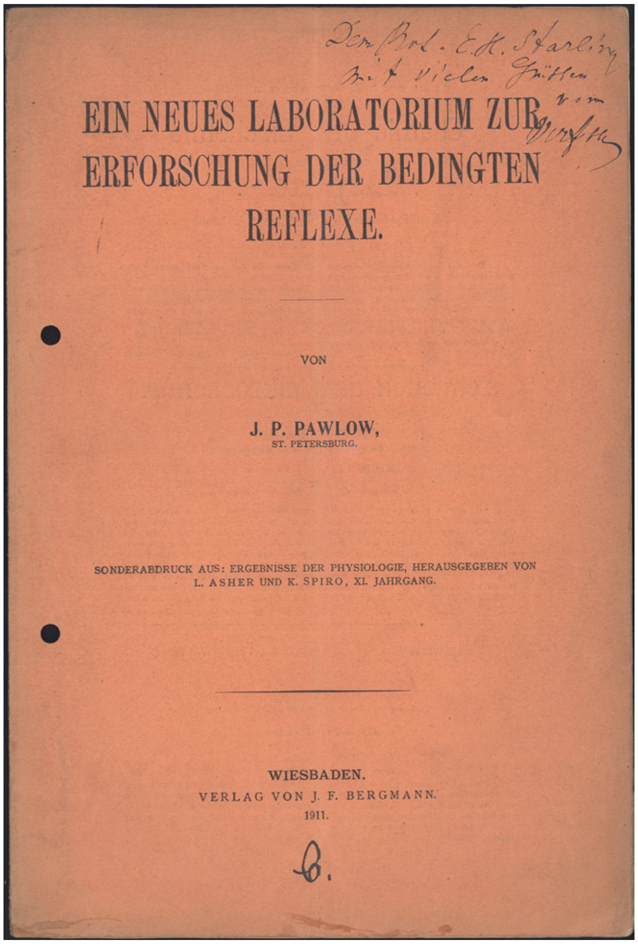


Presented by Osler to George C. Shattuck

39. [**Osler, William** (1849-1919).] **Galen** (130-200 A.D.). On the natural faculties. With an English translation by Arthur John Brock, M.D. Loeb Classical Library. lv, 339, [5, including 4pp. adverts.]pp. London: Heinemann; New York: G. P. Putnam's Sons, 1916. 166 x 108 mm. Original cloth, gilt-lettered spine and front cover, top edges gilt, light wear to extremities. Fine apart from ink markings on rear free endpaper. *Inscribed by Osler* to George C. Shattuck (1879-1972) on sheet tipped to front free endpaper: "With Xmas greetings from Wm. Osler 1916." Shattuck's bookplate on front pastedown.

$1250

First Edition in English of Galen's treatise. Osler presented this copy to Dr. George Cheever Shattuck, the son of his old friend Dr. Frederick C. Shattuck, the Jackson Professor of Clinical Medicine at Harvard Medical School. The younger Shattuck, a specialist in tropical medicine, joined the faculty of Harvard Medical School in 1908 and served as Professor of Clinical Tropical Medicine in Harvard's School of Public Health from 1938 to 1947. See Cushing, *The Life of Sir William Osler*, pp. 384, 565, 701, 1218, 1277 and 1316 for references to George Shattuck. 43264



Presented by Pavlov to E. H. Starling

40. Pavlov, Ivan Petrovich (1849-1936). Ein neues Laboratorium zur Erforschung der bedingten Reflexe. Offprint from *Ergebnisse der Physiologie* 11 (1911). 8vo. 357-371pp. 250 x 168 mm. Original printed wrappers, creased vertically, holes punched in left margin. Inscribed by Pavlov to physiologist Ernest Henry Starling (1866-1927) as follows: "Dem Prof. E. H. Starling mit vielen Grüssen vom Verfasser." $2500

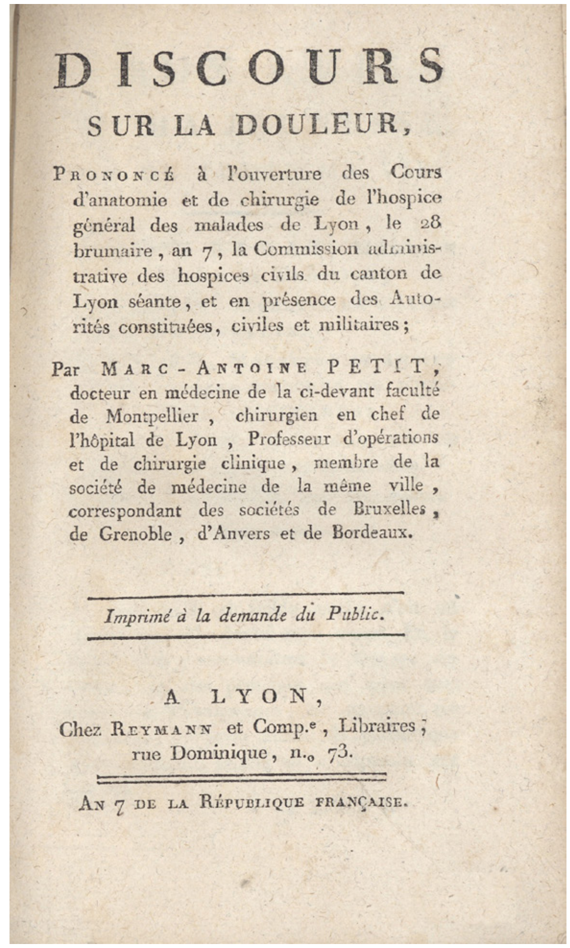
First Edition Offprint Issue. Pavlov received the 1904 Nobel Prize in physiology / medicine for his studies of the physiology of digestion, which revealed the part that the nervous system plays in controlling digestive secretions.

In conducting his physiological researches, Pavlov introduced the method of long-term or continuous experimentation, which—in contrast with traditional vivisectional methods—allowed him to study the operation of physiological processes in healthy animals under normal conditions over extended periods of time. His investigations of the nervous system's role in digestion led him to explore the phenomenon of "psychic" stimulation; i.e., salivary secretion prompted by the sight or smell of food rather than by direct contact. In Pavlov's hands this became a powerful tool for investigating the functions of the cerebral cortex and the physiology of behavior. The most famous outcome of his researches is, of course, the artificial conditioned reflex, in which physiological processes such as salivation are arbitrarily associated with stimuli such as the ringing of a bell.

Pavlov presented this offprint, discussing a new laboratory for studying conditioned reflexes, to the British physiologist Ernest Henry Starling, co-discoverer (with Bayliss) of pancreatic secretin (1902; see Garrison-Morton 1024) and co-developer (again with Bayliss) of the theory of hormonal control of internal secretion (1905; see Garrison-Morton 1122). Pavlov had been a strong advocate of the "nervist" doctrine of physiology, which held that the nervous system controlled most body activities; however, Starling and Bayliss's discovery of secretin, which confirmed the humoral (rather than nervous) transmission of impulses from the intestine to the pancreas, forced Pavlov to rework his theories of digestion (see Babkin, *Pavlov,* pp. 228-230). Magill, *The Nobel Prize Winners: Physiology or Medicine*, pp. 61-68. 43234

One of the Earliest Works on the Problem of Pain

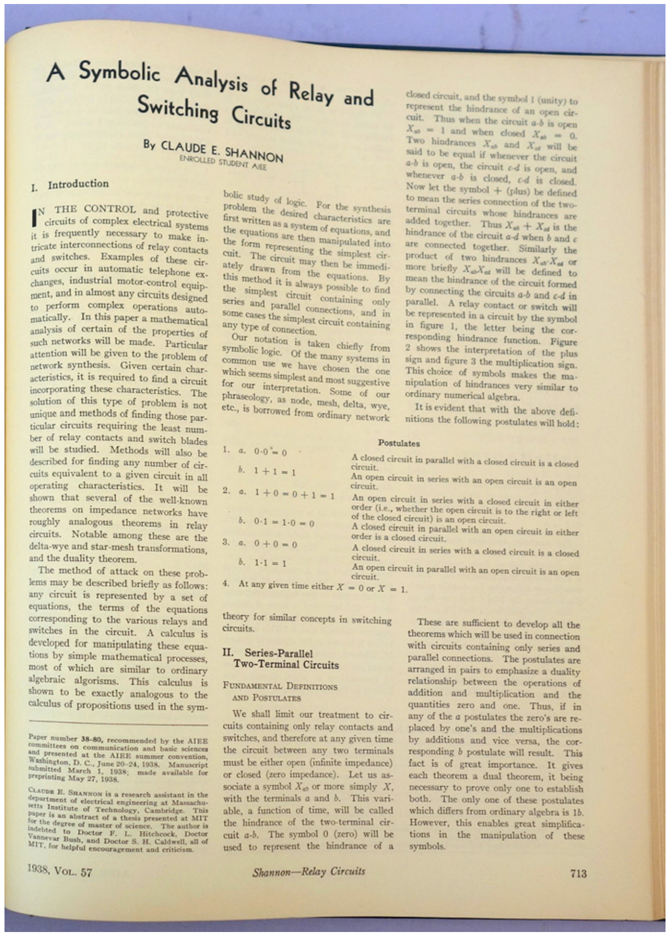
41. Petit, Marc Antoine (1766-1811). Discours sur la douleur. 8vo. 93, [3, including publisher's adverts.]pp. Lyon: Reymann et Cie., An 7 [1797/98]. 193 x 121 mm. Modern marbled wrappers. Light toning but very good. Marginal notes in an early hand (slightly cropped) on pp. 8, 15 and 16. $2750



First Edition of one of the earliest works devoted to the problem of pain. The use of the guillotine during the French Revolution sparked a scientific debate as to whether some sort of consciousness, particularly consciousness of pain, could be maintained by a body after decapitation. The famous episode of Charlotte Corday's severed head flushing when slapped by the executioner prompted some physicians to claim that pain continued to be experienced after the apparent extinction of life; however, Petit, the chief surgeon at Lyon's Hôtel-Dieu, emphatically denied this in his *Discourse on Pain*:

> . . . if pain requires a form of judgment, how could it come about in a severed head? How could a head have an awareness of pain, no longer having the integrity of its organization? . . . In actual fact, one can observe movements in the eyes, lips and eyelids of a severed head, one can see the cheeks color momentarily: but these are animal movements, phenomena of irritability, and not the product of a pain felt and judged; they no more prove that the severed head is expressing anger than an amputated hand demonstrates a desire to hit out, when it closes into a fist when the muscles in the arm are prodded (pp. 28-29; English translation from Rey, p. 111).

Petit's treatise includes a discussion of various methods of pain relief (pp. 69 *et seq.*), including opium and its various preparations; alcohol; the application of ice; and analgesics such as ether, hartshorn, quinine, camphor, mercury and infusions of herbs including linden, lily of the valley, peony and valerian. Rey, *The History of Pain*, pp. 110-111; 122. 43169



A Symbolic Analysis of Relay and Switching Circuits

By CLAUDE E. SHANNON
ENROLLED STUDENT AIEE

I. Introduction

IN THE CONTROL and protective circuits of complex electrical systems it is frequently necessary to make intricate interconnections of relay contacts and switches. Examples of these circuits occur in automatic telephone exchanges, industrial motor-control equipment, and in almost any circuits designed to perform complex operations automatically. In this paper a mathematical analysis of certain of the properties of such networks will be made. Particular attention will be given to the problem of network synthesis. Given certain characteristics, it is required to find a circuit incorporating these characteristics. The solution of this type of problem is not unique and methods of finding those particular circuits requiring the least number of relay contacts and switch blades will be studied. Methods will also be described for finding any number of circuits equivalent to a given circuit in all operating characteristics. It will be shown that several of the well-known theorems on impedance networks have roughly analogous theorems in relay circuits. Notable among these are the delta-wye and star-mesh transformations, and the duality theorem.

The method of attack on these problems may be described briefly as follows: any circuit is represented by a set of equations, the terms of the equations corresponding to the various relays and switches in the circuit. A calculus is developed for manipulating these equations by simple mathematical processes, most of which are similar to ordinary algebraic algorisms. This calculus is shown to be exactly analogous to the calculus of propositions used in the symbolic study of logic. For the synthesis problem the desired characteristics are first written as a system of equations, and the equations are then manipulated into the form representing the simplest circuit. The circuit may then be immediately drawn from the equations. By this method it is always possible to find the simplest circuit containing only series and parallel connections, and in some cases the simplest circuit containing any type of connection.

Our notation is taken chiefly from symbolic logic. Of the many systems in common use we have chosen the one which seems simplest and most suggestive for our interpretation. Some of our phraseology, as node, mesh, delta, wye, etc., is borrowed from ordinary network theory for similar concepts in switching circuits.

Paper number 38-80, recommended by the AIEE committees on communication and basic sciences and presented at the AIEE summer convention, Washington, D. C., June 20–24, 1938. Manuscript submitted March 1, 1938; made available for preprinting May 27, 1938.

CLAUDE E. SHANNON is a research assistant in the department of electrical engineering at Massachusetts Institute of Technology, Cambridge. This paper is an abstract of a thesis presented at MIT for the degree of master of science. The author is indebted to Doctor F. L. Hitchcock, Doctor Vannevar Bush, and Doctor S. H. Caldwell, all of MIT, for helpful encouragement and criticism.

II. Series-Parallel Two-Terminal Circuits

FUNDAMENTAL DEFINITIONS AND POSTULATES

We shall limit our treatment to circuits containing only relay contacts and switches, and therefore at any given time the circuit between any two terminals must be either open (infinite impedance) or closed (zero impedance). Let us associate a symbol X_{ab} or more simply X, with the terminals a and b. This variable, a function of time, will be called the hindrance of the two-terminal circuit a-b. The symbol 0 (zero) will be used to represent the hindrance of a closed circuit, and the symbol 1 (unity) to represent the hindrance of an open circuit. Thus when the circuit a-b is open $X_{ab} = 1$ and when closed $X_{ab} = 0$. Two hindrances X_{ab} and X_{cd} will be said to be equal if whenever the circuit a-b is open, the circuit c-d is open, and whenever a-b is closed, c-d is closed. Now let the symbol + (plus) be defined to mean the series connection of the two-terminal circuits whose hindrances are added together. Thus $X_{ab} + X_{cd}$ is the hindrance of the circuit a-d when b and c are connected together. Similarly the product of two hindrances $X_{ab} \cdot X_{cd}$ or more briefly $X_{ab}X_{cd}$ will be defined to mean the hindrance of the circuit formed by connecting the circuits a-b and c-d in parallel. A relay contact or switch will be represented in a circuit by the symbol in figure 1, the letter being the corresponding hindrance function. Figure 2 shows the interpretation of the plus sign and figure 3 the multiplication sign. This choice of symbols makes the manipulation of hindrances very similar to ordinary numerical algebra.

It is evident that with the above definitions the following postulates will hold:

Postulates

1. a. $0 \cdot 0 = 0$ — A closed circuit in parallel with a closed circuit is a closed circuit.
   b. $1 + 1 = 1$ — An open circuit in series with an open circuit is an open circuit.
2. a. $1 + 0 = 0 + 1 = 1$ — An open circuit in series with a closed circuit in either order (i.e., whether the open circuit is to the right or left of the closed circuit) is an open circuit.
   b. $0 \cdot 1 = 1 \cdot 0 = 0$ — A closed circuit in parallel with an open circuit in either order is a closed circuit.
3. a. $0 + 0 = 0$ — A closed circuit in series with a closed circuit is a closed circuit.
   b. $1 \cdot 1 = 1$ — An open circuit in parallel with an open circuit is an open circuit.
4. At any given time either $X = 0$ or $X = 1$.

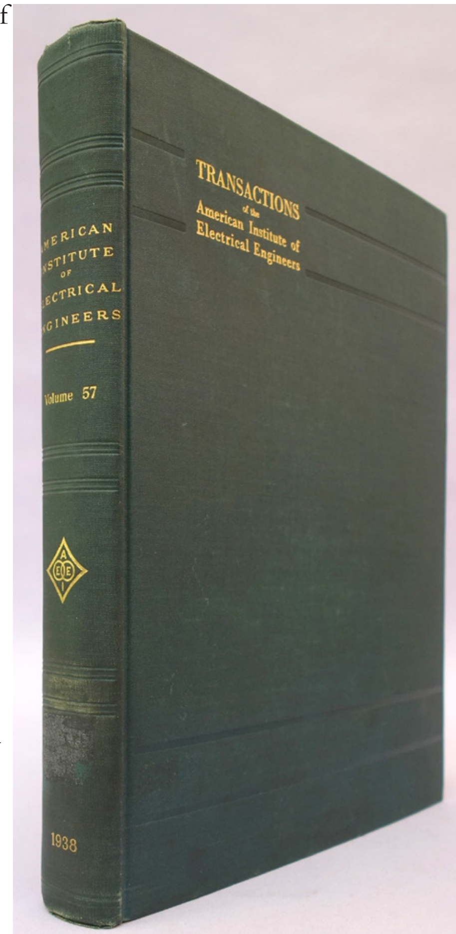
These are sufficient to develop all the theorems which will be used in connection with circuits containing only series and parallel connections. The postulates are arranged in pairs to emphasize a duality relationship between the operations of addition and multiplication and the quantities zero and one. Thus, if in any of the a postulates the zero's are replaced by one's and the multiplications by additions and vice versa, the corresponding b postulate will result. This fact is of great importance. It gives each theorem a dual theorem, it being necessary to prove only one to establish both. The only one of these postulates which differs from ordinary algebra is 1b. However, this enables great simplifications in the manipulation of these symbols.

1938, VOL. 57 — *Shannon—Relay Circuits* — 713

"The Most Important Master's Thesis of the Twentieth Century"

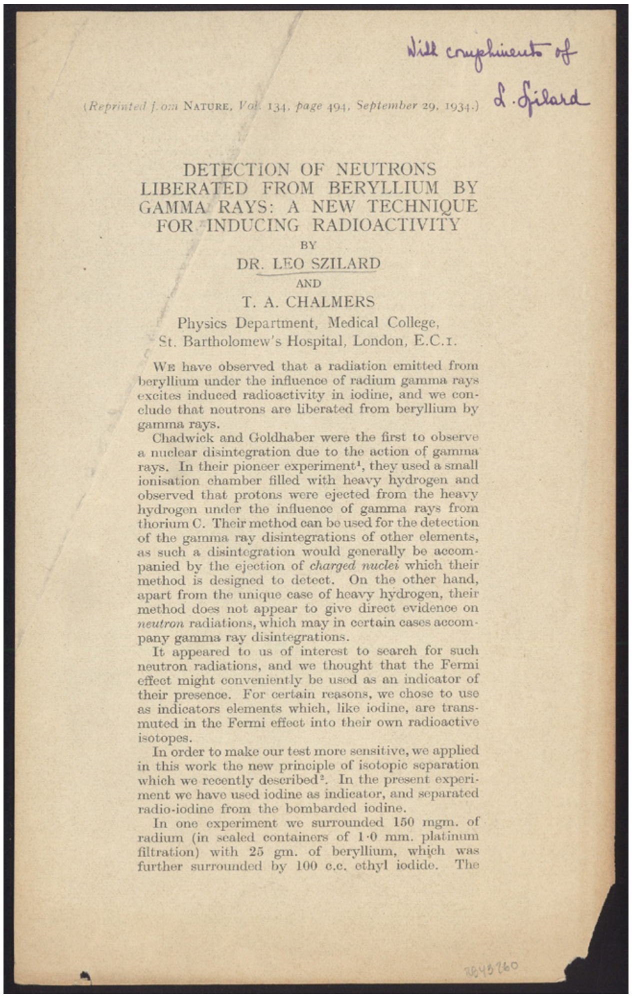
42. Shannon, Claude E. (1916–2001). A symbolic analysis of relay and switching circuits. In *Transactions of the American Institute of Electrical Engineers* 57 (1938): 713–23. Whole volume. [4], 806pp. 287 x 222 mm. Original dark blue publisher's cloth, library marking carefully removed from spine, very slight wear at extremities. Bookplate and withdrawal stamp of the Goodwyn Institute Library, slight offsetting from bookplate and stamp onto front free endpaper, small numerical stamp at foot of second leaf, but otherwise a fine, clean and probably unread copy. $16,500

First Edition. Claude Shannon's paper, described in a note on p. 713 as "an abstract of a thesis presented at MIT for the degree of Master of Science," has been frequently called the most important master's thesis of the twentieth century with respect to the influence it had on the development of the electronic and computer industries. Shannon obtained B.S. degrees in mathematics and engineering in 1936 from the University of Michigan, and later that year became a graduate student and research assistant at MIT's Department of Electrical Engineering, where he began working toward an advanced degree. As an undergraduate Shannon had studied symbolic logic and Boolean algebra, and while working with the Bush differential analyzer at MIT became interested in the machine's complex relay circuit that controlled the machine's operation. Recognizing that Boolean algebra was "the appropriate mathematics for studying such two-valued systems," Shannon "developed these ideas during the summer of 1937, which he spent at Bell Laboratories in New York City, and, back at MIT, in his master's thesis, where he showed how Boolean algebra could be used in the analysis and synthesis of switching and computer circuits. The thesis, his first published paper, aroused considerable interest when it appeared in 1938 . . . In 1940 it was awarded the Alfred Noble Prize of the combined engineering societies of the United States" (Shannon, pp. xii–xii). Shannon submitted this thesis in 1937 at the age of 21, only one year after Turing published *On Computable Numbers*.



In his thesis Shannon recognized that the true/false values in Boole's two-valued logic were analogous to the open and closed states of electrical circuits. From this it followed that Boolean algebra could be used to describe or to design electrical circuits. Boolean algebra, invented by George Boole in his *Mathematical Analysis of Logic* (1847) and *The Laws of Thought* (1854), makes it possible to devise a procedure or build a device, the state of which can store specific information. Once Shannon showed that electrical circuitry can perform logical and mathematical operations, and can also store the result of these operations, the inference could be drawn that it was possible to design calculating machines using electrical switches. When Shannon wrote his thesis he was thinking of electro-mechanical relays used as switches in telephone technology rather than vacuum tubes, though the same principles apply to both technologies.

In more than forty years of collecting and dealing in rare books on computing, we have never seen or heard of either an individual journal issue or an original separate offprint of Shannon's paper. The only copies we have previously handled were included in the 1938 clothbound volume of the Transactions. It was unusual at this time for a journal publisher to issue a volume in this original clothbound form; however it is very possible that for the year 1938 the publishers only supplied an annual volume rather than monthly issues. We note that the version of the 1938 volume digitized and online from the IEEE conforms to our version. The IEEE website shows digitized versions of monthly issues for certain other years, but not 1938. OCLC records a only later offprint of the paper, published in 1952 by E. C. Berkeley and Associates. *Claude Elwood Shannon: Collected Papers* [1993], xi–xii). Berkeley, *Giant Brains or Machines That Think* (1949), 248. Randell, *The Origins of Digital Computers* (1982), 509. *Origins of Cyberspace* 363. 43205



With compliments of L. Szilard

(*Reprinted from* NATURE, *Vol.* 134, *page* 494, *September* 29, 1934.)

DETECTION OF NEUTRONS LIBERATED FROM BERYLLIUM BY GAMMA RAYS: A NEW TECHNIQUE FOR INDUCING RADIOACTIVITY

BY

DR. LEO SZILARD

AND

T. A. CHALMERS

Physics Department, Medical College, St. Bartholomew's Hospital, London, E.C.1.

WE have observed that a radiation emitted from beryllium under the influence of radium gamma rays excites induced radioactivity in iodine, and we conclude that neutrons are liberated from beryllium by gamma rays.

Chadwick and Goldhaber were the first to observe a nuclear disintegration due to the action of gamma rays. In their pioneer experiment[1], they used a small ionisation chamber filled with heavy hydrogen and observed that protons were ejected from the heavy hydrogen under the influence of gamma rays from thorium C. Their method can be used for the detection of the gamma ray disintegrations of other elements, as such a disintegration would generally be accompanied by the ejection of *charged nuclei* which their method is designed to detect. On the other hand, apart from the unique case of heavy hydrogen, their method does not appear to give direct evidence on *neutron* radiations, which may in certain cases accompany gamma ray disintegrations.

It appeared to us of interest to search for such neutron radiations, and we thought that the Fermi effect might conveniently be used as an indicator of their presence. For certain reasons, we chose to use as indicators elements which, like iodine, are transmuted in the Fermi effect into their own radioactive isotopes.

In order to make our test more sensitive, we applied in this work the new principle of isotopic separation which we recently described[2]. In the present experiment we have used iodine as indicator, and separated radio-iodine from the bombarded iodine.

In one experiment we surrounded 150 mgm. of radium (in sealed containers of 1·0 mm. platinum filtration) with 25 gm. of beryllium, which was further surrounded by 100 c.c. ethyl iodide. The

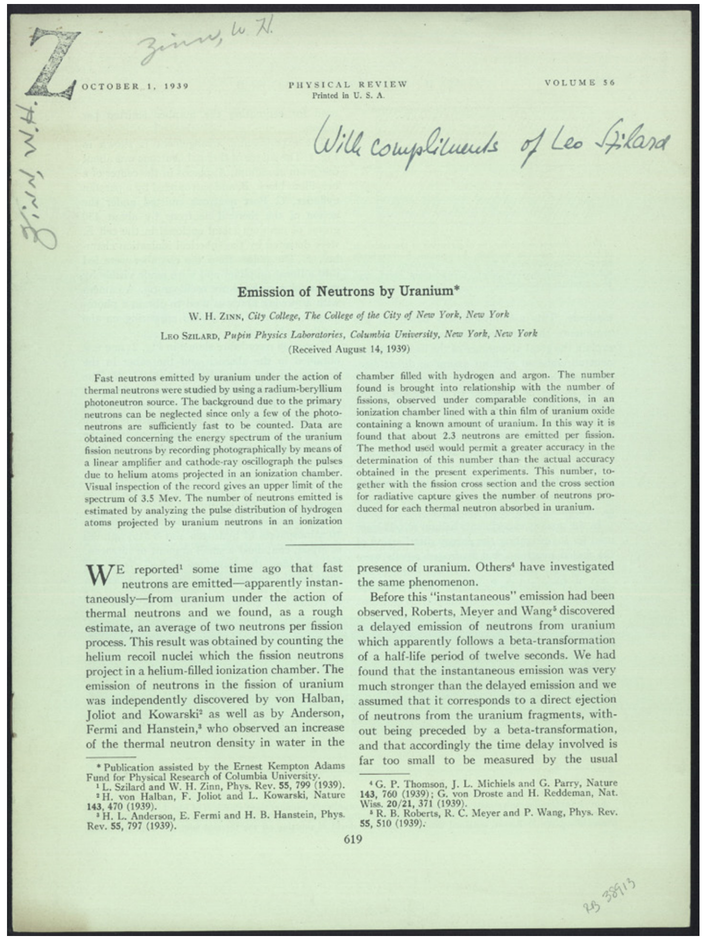
43. Szilard, Leo (1898-1964) and **Thomas A. Chalmers.** Detection of neutrons liberated from beryllium by gamma rays: A new technique for inducing radioactivity. Offprint from *Nature* 134 (Sept. 29, 1934). Single sheet, unbound. [2]pp. 216 x 134 mm. Crease in upper left corner, lower right corner chipped, light toning but very good. *Presentation Copy,* inscribed in the upper right corner in an unidentified hand: "With compliments of L. Szilard." $2750

First Edition, Offprint Issue. In 1933, after fleeing from Germany to England to escape the Nazis, Hungarian theoretical physicist Leo Szilard came up with the idea of the nuclear chain reaction while crossing a street in London. He filed his first patent on the chain reaction in March 12, 1934 and that summer, in collaboration with T. A. Chalmers, he began a series of experiments on the beryllium nucleus using radium owned by the physics department at St. Bartholomew's Hospital Medical College.

> The beryllium nucleus was so lightly bound [Szilard] suspected he could knock neutrons out of it not only with alpha particles or neutrons but even with gamma rays or high-energy X rays . . . Their first experiment demonstrated a brilliantly simple method for separating isotopes of iodine by bombarding an iodine compound with neutrons. They then used this Szilard-Chalmers effect (as it came to be called), which was extremely sensitive, as a tool for measuring the production of neutrons in their second experiment: knocking neutrons out of beryllium using the gamma radiation from radium (Rhodes, *The Making of the Atomic Bomb*, p. 215).

The results of this second experiment are described in the present offprint. To Szilard's disappointment, beryllium proved to be an unsuitable candidate for chain reaction; it was not until 1939, after the discovery of nuclear fission, that Szilard and Enrico Fermi were able to produce a nuclear chain reaction in uranium. The first self-sustaining nuclear chain reaction—which made possible the atomic bomb—was accomplished by Fermi and his associates in 1942. 43260

44. Szilard, Leo (1898-1964) and **Walter H. Zinn** (1906-2000). Emission of neutrons by uranium. Offprint from *Physical Review* 56 (1939). 619-624pp. Text illustrations. 268 x 201 mm. Without wrappers as issued. Light toning but very good. *Presentation Copy,* inscribed "With Compliments of Leo Szilard" in an unidentified hand on first page. From the library of **Theodore von Kármán** (1881-1963), docketed and stamped with Kármán's cataloguing symbols. $2750



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Zinn, W. H.

Zinn, W.H.

OCTOBER 1, 1939 PHYSICAL REVIEW Printed in U. S. A. VOLUME 56

With compliments of Leo Szilard

Emission of Neutrons by Uranium*

W. H. Zinn, *City College, The College of the City of New York, New York*

Leo Szilard, *Pupin Physics Laboratories, Columbia University, New York, New York*

(Received August 14, 1939)

Fast neutrons emitted by uranium under the action of thermal neutrons were studied by using a radium-beryllium photoneutron source. The background due to the primary neutrons can be neglected since only a few of the photoneutrons are sufficiently fast to be counted. Data are obtained concerning the energy spectrum of the uranium fission neutrons by recording photographically by means of a linear amplifier and cathode-ray oscillograph the pulses due to helium atoms projected in an ionization chamber. Visual inspection of the record gives an upper limit of the spectrum of 3.5 Mev. The number of neutrons emitted is estimated by analyzing the pulse distribution of hydrogen atoms projected by uranium neutrons in an ionization chamber filled with hydrogen and argon. The number found is brought into relationship with the number of fissions, observed under comparable conditions, in an ionization chamber lined with a thin film of uranium oxide containing a known amount of uranium. In this way it is found that about 2.3 neutrons are emitted per fission. The method used would permit a greater accuracy in the determination of this number than the actual accuracy obtained in the present experiments. This number, together with the fission cross section and the cross section for radiative capture gives the number of neutrons produced for each thermal neutron absorbed in uranium.

We reported[1] some time ago that fast neutrons are emitted—apparently instantaneously—from uranium under the action of thermal neutrons and we found, as a rough estimate, an average of two neutrons per fission process. This result was obtained by counting the helium recoil nuclei which the fission neutrons project in a helium-filled ionization chamber. The emission of neutrons in the fission of uranium was independently discovered by von Halban, Joliot and Kowarski[2] as well as by Anderson, Fermi and Hanstein,[3] who observed an increase of the thermal neutron density in water in the presence of uranium. Others[4] have investigated the same phenomenon.

Before this "instantaneous" emission had been observed, Roberts, Meyer and Wang[5] discovered a delayed emission of neutrons from uranium which apparently follows a beta-transformation of a half-life period of twelve seconds. We had found that the instantaneous emission was very much stronger than the delayed emission and we assumed that it corresponds to a direct ejection of neutrons from the uranium fragments, without being preceded by a beta-transformation, and that accordingly the time delay involved is far too small to be measured by the usual

* Publication assisted by the Ernest Kempton Adams Fund for Physical Research of Columbia University.

[1] L. Szilard and W. H. Zinn, Phys. Rev. **55**, 799 (1939).

[2] H. von Halban, F. Joliot and L. Kowarski, Nature **143**, 470 (1939).

[3] H. L. Anderson, E. Fermi and H. B. Hanstein, Phys. Rev. **55**, 797 (1939).

[4] G. P. Thomson, J. L. Michiels and G. Parry, Nature **143**, 760 (1939); G. von Droste and H. Reddeman, Nat. Wiss. **20/21**, 371 (1939).

[5] R. B. Roberts, R. C. Meyer and P. Wang, Phys. Rev. **55**, 510 (1939).

619

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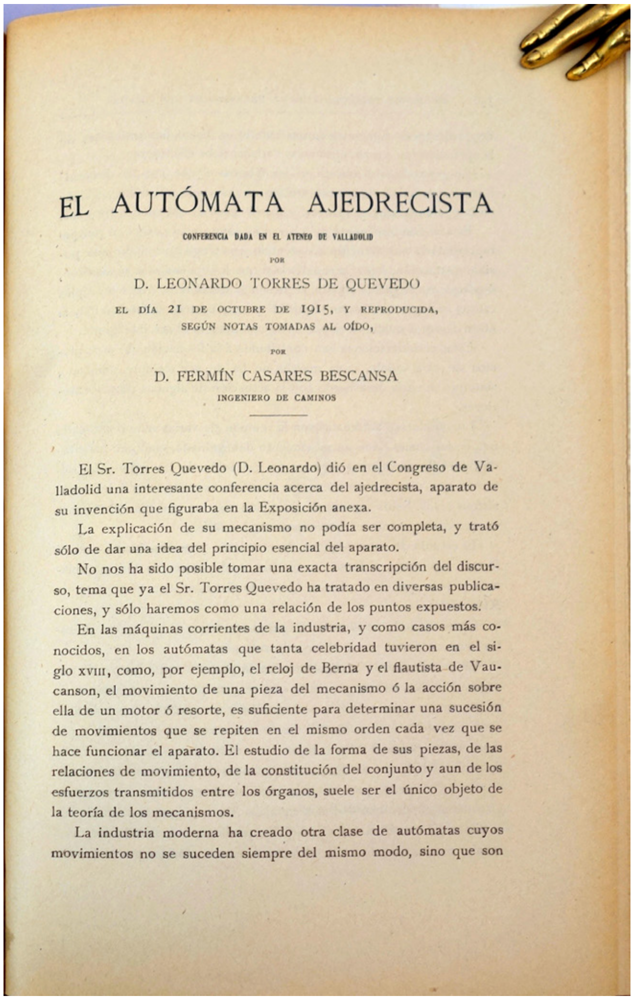
First Edition, Offprint Issue. The second of Szilard and Zinn's two important papers on the experimental production of fast neutrons from uranium—an essential component of the nuclear chain reaction. Hahn and Strassmann had discovered nuclear fission in 1938, and Szilard immediately realized that fission would be the key to releasing nuclear energy. In that year Szilard had emigrated from England to the United States, and he began a series of experiments with Walter Zinn at Columbia University in New York to determine which characteristics of fission would make it possible to establish a chain reaction.

> "All we needed to do," [Szilard] said later, "was to get a gram of radium, get a block of beryllium, expose a piece of uranium to the neutrons which come from the beryllium, and then see by means of the ionization chamber which Zinn had built whether fast neutrons were emitted in the process . . ."
>
> He got his radium, two grams sealed in a small brass capsule, early in March, after he arranged admission to the Columbia laboratories for three months as a guest researcher. He and Zinn immediately set up their experiment. They made an ingenious nest, like Chinese boxes, of its various components: a large cake of paraffin wax, the beryllium cylinder set at the bottom of a blind hole in the paraffin, the radium capsule fitted into the beryllium cylinder; resting on the beryllium, inside the paraffin, a box lines with neutron-absorbing cadmium filled with uranium oxide; pushed into that box, but shielded from the radium's gamma radiation by a lead plug, the ionization tube itself, which connected to an oscilloscope. With this arrangement . . . they could measure the flux of neutrons from the uranium with and without the cadmium shield . . . (Rhodes, *The Making of the Atomic Bomb*, pp. 288; 291).

Szilard and Zinn found that about two neutrons were emitted per fission, which matched the results of similar experiments conducted at the same time by Fermi and Anderson at Columbia and by Frédéric Joliot and his colleagues in France. He and Zinn announced their findings in a brief paper ("Instantaneous emission of fast neutrons in the interaction of slow neutrons with uranium," *Physical Review* 55 [April 1939]: 799-800), and six months later issued the present paper describing their further experiments.

This copy of Szilard and Zinn's paper is from the library of Hungarian physicist Theodore von Kármán (1881-1963), founder of the Jet Propulsion Laboratory, who made fundamental advances in the fields of aerodynamics and astronautics. Wigner, *Leo Szilard 1898-1964: A Biographical Memoir* (1969). 38913



EL AUTÓMATA AJEDRECISTA

CONFERENCIA DADA EN EL ATENEO DE VALLADOLID

POR

D. LEONARDO TORRES DE QUEVEDO

EL DÍA 21 DE OCTUBRE DE 1915, Y REPRODUCIDA,
SEGÚN NOTAS TOMADAS AL OÍDO,

POR

D. FERMÍN CASARES BESCANSA

INGENIERO DE CAMINOS

El Sr. Torres Quevedo (D. Leonardo) dió en el Congreso de Valladolid una interesante conferencia acerca del ajedrecista, aparato de su invención que figuraba en la Exposición anexa.

La explicación de su mecanismo no podía ser completa, y trató sólo de dar una idea del principio esencial del aparato.

No nos ha sido posible tomar una exacta transcripción del discurso, tema que ya el Sr. Torres Quevedo ha tratado en diversas publicaciones, y sólo haremos como una relación de los puntos expuestos.

En las máquinas corrientes de la industria, y como casos más conocidos, en los autómatas que tanta celebridad tuvieron en el siglo XVIII, como, por ejemplo, el reloj de Berna y el flautista de Vaucanson, el movimiento de una pieza del mecanismo ó la acción sobre ella de un motor ó resorte, es suficiente para determinar una sucesión de movimientos que se repiten en el mismo orden cada vez que se hace funcionar el aparato. El estudio de la forma de sus piezas, de las relaciones de movimiento, de la constitución del conjunto y aun de los esfuerzos transmitidos entre los órganos, suele ser el único objeto de la teoría de los mecanismos.

La industria moderna ha creado otra clase de autómatas cuyos movimientos no se suceden siempre del mismo modo, sino que son

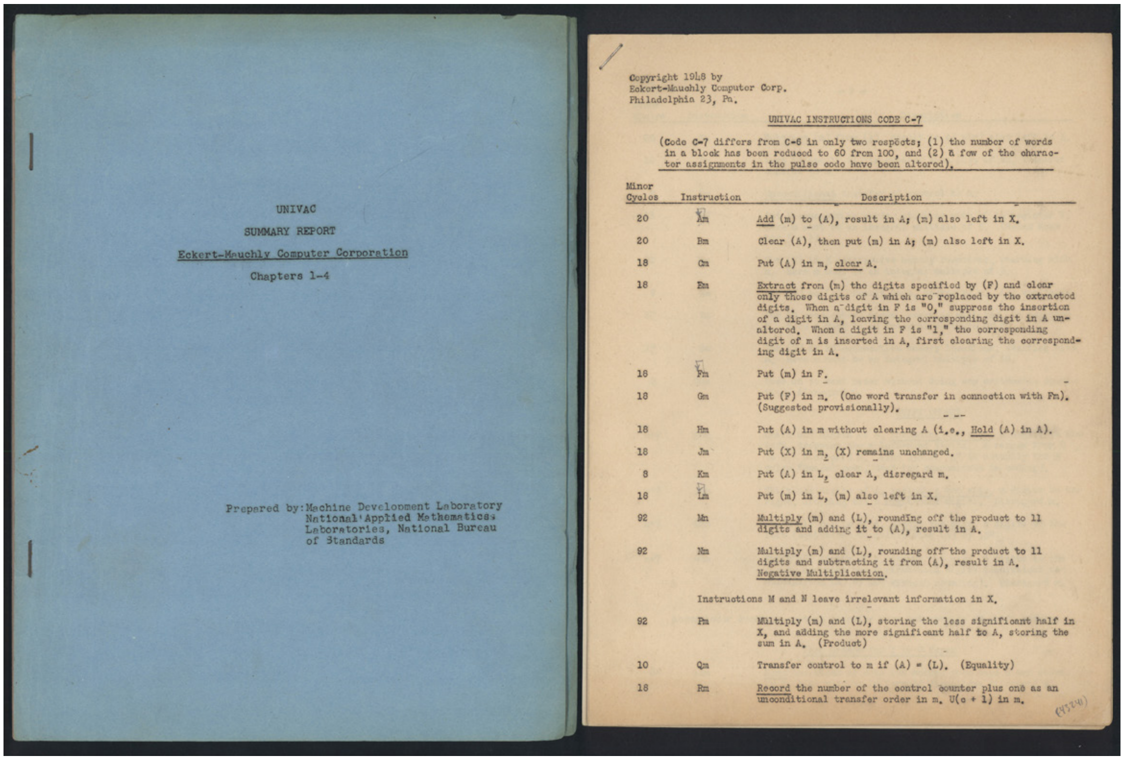
The First Genuine Chess-Playing Automaton

45. Torres y Quevedo, Leonardo (1852-1936). El autómata ajedrecista. Extract from *Asociación Española para el Progreso de las Ciencias, Congreso de Valladolid*, Vol. 2 (1915). 549-556pp. Text diagrams. Madrid: Imprenta de Fortanet, [1915]. 245 x 159 mm. Modern boards, original printed wrappers bound in. Light toning, library stamps on rectos and versos of wrappers. Very good.

$1750

First Edition, and very rare. Torres y Quevedo, a Spanish engineer, invented the first genuine chess-playing automaton, which he completed in 1911 and debuted in 1914 at the Paris World's Fair. The machine, which Torres y Quevedo called "El Ajedrecista" (the chess-player), pitted the white king and rook against the black king; it was fully automatic with electrical sensing of the pieces on the board and a mechanical arm to move its own pieces. The present paper describing the machine, published in the proceedings of the Asociación Española para el Progreso de las Ciencias' Congreso de Valladolid (1915), contains several diagrams illustrating the machine's electromechanical setup.

A pioneer of automation, Torres y Quevedo invented several analog algebraic equation solvers, a radio-control system and a prototype electromechanical calculating machine. His inventions "looked beyond assembly lines to the industrial use of programmed machines. To prove that machines could do jobs that seemed to require mental ability, [Torres y Quevedo] combined electromechanical calculating techniques with his principles of automata, and showed how a machine could be assembled to perform any desired sequence of arithmetic operations" (Eames and Eames, *A Computer Perspective: Background to the Computer Age,* p. 66). 43239

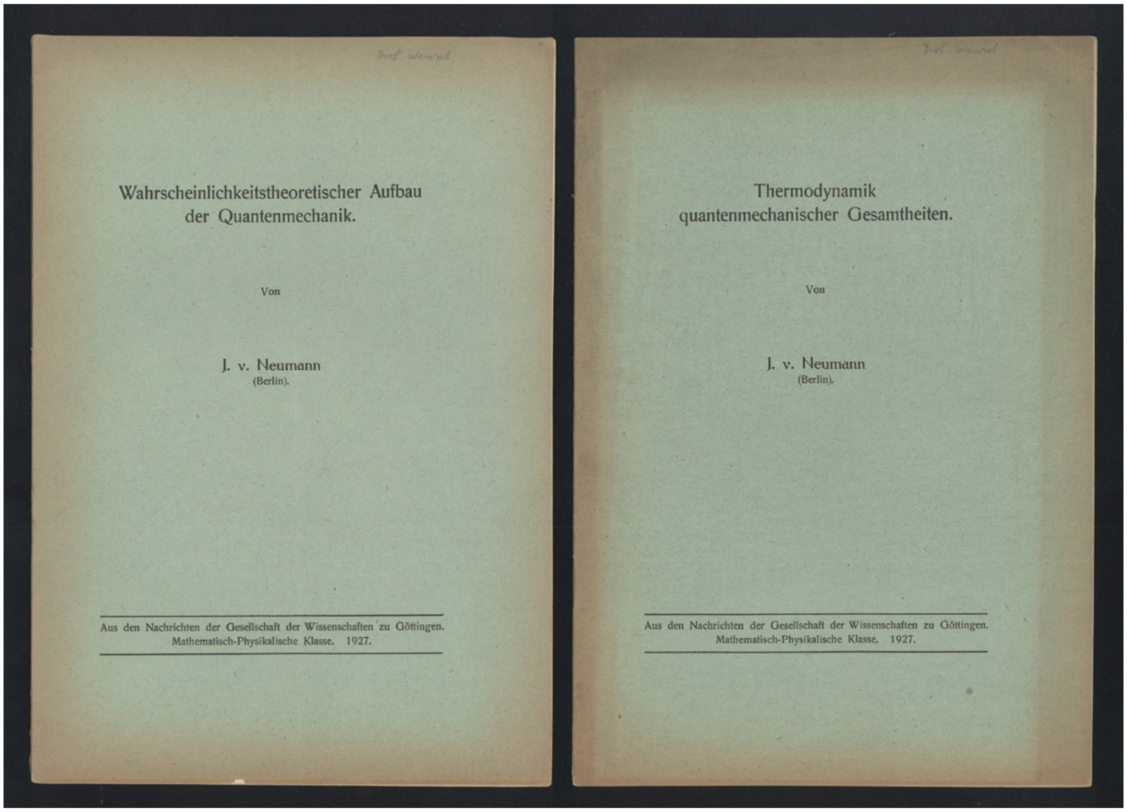


Two of the Earliest Reports on the Development of the UNIVAC and its Software

46. UNIVAC. (1) UNIVAC summary report. Eckert-Mauchly Computer Corporation, chapters 1 – 4. Mimeographed typescript. [1], 28ff. N.p., n.d. [1948]. 268 x 200 mm. Original printed wrappers (wrappers measure 280 x 216 mm.), edges a little frayed, a few rust-stains. Some marginal pencil annotations by a former owner. (2) UNIVAC instructions code C-7. Mimeographed typescript. 9ff., including full-page mimeographed diagram. A few tiny marginal tears; a few pencil annotations by former owner. Together 2 items. Very good. $9500

First Editions. In late September 1946, Eckert and Mauchly's fledgling Electronic Control Company formally contracted to supply the United States Census Bureau with an electronic digital computer, an event that marks the beginning of the commercial computer industry. Since the Census Bureau was forbidden by law to enter into any research and development contracts, a complex financing arrangement was worked out between ECC (renamed the Eckert-Mauchly Computer Corporation in 1947), the Census Bureau, and the National Bureau of Standards in which the money was funneled via the Census Bureau to the NBS, which then used it to fund the development of the machine. The design and construction of this computer—the first UNIVAC I—took longer than anticipated, largely due to the Eckert-Mauchly Computer Corporation's continuing financial difficulties. The Census Bureau did not take possession of its computer until 1951, by which time the EMCC had become a subsidiary of Remington Rand.

No. (1) "is a summary of a report on the UNIVAC prepared by the Eckert-Mauchly Computer Corporation (Electronic Control Company) and transmitted to the National Bureau of Standards in November, 1947" (first leaf). The summary, prepared by the NBS's Machine Development Laboratory, includes descriptions of the UNIVAC's equipment and basic engineering design principles, as well as a copy of version C-6 of the UNIVAC's instruction codes "valid as of April 1948" (p. 7). As the name indicates, C-6 was the sixth revision of the machine's initial instruction code C-1, devised in 1947. The code went through at least one more revision—C-7—in 1948, which is included here (no. [2]). "Code C-7 differs from C-6 in only two respects; (1) the number of words in a block have been reduced to 60 from 100, and (2) a few of the character assignments in the pulse code have been altered" (p. 1). Both of these reports are *extremely rare*. *Origins of Cyberspace* 1135 (C-7). 43241

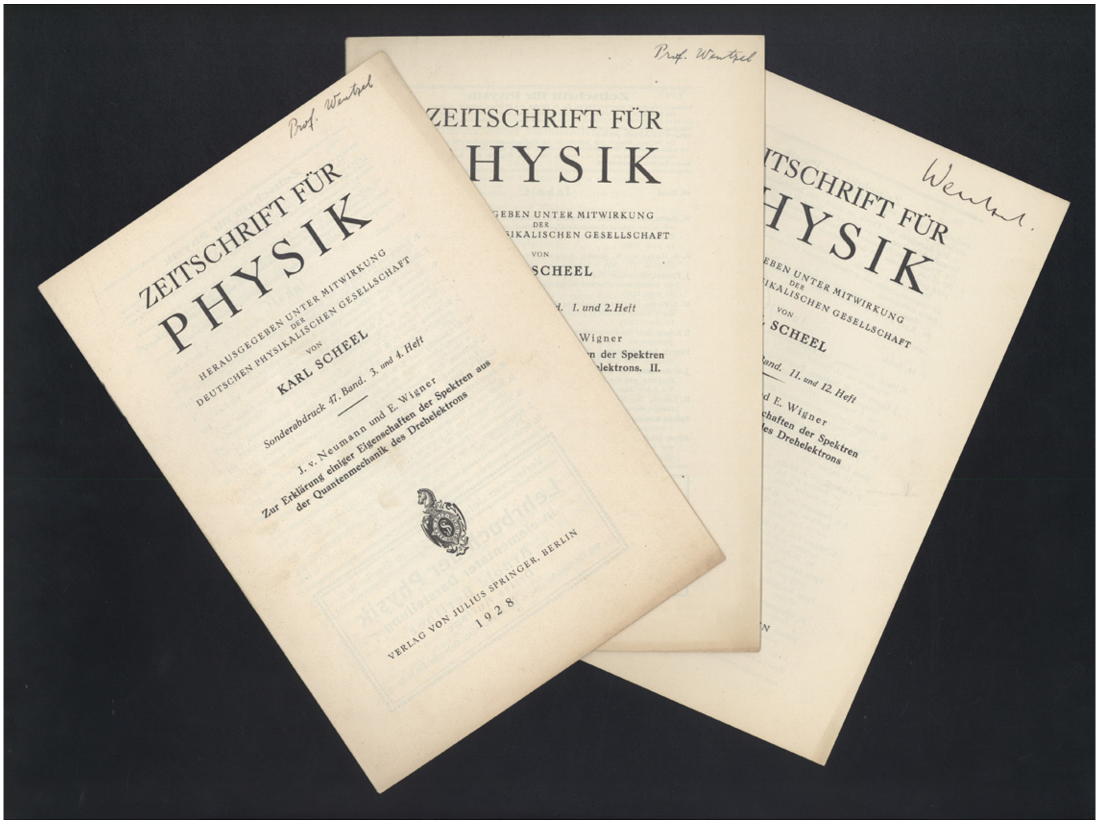


Mathematical Foundations of Quantum Mechanics

47. Von Neumann, John (1903–57). **(1)** Wahrscheinlichkeitstheoretischer Aufbau der Quantenmechanik. Offprint from Nachrichten der Gesellschaft der Wissenschaften zu Göttingen, Math.-Phys. Klasse (1927). [2], 245–272pp. **(2)** Thermodynamik quantenmechanischer Gesamtheiten. Offprint from Nachrichten der Gesellschaft der Wissenschaften zu Göttingen, Math.-Phys. Klasse (1927). 273–291pp. Together 2 offprints. Original printed wrappers, light vertical creases, margins a little browned. Very good. From the library of physicist Gregor Wentzel (1898–1978), with his name in an unidentified hand on the front wrappers. $4500

First Editions, Offprint Issues. Von Neumann was "the principal hero" (Mehra & Rechenberg, *The Historical Development of Quantum Theory,* 6, p. 431) among those who established the mathematical foundations of quantum mechanics in the 1920s and 1930s. On November 11, 1927 these two fundamental papers by von Neumann were presented to the Göttingen Academy of Sciences. In the first paper, titled "Probability-theoretical formulation of quantum mechanics," von Neumann "formulate[d] in a concise mathematical language the concept of measurement and the statistical connection between different measurements in quantum mechanics. In particular, he determined in some detail what were the measurements in 'pure' systems, in 'mixed' systems, and in 'elementary disordered' systems . . . *One must indeed admire the keen insight of the young mathematician, who in a single stroke sketched and completed the probability-theoretical formulation of quantum mechanics*" (Mehra & Rechenberg, 6, pp. 434–435; emphasis ours).

In the second paper, "Thermodynamics of quantum mechanical ensembles," von Neumann "[laid] the foundation of a consistent quantum-mechanical thermodynamics" (Mehra & Rechenberg, 6, p. 430). "The analysis carried out in [this paper] introduced the concept of an ensemble of systems which are not necessarily all in the same quantum state. The statistical matrix (now called ρ-matrix although von Neumann's notation was U) has become one of the magic tools of quantum physics, and it is through this contribution that von Neumann's name became familiar to even the least mathematically minded physicist" (Van Hove, p. 97). Van Hove, "Von Neumann's contributions to quantum theory," *Bulletin of the American Mathematical Society* 64 (1958): 95–99. 43271



48. **Von Neumann, John** (1903-57) and **Eugene Wigner** (1902-95). Zur Erklärung einiger Eigenschaften der Spektren aus der Quantenmechanik des Drehelektrons [Parts I – III]. Together three offprints from *Zeitschrift für Physik* 47, Heft 3 – 4 (1928); 49, Heft 1 – 2 (1928); and 51, Heft 11 – 12 (1928). 203-220; 73-94; 844-858pp. 230 x 158 mm. Original printed self-wrappers, faint soiling and spotting. Fine. From the library of physicist Gregor Wentzel (1898-1978), with his name in an unidentified hand on the front wrappers of the first two parts and his signature on the front wrapper of the third part.

$3750

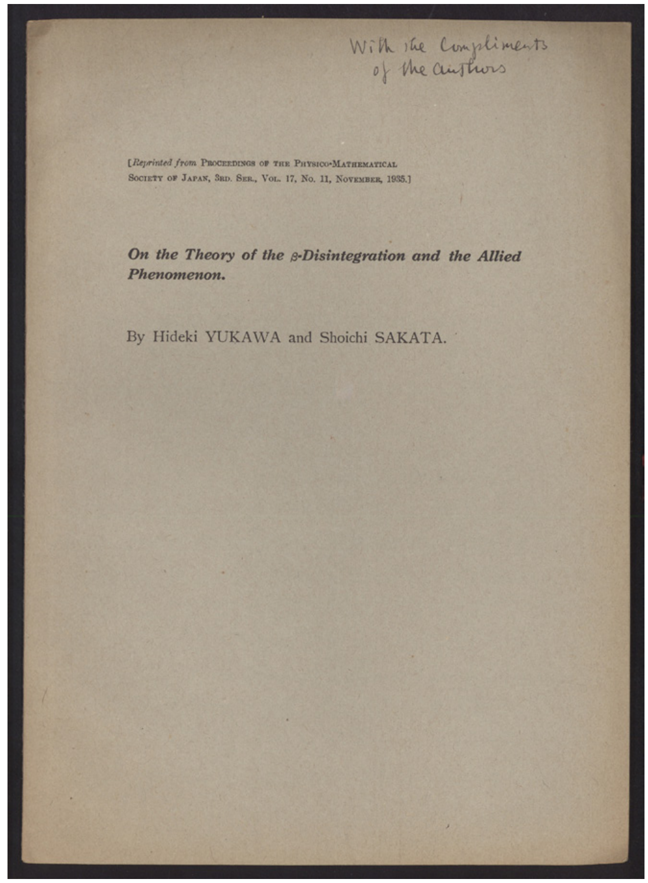
First Editions, Offprint Issues. Wigner, who won a share of the 1963 Nobel Prize in physics for his application of fundamental symmetry principles to the theory of the atomic nucleus, introduced group-theoretical mathematical methods into quantum mechanics. He began with a paper published in 1927 ("Über nichtkombinierende Terme in der neueren Quantentheorie, zweiter Teil," not present here), in which

> some rules of term zoology were deduced, but the [electron] spin was still left out of account. *In the [1928] papers of von Neumann and Wigner, the whole apparatus of group characters and representations was put into action and the complete system of term zoology, including selection rules, intensity formulae [and] Stark effect was developed* (Van der Waerden, quoted in Mehra & Rechenberg, *The Historical Development of Quantum Theory*, 6, p. 488; emphasis ours).

"Von Neumann and Wigner wished—by exploiting the elementary symmetry of atomic systems (notably, the identity of all electrons and the equality of all space directions) and the specific spin-property of the electron—*to derive essentially the complete spectroscopic structure of atoms*" (Mehra & Rechenberg, 6, pp. 496-497; emphasis ours). The papers were largely Wigner's work, but he included his good friend von Neumann as co-author in gratitude for von Neumann's having introduced him to the works of F. G. Frobenius and Issai Schur on group theory.

Both nos. 46 and 47 in this catalogue are from the library of theoretical physicist Gregor Wentzel, who also made contributions to quantum mechanics; he is best known for the Wentzel-Kramers-Brillouin approximation for finding approximate solutions to linear partial differential equations with spatially varying coefficients. 43270

The First Japanese Physicist to Win the Nobel Prize


With the Compliments of the authors

[Reprinted from Proceedings of the Physico-Mathematical Society of Japan, 3rd. Ser., Vol. 17, No. 11, November, 1935.]

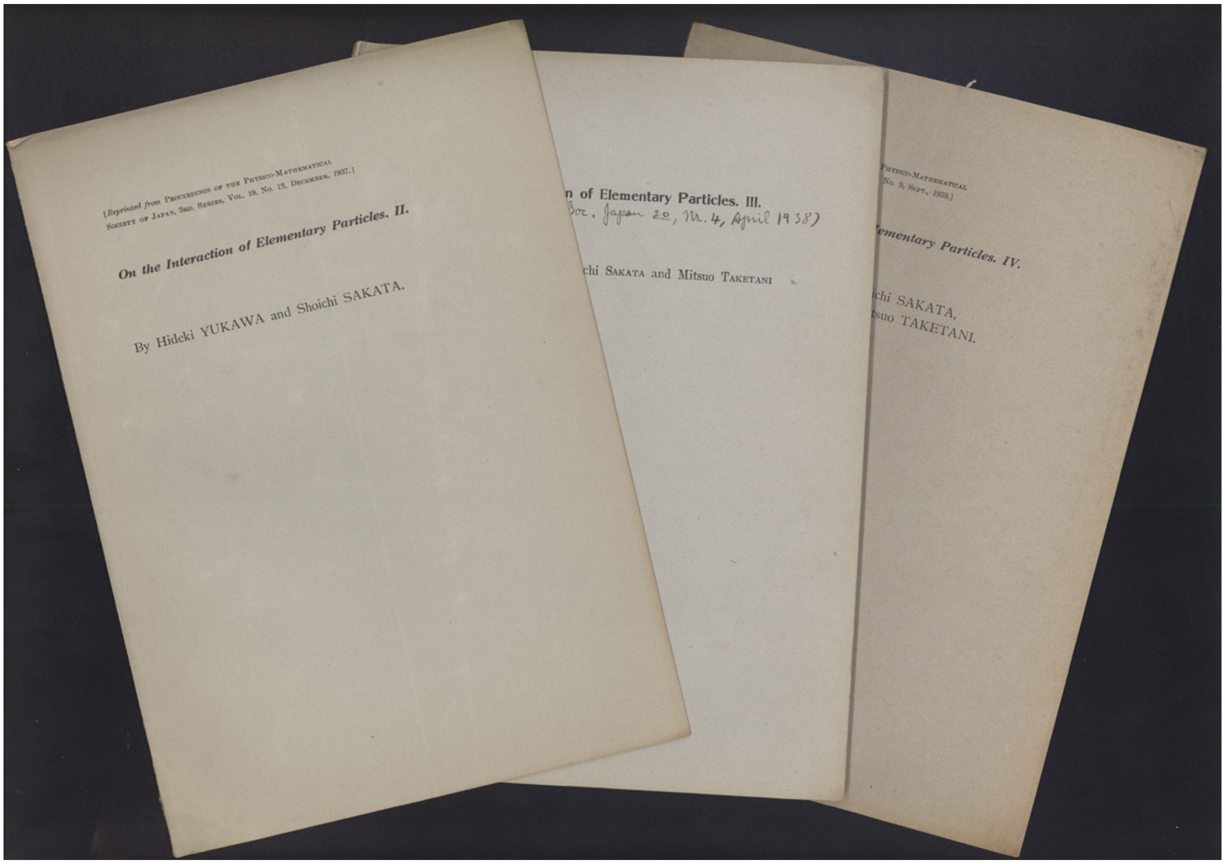
On the Theory of the β-Disintegration and the Allied Phenomenon.

By Hideki YUKAWA and Shoichi SAKATA.

49. Yukawa, Hideki (1907-81). **(1)** [with Shoichi Sakata] On the theory of the β-disintegration and the allied phenomenon. Offprint from *Proceedings of the Physico-Mathematical Society of Japan,* 3rd series, 17 (1935). 467-479pp. 260 x 188 mm. Original printed wrappers. *Presentation Copy,* inscribed "With the compliments of the authors" on the front wrapper. **(2)** [with Sakata] On the theory of internal pair production. Offprint from *Proceedings of the Physico-Mathematical Society of Japan,*, 3rd series, 17 (1935). 397-407pp. 260 x 188 mm. Original printed wrappers. *Presentation Copy,* inscribed "With the compliments of the authors" on the front wrapper. **(3)** On a possible interpretation of the penetrating component of the cosmic ray. Offprint from *Proceedings of the Physico-Mathematical Society of Japan,* 3rd series, 19 (1937). [1], 712-713pp. 271 x 195 mm. **(4)** [with Sakata, Mitsuo Taketani and Minoru Kobayasi] On the interaction of elementary particles II [-IV]. Parts II and IV are offprints from *Proceedings of the Physico-Mathematical Society of Japan*, 3rd series, 19 (1937) and 20 (1938); Part III is a mimeograph typescript bound similarly to the other two offprints. 1084-93; 35; 720-745pp. 260 x 188 mm. Original printed wrappers. Together 4 items in 5 parts. Spine of no. (3), Part III split at extremities, light vertical creasing. Light browning, but very good. $3750

First Editions, Offprint Issues. In October 1934 Yukawa, then a lecturer in physics at Osaka Imperial University, proposed a unified theory of nuclear forces in which a set of hypothetical particles—now known as mesons—was responsible for the force binding positively charged protons and neutral neutrons together in atomic nuclei. The following year Yukawa published "On the interaction of elementary particles" (not offered here), in which he set forth his meson theory, calculated the mass of the proposed particle (about 200 times that of the electron) and suggested that these particles might be present in cosmic rays. In 1936 Anderson and Neddermeyer reported anomalous cosmic-ray tracks made by particles intermediate in mass between the electron and proton; their observations were confirmed in early 1937 by several other cloud-chamber groups. In June 1937 Oppenheimer, Serber and Stueckelbert sent letters to the *Physical Review* calling attention to Yukawa's meson theory, and from then on its success, and that of its author, was assured. In 1949 Yukawa received the Nobel Prize for physics for his prediction of the existence of the meson.

Despite its later success Yukawa's meson theory attracted almost no attention in the two years following its announcement, largely because physicists were reluctant to accept the possibility of a new particle without direct observational confirmation. During this fallow period Yukawa published several joint papers with his student Shoichi Sakata on electromagnetic and nuclear phenomena. We are offering the first two of these joint papers in **rare offprint form** with even **rarer presentation inscriptions**. The paper on beta disintegration (no. [1] above]) is remarkable in that it contains the only other published reference to the meson prior to 1937. This paper includes "an important calculation of the inverse beta-decay process: the absorption of an orbital electron by a nucleus with the emission of a neutrino. [The paper] was noteworthy, not only because it was



the first to call attention to a new effect but also because *it was the first additional application of the meson theory* [emphasis ours] and thus showed that Yukawa and Sakata had faith in it" (*Dictionary of Scientific Biography* [Supplement]).

In 1936, heartened by Anderson and Neddermeyer's discovery of a new unidentified particle in cosmic rays, Yukawa returned to meson theory. (It should be noted that Anderson and Neddermeyer's particle, although widely assumed at the time to be the one predicted by Yukawa, is in fact a decay product of the Yukawa particle; Yukawa's particle, now called the pi-meson or pion, was discovered by Powell and Occhialini in 1947.) Yukawa wrote a letter to *Nature* that year calling attention to a possible connection between his postulated new particle and the puzzling cosmic-ray cloud chamber tracks observed by Anderson and Neddermeyer. Unfortunately, *Nature* rejected Yukawa's letter, but he was able to get a similar letter published the following year in *Proceedings of the Physico-Mathematical Society of Japan* (no. [3] above).

In 1937 and 1938 Yukawa and his students published three more fundamental papers on meson theory (no. [4] above). "On the interaction of elementary particles II" presents a scalar meson theory of nuclear forces based on the Pauli-Weisskopf method, and speculates on the possible existence of an additional electrically neutral "heavy quantum." Part III introduces what is now called "vector meson theory"; the fourth and final part completes the pioneering work begun by Yukawa four years earlier.

Curiously, our copy of Part III is a mimeograph typescript bound in wrappers similar to those of Parts II and IV but omitting the journal imprint information (this information is supplied in manuscript below the wrapper title in our copy). The typescript has a mimeograph label inside the back wrapper with the undated imprint of Teidai Print in Tokyo. OCLC does not list any copies of the separate edition of Part III; we do not know if a typeset offprint version also exists. Magill, ed., *The Nobel Prize Winners: Physics*, pp. 561-69. Mehra & Rechenberg, *The Historical Development of Quantum Theory*, 6, pp. 831-836; 946-958. *Twentieth Century Physics*, 1, pp. 378-392. Weber, *Pioneers of Science*, pp. 133-34. 43268

Afterword: Reflections on Fifty Years of Antiquarian Bookselling

That our 50th catalogue coincides almost exactly with the fiftieth anniversary of my first experiences in the antiquarian book trade is a convenient coincidence. It was in September or October 1964 that I reported for duty at Warren R. Howell's John Howell-Books in San Francisco at the age of 19 to take up a job as the assistant to the packing room clerk. The job paid the minimum wage, then $1.15 per hour. Thus began a career that retains its challenges and fascination 50 years later.

At this point nearly all of my clients are younger than me, and I am grateful that some actually share my opinion that in collecting experience is valuable and very difficult to obtain without being actively involved for extended periods of time. Thus consultation with experienced dealers remains worthwhile even in this increasingly impersonal world of ecommerce.

This catalogue is not a collection of high spots that we have been saving for a special occasion; it is mainly a grouping of some of the most significant items that have come into stock during the past six months.

How has the antiquarian book trade changed during the past 50 years? Some of the changes that come to mind are:

1. The growth of marketing ability of auction houses. Fifty years ago most book auctions were wholesale, with most descriptions brief, illustrations scarce, and dealers buying the majority of the books.
2. Increasingly selective buying by institutions. Fifty years ago American libraries especially were expanding their special collections at a rapid rate, sometimes buying entire catalogues. (This experience never happened to me.)
3. The Internet. This gives many buyers access to the same inventory as dealers, requiring dealers to be rather swift-footed and price-sensitive if they expect to make a profit. It also exposes our inventory to a geographical and economic range of buyers that was impossible in the past, and it has also made it possible for me to work very conveniently from home.
4. The increasing prices of high spots. Often several retail buyers and dealers chase the same books at auction, resulting in new price records for the finest copies of the most famous books. Conversely, if one is willing to collect a subject in depth it is now possible to fill in many items in subject collections, sometimes with little competition.
5. Offprints. During my experience we learned that scientific offprints, often printed in editions of about 25 copies, may be of the greatest rarity. With some exceptions, I have never handled more than one or two copies of major offprints. That measure of rarity applies to a number of the quantum physics and relativity offprints in this catalogue. These come from the estate of the historian of physics Jagdish Mehra. During the 1990s I purchased many offprints from Mehra that filled out the Harvey Plotnick collection. Since then there has only been a tiny supply of this material on the market, so the group offered in this catalogue is exceptional. Some of the items in this catalogue I could not obtain for Harvey Plotnick twenty years ago. Institutions tended to amplify the rarity of offprints by destroying donated collections, rather than cataloguing them, if they owned the journals in which the papers were published.

6. The rarity of special copies. Fifty or more years ago my father and I were able to collect a significant number of very fine, or presentation, association or even author's copies of landmarks in science and medicine, often paying a premium of only two or three times the price of an ordinary nice copy. During the 40 years we were collecting, so many remarkable copies became available that it was difficult to judge their rarity. Since the publication of the two-volume bibliography of his library in 1991 and the library's sale at auction in 1998, the rarity of special copies has become clear, and the premium paid for special copies has dramatically increased.

7. Electronic publication and distribution of catalogues on the Internet. Catalogue 50 is, of course, an example of this. Using electronic technology my associate for the past 30 years, Diana Hook, has written and published this catalogue in only about four weeks. My role has chiefly been in buying the material, in selecting what to include in the catalogue, pricing the material, taking a few photographs, and making mostly minor edits. That we have been able to issue this catalogue is in many ways a tribute to Diana's excellent work and her remarkable ability to continue to adapt old techniques to new markets and new technology.

Jeremy M. Norman

October 1, 2014