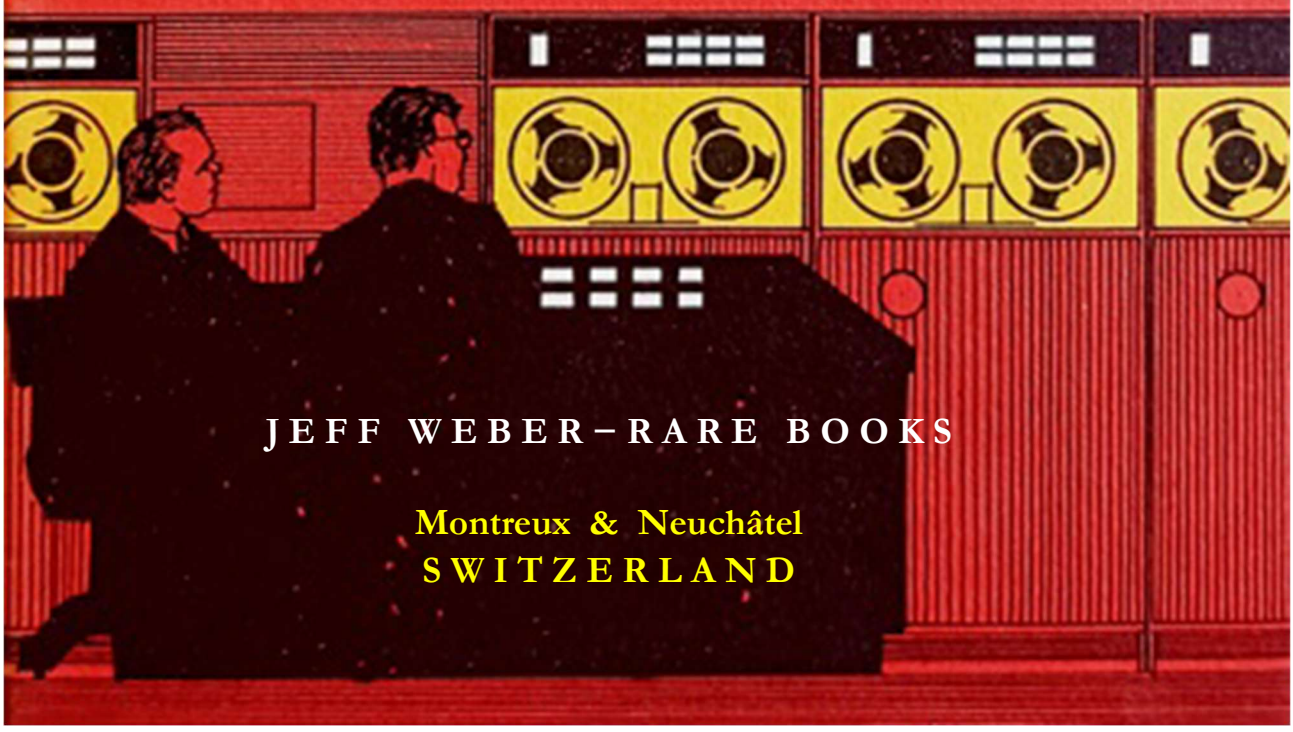
Catalogue 314

What's in a 

"Be yourself; everyone else is already taken."
– Oscar Wilde

Selections from Private Libraries
Relating to the Sciences



JEFF WEBER – RARE BOOKS

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Catalogue 314

What's in a 

"Be yourself; everyone else is already taken." – Oscar Wilde

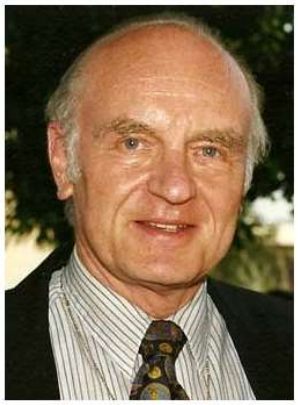
Selections from the Personal Libraries:
ROGER HAHN [French History of Science]

Professor of History, University of California, Berkeley
NORMAN HAROLD HOROWITZ [Genetics]
Geneticist, California Institute of Technology

DAVID CHARLES LINDBERG [Optics]
Hilldale Professor Emeritus of History of Science,
University of Wisconsin, Madison

'BRAM' PAIS [Physics]
Professor of Physics, Rockefeller University

HAHN



HOROWITZ

LINDBERG

PAIS

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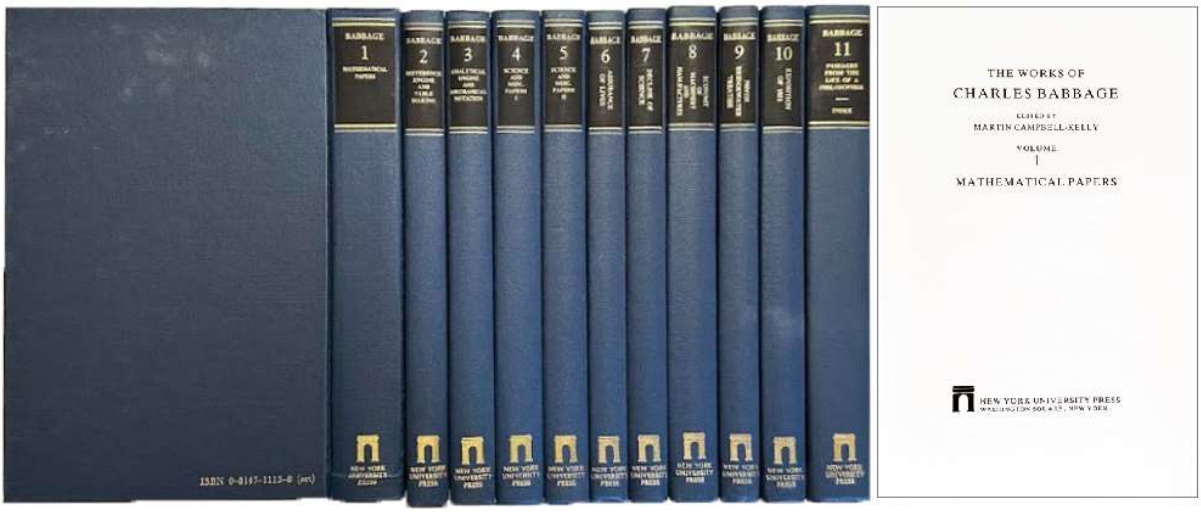
Part II: 'B' as in Books

Note: ITEMS LISTED ON-LINE, MANY WITH MORE PHOTOGRAPHS
WEBERRAREBOOKS.com



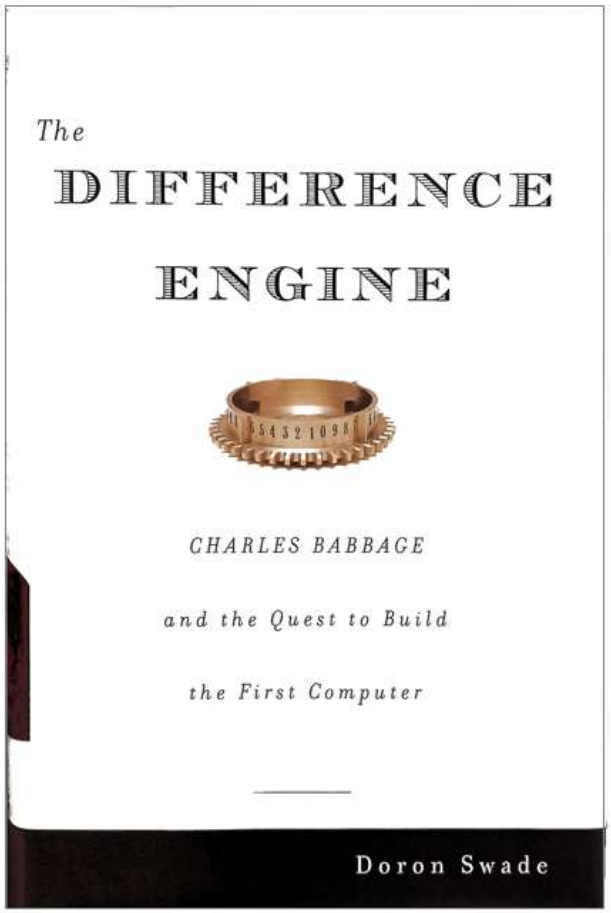
98. **BABBAGE, Charles** (1791-1871). *The Works of Charles Babbage. Edited by Martin Campbell-Kelly*. New York: New York University Press, 1989. ¶ 11 Volumes. 8vo. Figs., index. Full gilt stamped purplish-blue cloth. FINE. S7159

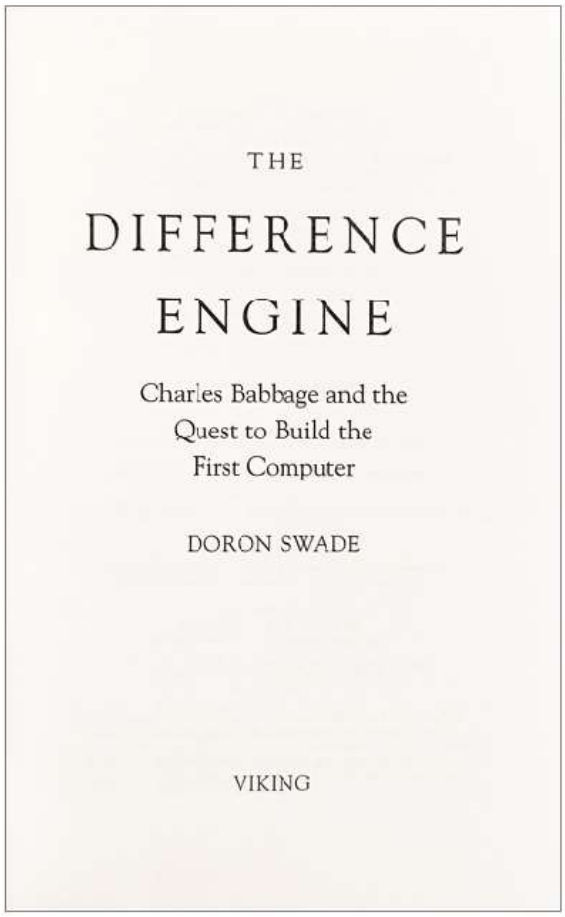
$ 800

The complete works of this pioneer mathematician and statistician. Babbage is the father of the modern computer, and worked tirelessly on advancing machinery to reduce human involvement. This comprehensive and attractive set includes all of his most celebrated papers on early calculating machines as well as many others that display the breadth of his talent and interests. *DSB*.

Babbage is considered by some to be "father of the computer". He is credited with inventing the first mechanical computer, the Difference Engine, that eventually led to more complex electronic designs, though all the essential ideas of modern computers are to be found in his Analytical Engine, programmed using a principle openly borrowed from the Jacquard loom. Babbage had a broad range of interests in addition to his work on computers covered in his 1832 book Economy of Manufactures and Machinery.

The editor, Martin Campbell-Kelly FCBS FLSW (c.1960-), Emeritus Professor at the University of Warwick, specializing in the history of computing.

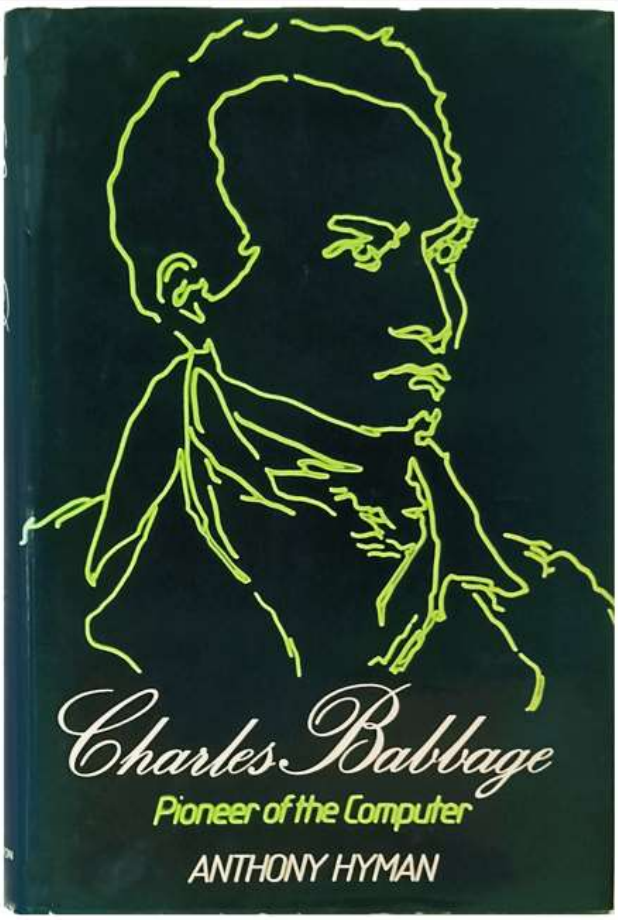


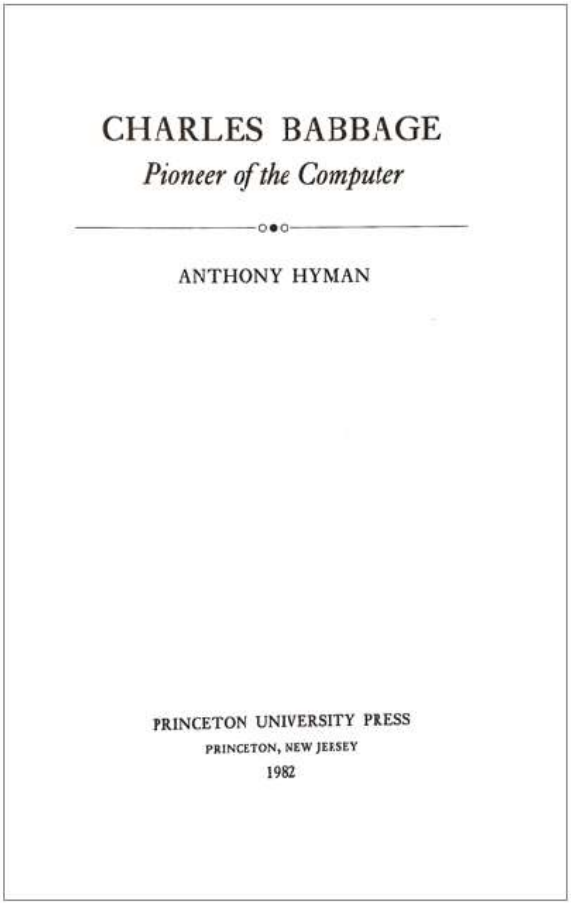


99. [**BABBAGE, Charles** (1791-1871)] **SWADE, Doron** (1944-). *The difference engine; Charles Babbage and the quest to build the first computer*. New York, etc.: Viking, 2000. ¶ 8vo. x, 342 pp. 42 figs. on plates, bibliog., index. Quarter cloth, dust-jacket. Fine. S6038

$ 10

The remarkable story of how Babbage tried to build a calculating engine, the precursor to the modern-day computer, which was (in fact) finally built to his designs in 1991. Doron Swade MBE, is a museum curator and author, specialising in the history of computing. He is especially known for his work on the computer pioneer Charles Babbage and his Difference Engine.




CHARLES BABBAGE

Pioneer of the Computer

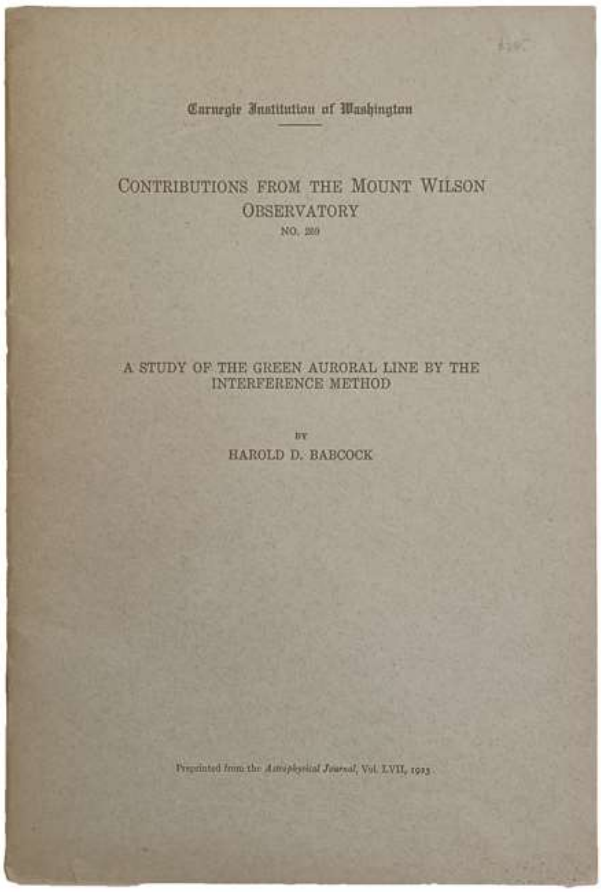
ANTHONY HYMAN

PRINCETON UNIVERSITY PRESS
PRINCETON, NEW JERSEY
1982

100. [**BABBAGE, Charles** (1791-1871)] **HYMAN, [Robert] Anthony** (1928-2011). *Charles Babbage: Pioneer of the Computer*. Princeton, NJ: Princeton University Press, 1982. ¶ 8vo. xv, 287 pp. Frontis. port. of Babbage, 21 plates, 18 figs. & drawings, index. Green cloth, gilt-stamped spine title, dust jacket. Embossed ownership stamp on half-title. Near fine. S10224

$ 25

Robert Anthony Hyman was a British historian of computing.



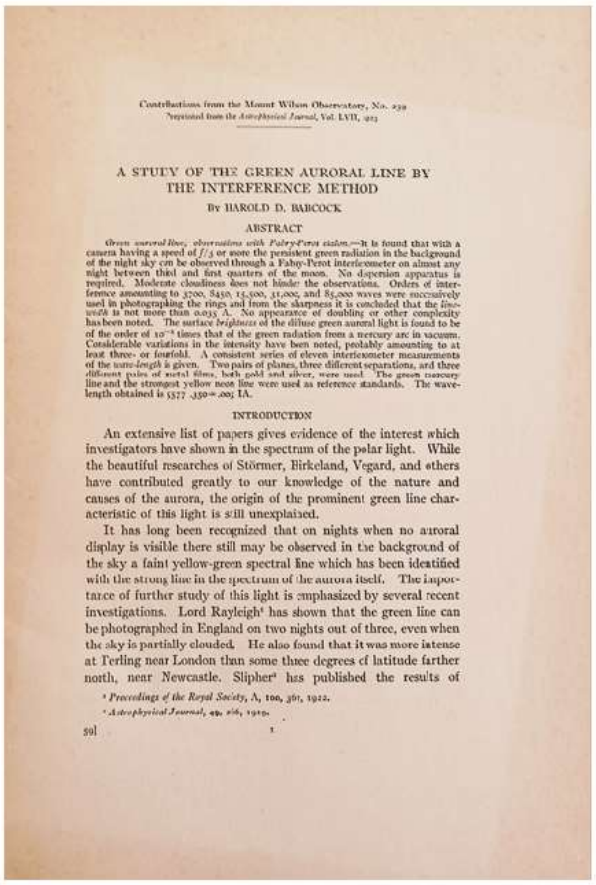
Carnegie Institution of Washington

CONTRIBUTIONS FROM THE MOUNT WILSON OBSERVATORY
NO. 259

A STUDY OF THE GREEN AURORAL LINE BY THE INTERFERENCE METHOD

BY
HAROLD D. BABCOCK

Preprinted from the *Astrophysical Journal*, Vol. LVII, 1923



Contributions from the Mount Wilson Observatory, No. 259
Preprinted from the *Astrophysical Journal*, Vol. LVII, 1923

A STUDY OF THE GREEN AURORAL LINE BY THE INTERFERENCE METHOD

By HAROLD D. BABCOCK

ABSTRACT

Green auroral line, observations with Fabry-Perot etalon.—It is found that with a camera having a speed of *f*/3 or more the persistent green radiation in the background of the night sky can be observed through a Fabry-Perot interferometer on almost any night between third and first quarters of the moon. No dispersion apparatus is required. Moderate cloudiness does not hinder the observations. Orders of interference amounting to 3700, 8450, 15,000, 31,000, and 85,000 waves were successively used in photographing the rings and from the sharpness it is concluded that the *line-width* is not more than 0.035 A. No appearance of doubling or other complexity has been noted. The surface *brightness* of the diffuse green auroral light is found to be of the order of 10^{-3} times that of the green radiation from a mercury arc in vacuum. Considerable variations in the intensity have been noted, probably amounting to at least three- or fourfold. A consistent series of eleven interferometer measurements of the *wave-length* is given. Two pairs of plates, three different separations, and three different pairs of metal films, both gold and silver, were used. The green mercury line and the strongest yellow neon line were used as reference standards. The wave-length obtained is 5577 .350±.003 IA.

INTRODUCTION

An extensive list of papers gives evidence of the interest which investigators have shown in the spectrum of the polar light. While the beautiful researches of Störmer, Birkeland, Vegard, and others have contributed greatly to our knowledge of the nature and causes of the aurora, the origin of the prominent green line characteristic of this light is still unexplained.

It has long been recognized that on nights when no auroral display is visible there still may be observed in the background of the sky a faint yellow-green spectral line which has been identified with the strong line in the spectrum of the aurora itself. The importance of further study of this light is emphasized by several recent investigations. Lord Rayleigh[1] has shown that the green line can be photographed in England on two nights out of three, even when the sky is partially clouded. He also found that it was more intense at Terling near London than some three degrees of latitude farther north, near Newcastle. Slipher[2] has published the results of

[1] *Proceedings of the Royal Society*, A, 100, 367, 1922.
[2] *Astrophysical Journal*, 49, 216, 1919.

591

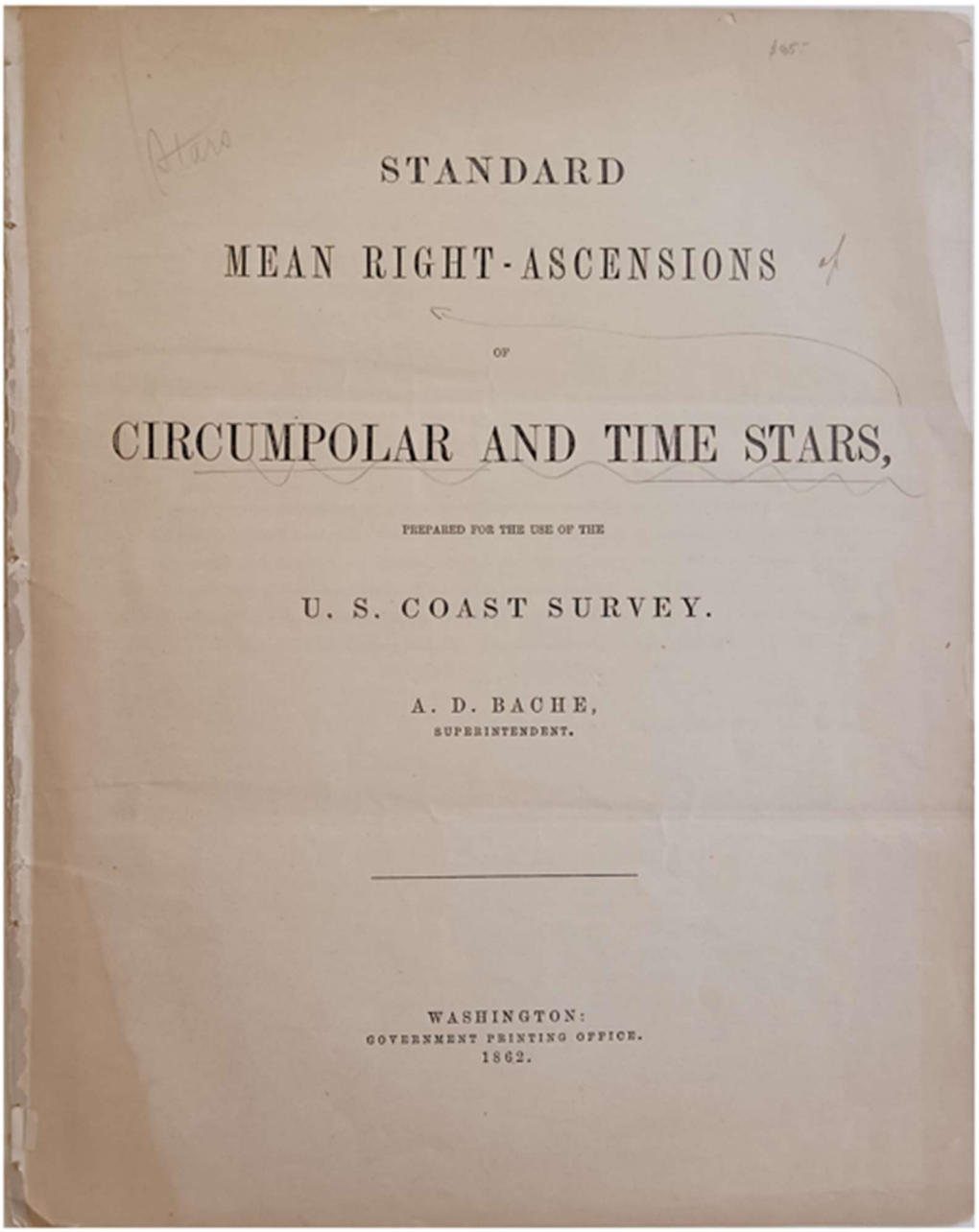
101. **BABCOCK, Harold Delos** (1882-1968). *"A study of the green auroral line by the interference method."* Preprint from: *Astrophysical Journal*, Vol. LVII, 1923. ¶ Series: *Contributions from the Mount Wilson Observatory*, No. 259. 253 x 171 mm. 8vo. 13 pp. 1 table, 2 plates. Printed wrappers. Fine. S5895

$ 20

"In 1923 Babcock used the interferometer techniques that he had developed to make the first precise measurement of the wavelength of the brightest but as yet unidentified line in the spectrum of the aurora—the well-known "green line." He achieved at least a one-hundred-fold increase in accuracy, showing that the line's wavelength was 5577.350 A and that its width was less than 0.035 A. This led to its identification as due to a forbidden transition in the oxygen atom." [Ira S. Bowen].

Harold Delos Babcock was an American astronomer. Babcock worked at the Mount Wilson Observatory (1907-1948), specializing in solar spectroscopy (with George Ellery Hale) and precisely mapped the distribution of magnetic fields over the Sun's surface. In 1953 he won the Bruce Medal.

See: Ira S. Bowen, *National Academy of Sciences*, *Memoir*, 1974.



STANDARD

MEAN RIGHT-ASCENSIONS

OF

CIRCUMPOLAR AND TIME STARS,

PREPARED FOR THE USE OF THE

U. S. COAST SURVEY.

A. D. BACHE,
SUPERINTENDENT.

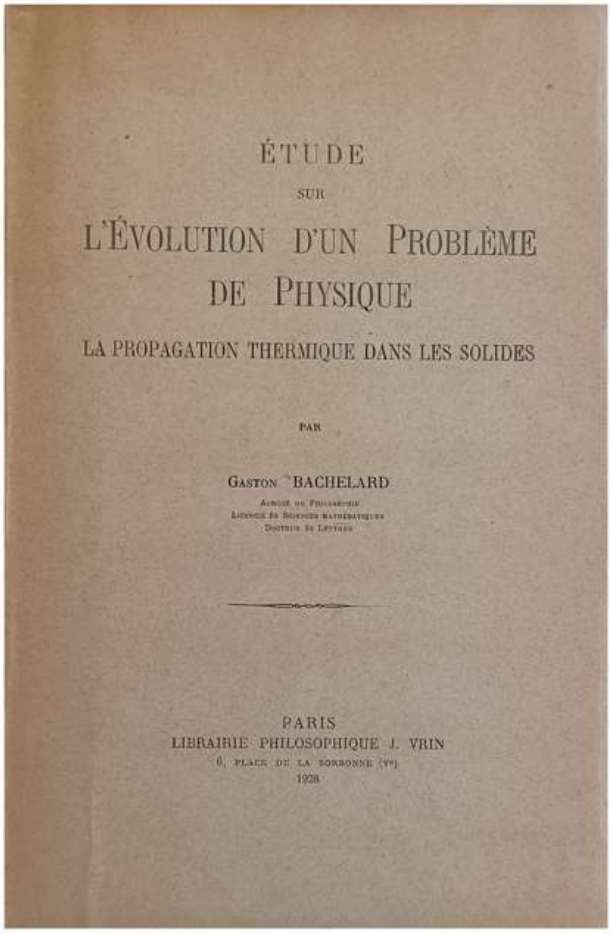
WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1862.

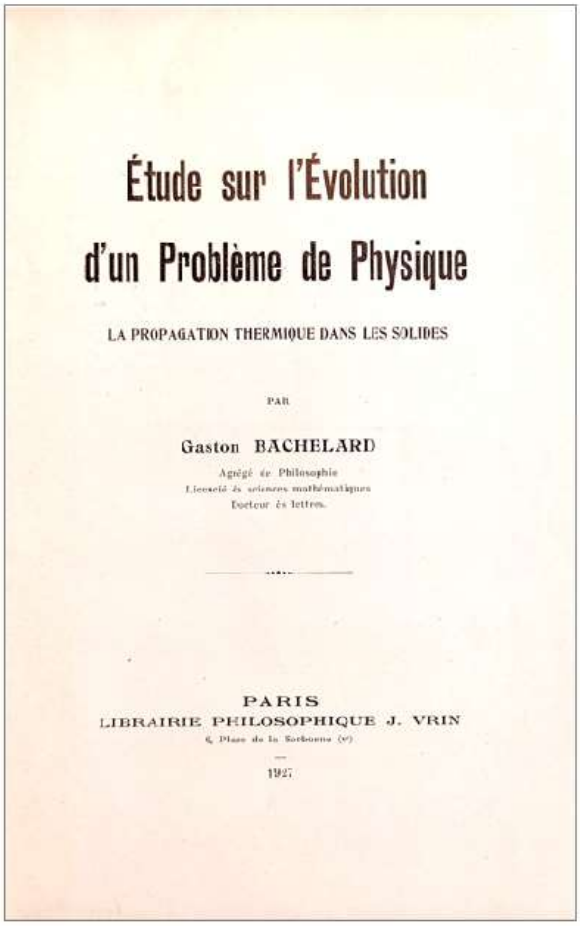
102. **BACHE, Alexander Dallas** (1806-1867). *Standard mean right-ascensions of circumpolar and time stars, prepared for the use of the U.S. Coast Survey.* Washington, D.C.: Government Printing Office, 1862. ¶ 4to. 15, [1 blank] pp. Tables. Dis-bound. Ms. notations on title. Very good. S6265

$ 35

"When Bache assumed direction of the Coast Survey, it was a small, insecurely established body with high scientific standards. In less than two decades it became entrenched, the largest employer of physical scientists in the United States, and active in many scientific fields. . .. Bache is clearly one of the founders of the scientific community in the United States. His administration of the Coast Survey

established a model for large-scale scientific organization that was followed either implicitly or explicitly by later groups." *DSB*, I, pp. 363-365.

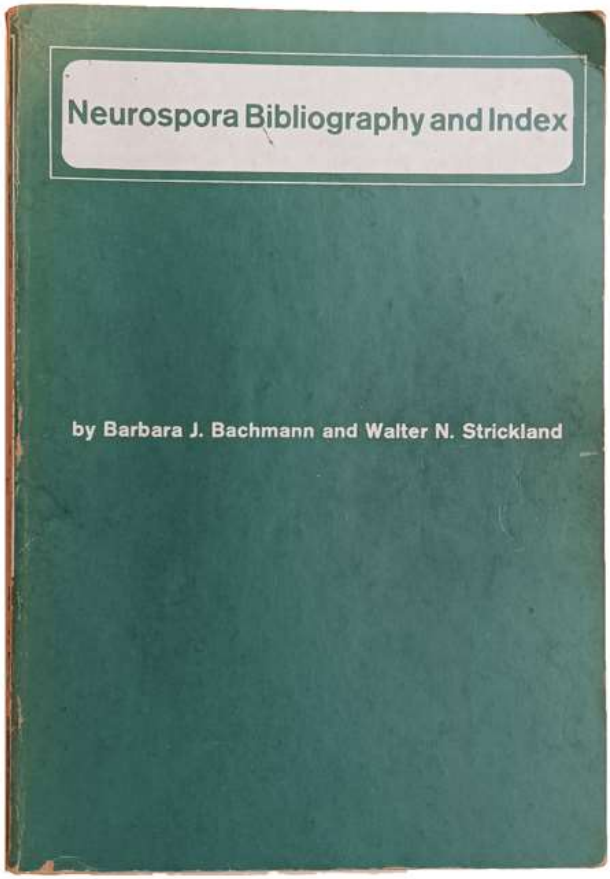


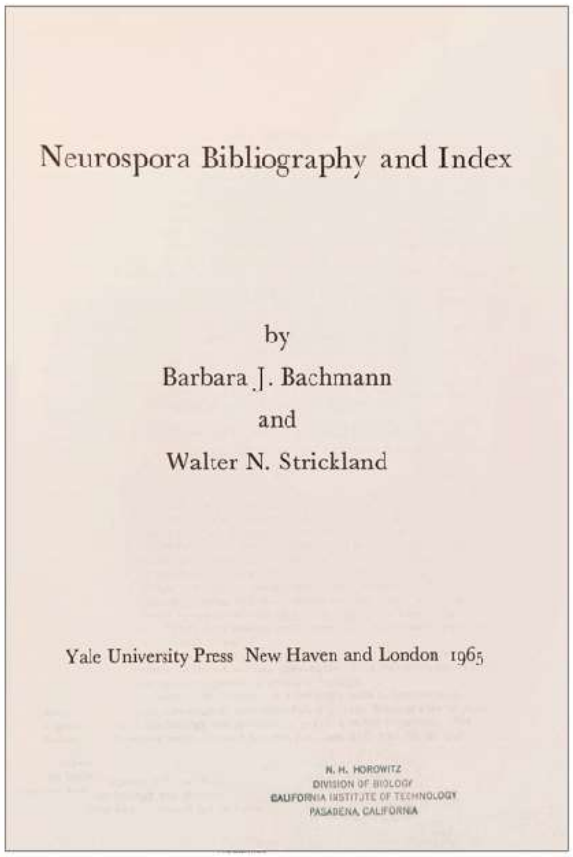


103. **BACHELARD, Gaston** (1884-1962). *Étude sur l'évolution d'un problème de physique : la propagation thermique dans les solides*. Paris: J. Vrin, 1927. ¶ 8vo. 182, [2] pp. Index; partially unopened. Original printed wrappers. Very good. From the library of Roger Hahn. RH1008

$ 20

To obtain his doctorate (doctorat ès lettres) in 1927, Bachelard wrote two theses: the main one, *Essai sur la connaissance approchée*, under the direction of Abel Rey, and the complementary one, *Étude sur l'évolution d'un problème de physique: la propagation thermique dans les solides*, supervised by Léon Brunschvicg.

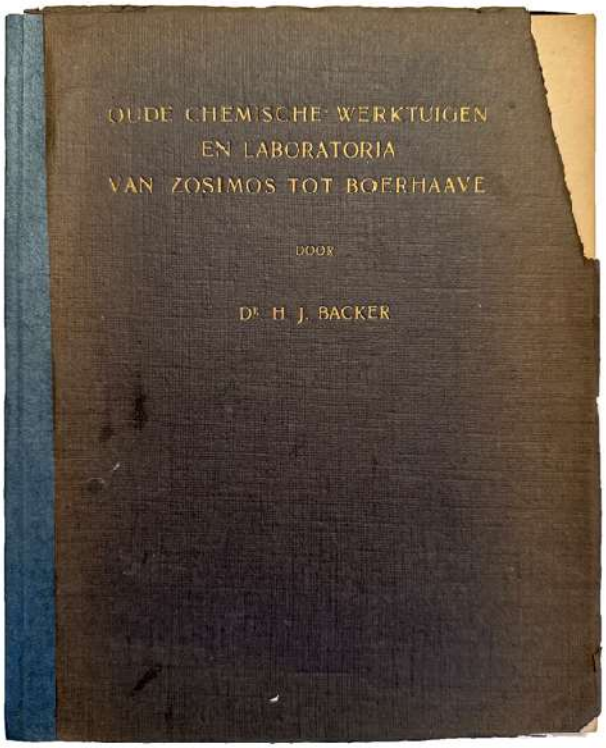




104. **BACHMANN, Barbara J. (Joyce)** (1924-1999); **Walter N. STRICKLAND**. *Neurospora Bibliography and Index.* New Haven: Yale University Press, 1965. ¶ 4to. vii, 225 pp. Printed wrappers; spine rubbed. Ownership rubber stamps of Norman Horowitz, California Institute of Technology. Very good. S7875

$ 10

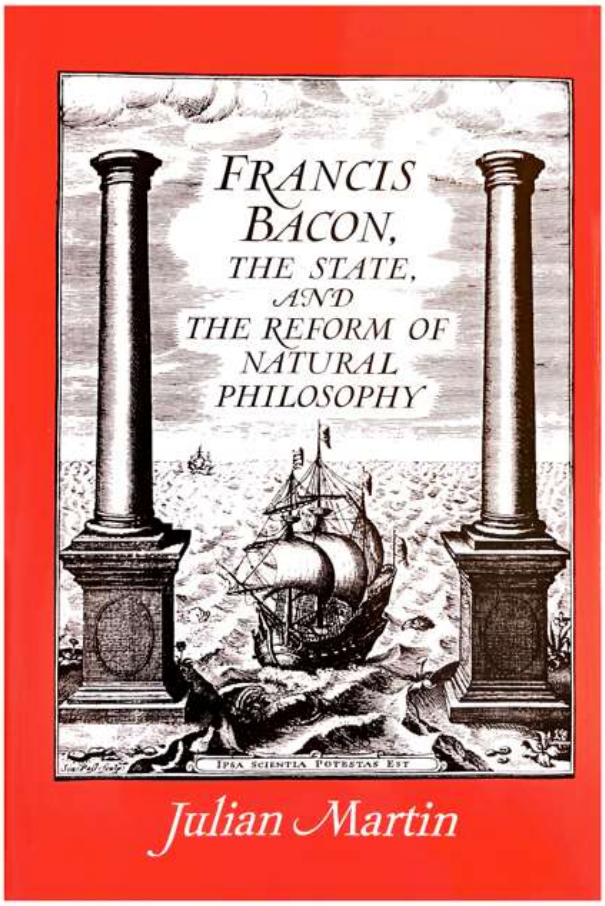
Bibliographic list of 2310 papers dealing with Neurospora. Barbara Joyce Bachmann was a lecturer at Yale University, UC Berkeley, Columbia and NYU, and is best known as director of the E. coli Genetic Stock Center and for publishing editions of the standard E. coli K-12 genetic linkage map. Walter N. Strickland was from the Dept. of Biological Sciences, Dartmouth College.

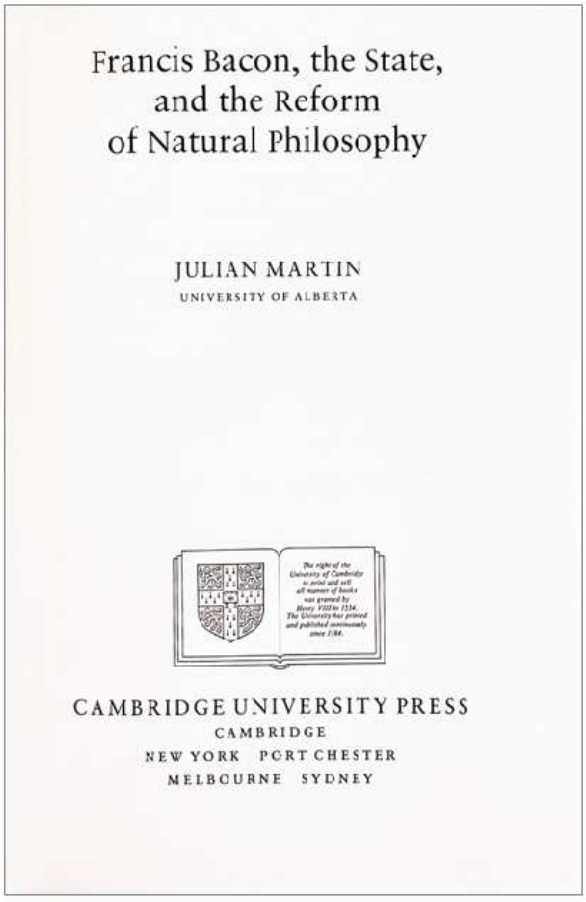


105. **BACKER, Hilmer Johannes** (1882-1959). *Oude Chemische Werktuigen en Laboratoria van Zosimos tot Boerhaave*. Groningen: Bij. J. B. Wolters', 1918. ¶ 8vo. Dutch text. 68 pp. 51 illus. Original black printed wrappers; spine mended, top corner chipped away. Early inscription. S2478

$ 20

'Ancient Chemical Tools and Laboratories from Zosimos to Boerhaave.' Backer was a Dutch university professor and chemist.



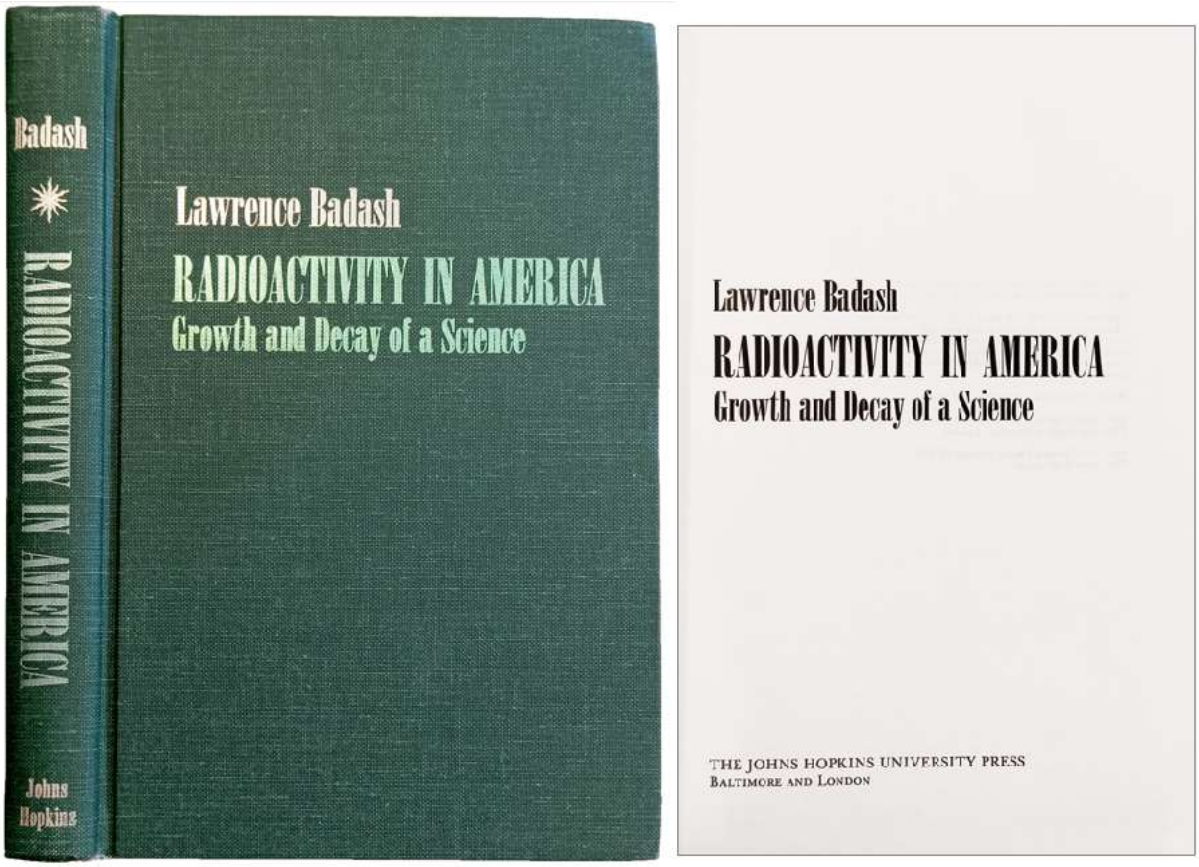


106. [**BACON, Francis** (1561-1626)] **Julian MARTIN**. *Francis Bacon, the State, and the Reform of Natural Philosophy*. Cambridge: Cambridge University Press, 1992. ¶ 8vo. xiii, 236 pp. Index. Cloth, dust-jacket. Ink ownership signature of David C. Lindberg. Fine. Scarce. DL1020

$ 28.95

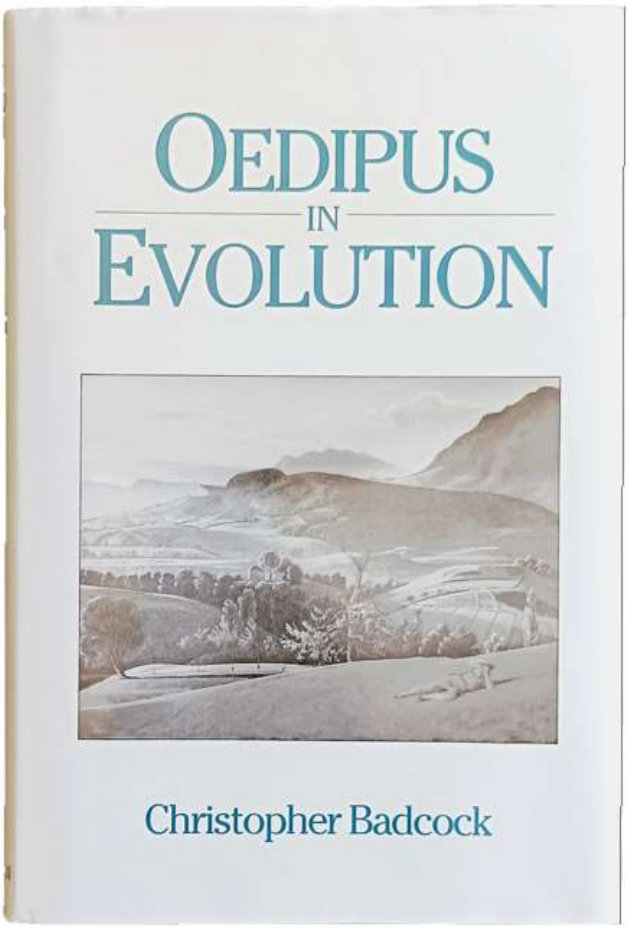
Why was it that Francis Bacon, trained for high political office, devoted himself to proposing a celebrated and sweeping reform of the natural sciences? Julian Martin's investigative study looks at Bacon's family context, his employment in Queen Elizabeth's security service and his radical critique of the relationship between the Common Law and the monarchy, to find the key to this important question. Deeply conservative and elitist in his political views, Bacon adapted Tudor strategies of State management and bureaucracy, the social anxieties and prejudices of the late Elizabethan governing elite, and a principal intellectual resource of the English governing classes - the Common Law - into a novel vision and method for the sciences. Bacon's axiom that 'Knowledge is Power' takes on far-reaching implications in Martin's challenging argument that the reform of natural philosophy was a central part of an audacious plan to strengthen the powers of the Crown in the State. [publisher].

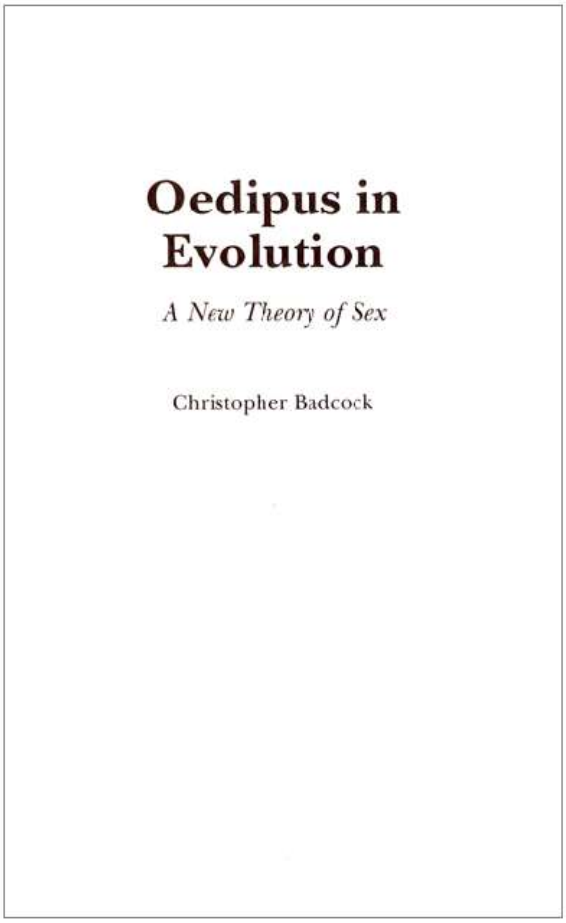
PROVENANCE: David C. Lindberg (1935-2015) was an American historian of science. His main focus was on the history of medieval and early modern science, especially physical science and the relationship between religion and science. Lindberg was the Hilldale Professor Emeritus of History of Science and past director of the Institute for Research in the Humanities, at the University of Wisconsin, Madison.



107. **BADASH, Lawrence** (1934-2010). *Radioactivity in America; growth and decay of a science*. Baltimore: Johns Hopkins University Press, (1979). ¶ 8vo. [xix], 327 pp. Illus., index. Silver and metallic-green-stamped green cloth. Fine. S12398 $ 20

Lawrence Badash, UCSB professor emeritus, was an American professor of the history of physical sciences, specializing in the history of physics, particularly the history of nuclear physics and nuclear weapons. "Larry's early writing focused on the career of Ernest Rutherford, "the greatest experimental physicist since Faraday," who is also recognized as the father of nuclear physics. Exploring Rutherford's career and papers required a combination of historical expertise along with an understanding of physics. Larry's first two books cataloged and interpreted Rutherford's correspondence on radioactivity. He then produced Radioactivity in America: Growth and Decay of a Science in 1979." – Santa Barbara Independent, *In Memoriam*, Peter Neushul, Sept. 7, 2010.

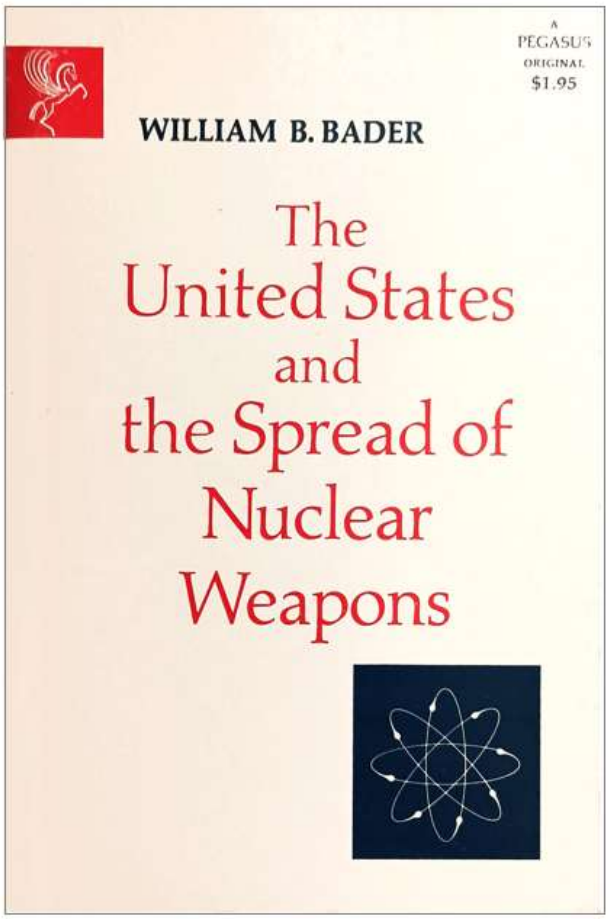


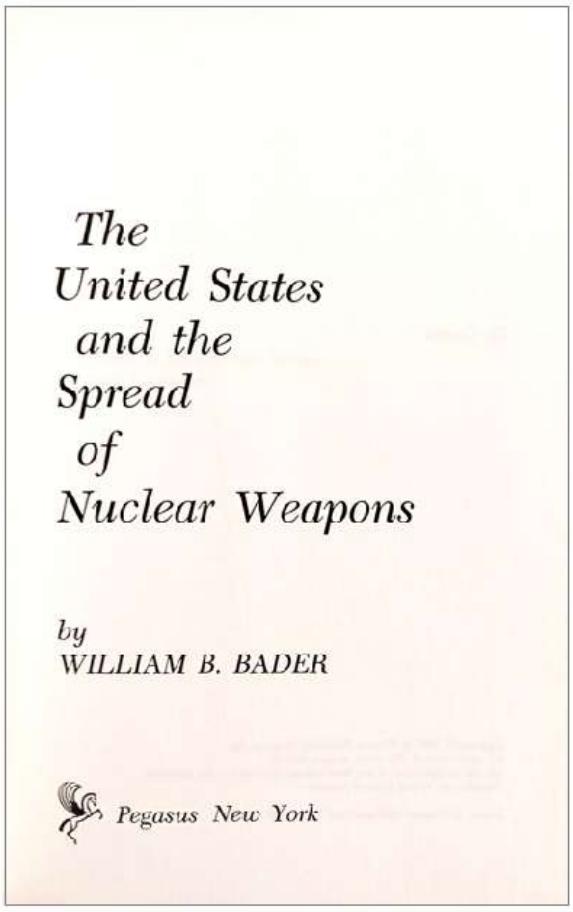


108. **BADCOCK, Christopher** (1946-). *Oedipus in Evolution. A New Theory of Sex.* Oxford: Basil Blackwell, 1990. ¶ First edition. 8vo. viii, 221 pp. Bibliog., index. Boards, dust-jacket. FINE. S8468

$ 17.95

Christopher Robert Badcock is a British sociologist and Emeritus Reader in Sociology at the London School of Economics.

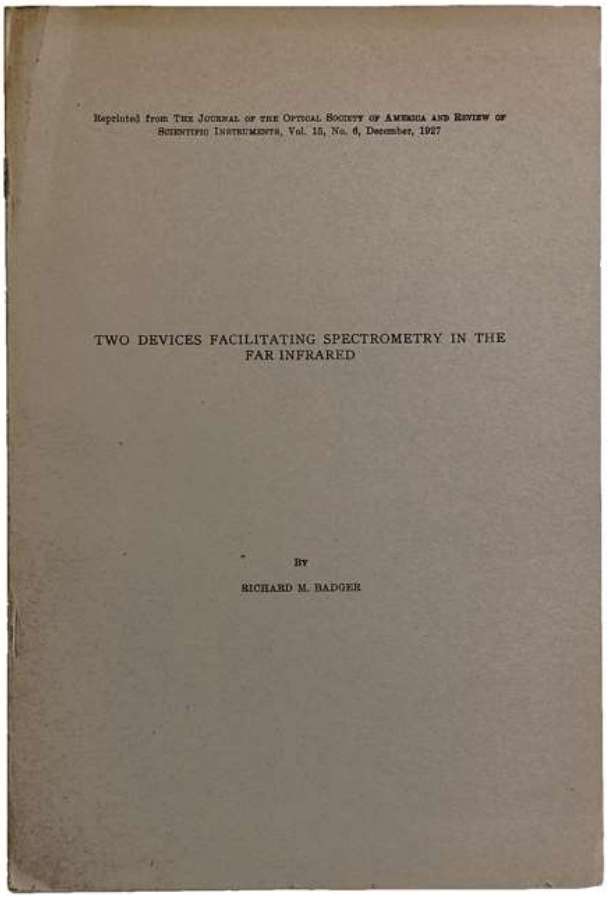


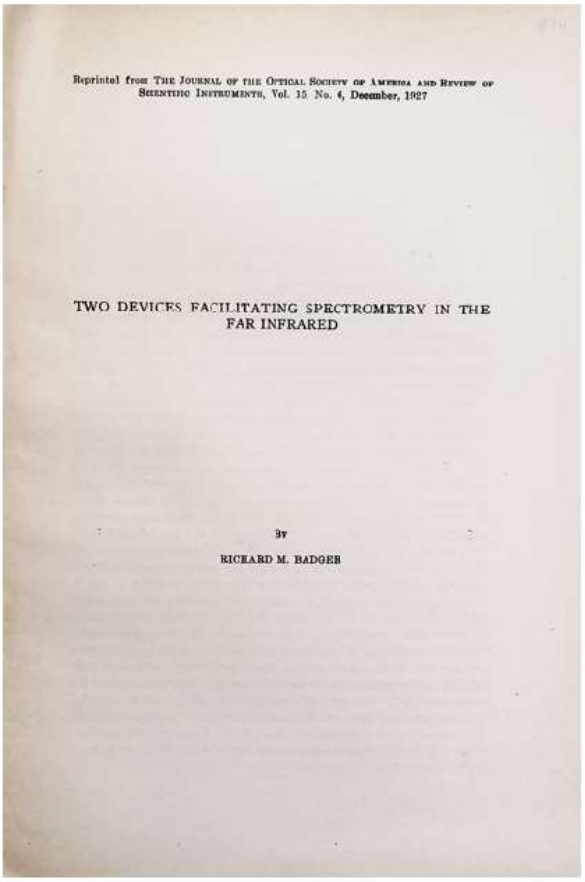


109. **BADER, William Banks** (1931-2016). *The United States and the Spread of Nuclear Weapons.* New York: Pegasus, 1968. ¶ Sm. 8vo. 176 pp. Index. Printed wrappers. Very good. RH1520

$ 5

William Banks Bader was an American diplomat who served as the assistant secretary of state for educational and cultural affairs (1999 to 2001).

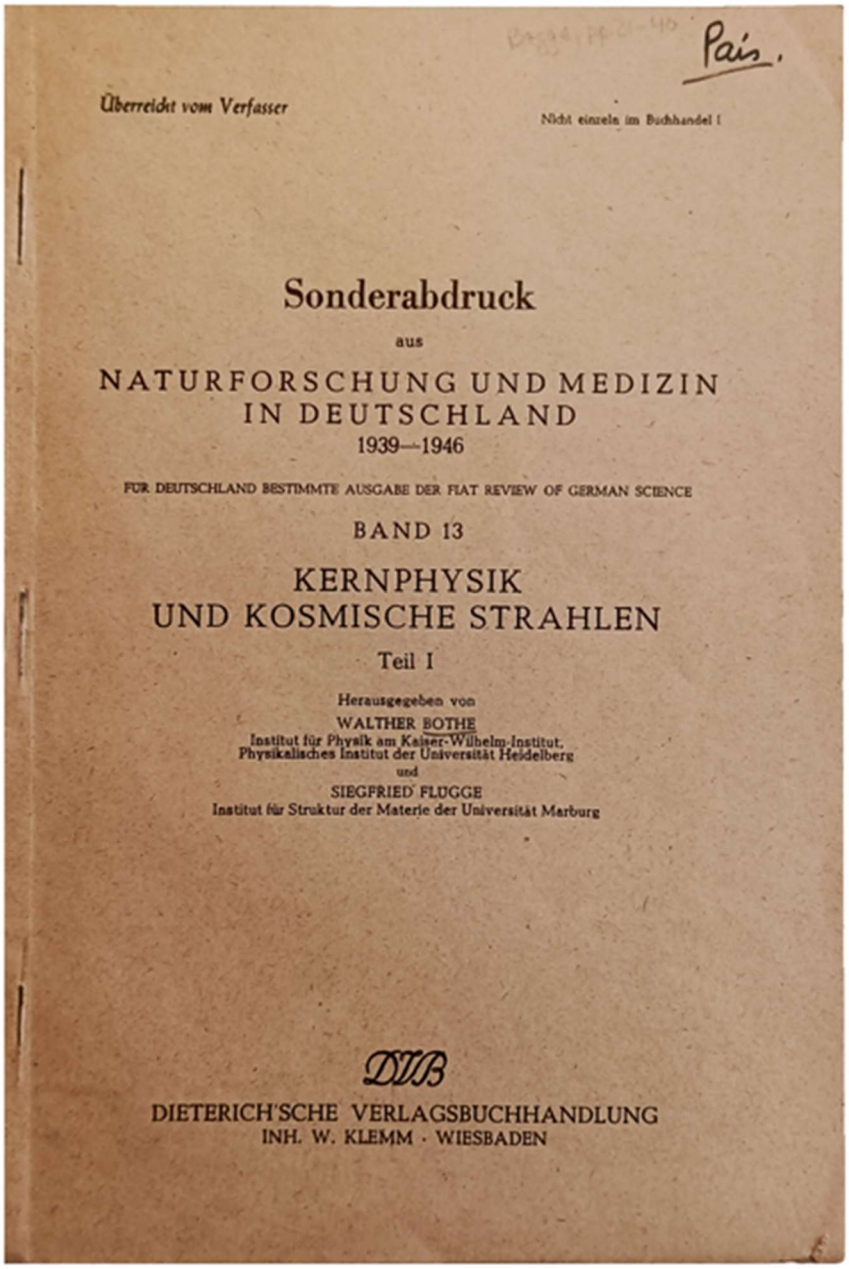




110. **BADGER, Richard M.** (1896-1974). *"Two Devices Facilitating Spectrometry in the Far Infrared."* Reprint from: *Journal of the Optical Society of America and Review of Scientific Instruments*, vol. 15, no. 6, Dec. 1927. ¶ 8vo. 370-373 pp. Figs. Printed wrappers. Fine. S7059

$ 10

Richard M. Badger, professor of chemistry emeritus at Caltech, who specialized in molecular spectroscopy with X rays and infrared radiation. He made pioneering studies on the modes of vibrations and spectral energies in small molecules. The so-called Badger's rule relating force and internuclear distance in diatomic molecules is based on his work from 1933. "A return to the work on the spectra of polyatomic molecules was evident in the second part of the year, which he spent at Professor Mecke's Institute in Bonn. Badger and Mecke, recognizing the inherent difficulties in obtaining sensitivity and high resolution in the middle and far infrared, turned to the measurement of the spectra of polyatomic molecules in their overtones and combination tones, which lie in the near infrared and visible region of the spectrum. Here there were two important advantages: the use of photo-graphic plates (which now could be sensitized for this region) permitting extended exposure times, and the high resolution obtainable with long-focus gratings". See: Wulf, Oliver R. National Academy of Sciences, *Memoir*, 1987.

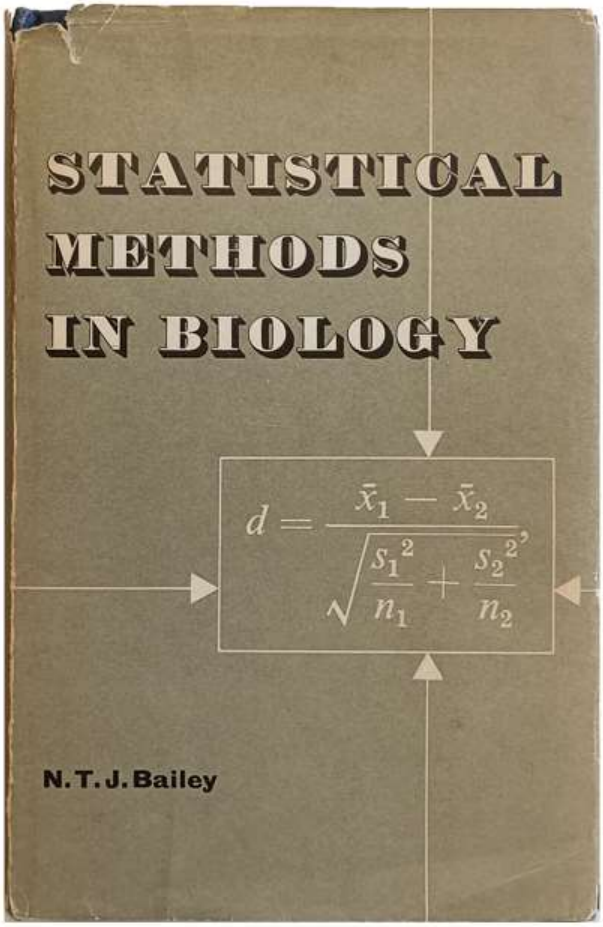


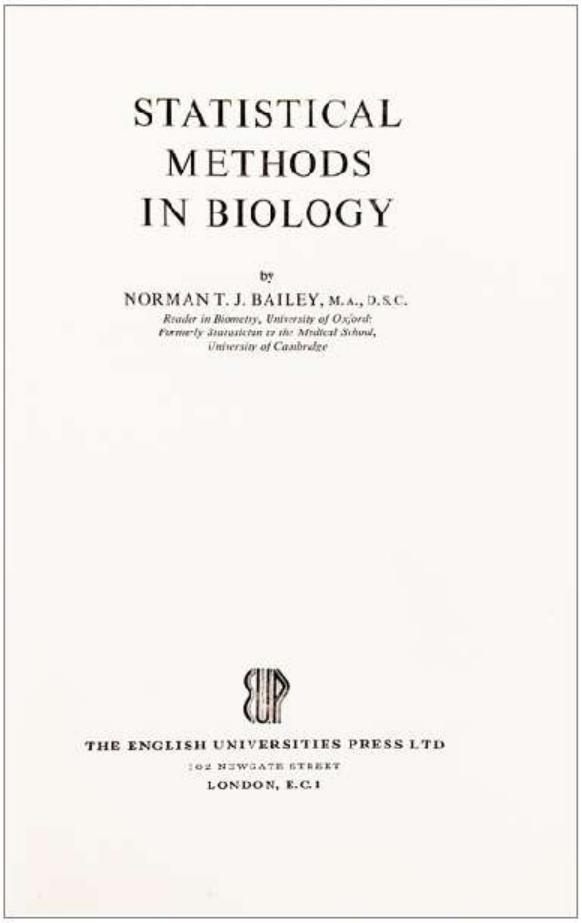
111. **BAGGE, Erich** (1912-1996). *"Theoretische Arbeiten über Mesonen, Nukleonen und Kernzertrum-Merungen in der Kosmischen Strahlung."* Offprint from: Sonderabdruck aus Naturforschung und Medizin in Deutschland 1939-1946. Band 13, teil I. Wiesbaden: Dietrich'sche Verlagsbuchhandlung, [1947?]. ¶ 8vo. (21)-56 pp. Figs. Printed wrappers; spine slightly worn. Ownership signature of A. Pais. PRESENTATION ISSUE. Very good. S7160

$ 20

Theoretical work on mesons, nucleons and nuclear mergers in cosmic rays.

Bagge was one of the pioneers of cosmic ray research in Europe, and a student of Werner Heisenberg. He worked on the German atomic bomb project during the WWII, and created the gaseous uranium centrifuge for enriching uranium radioactivity at Kiel in 1942.




STATISTICAL
METHODS
IN BIOLOGY

by

NORMAN T. J. BAILEY, M.A., D.Sc.

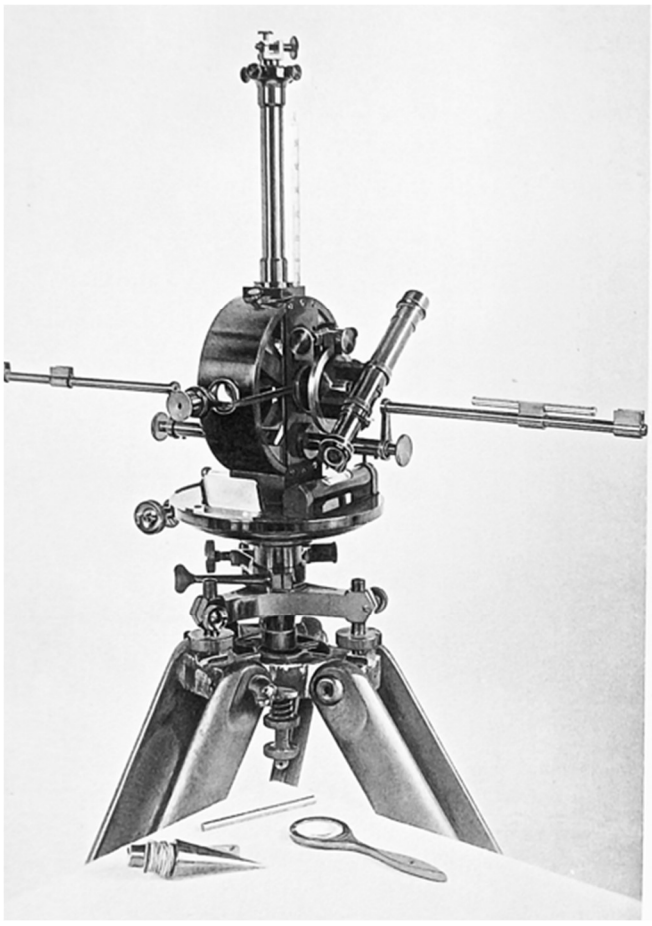
Reader in Biometry, University of Oxford: Formerly Statistician to the Medical School, University of Cambridge

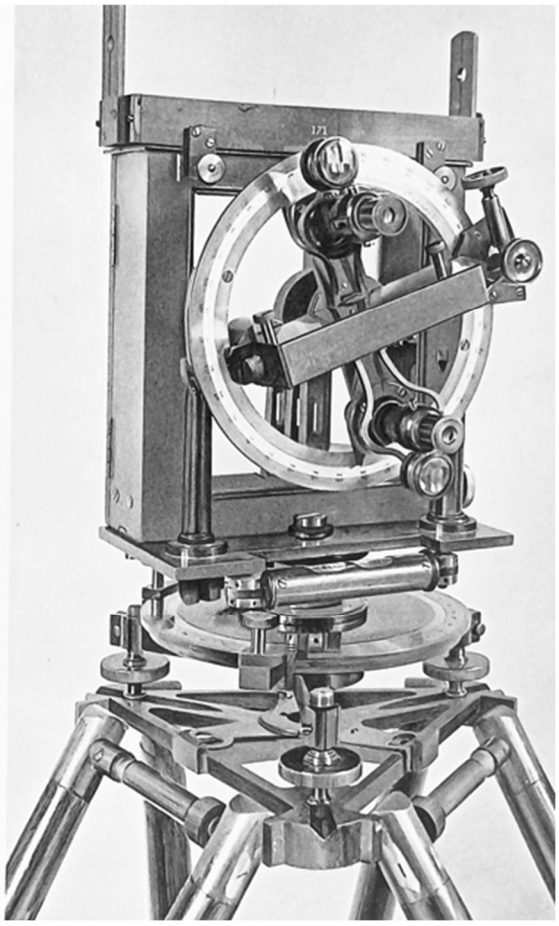
THE ENGLISH UNIVERSITIES PRESS LTD

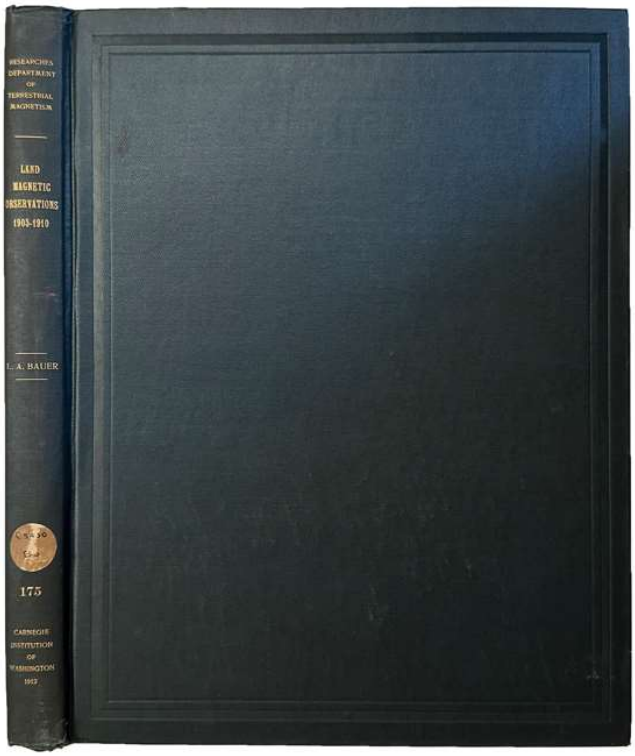
102 NEWGATE STREET

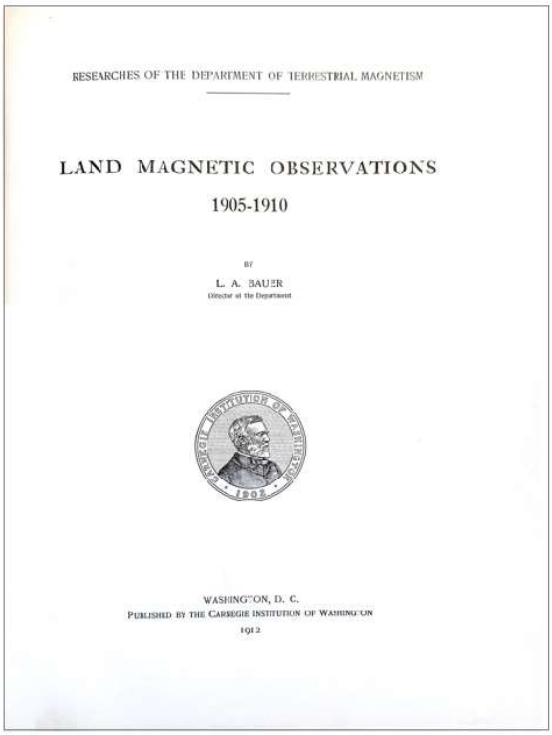
LONDON, E.C.1

112. **BAILEY, Norman T. J.** (1923-). *Statistical Methods in Biology*. London: The English Universities Press, 1959. ¶ First edition. 8vo. ix, 200 pp. Tables, index. Blue cloth, dust jacket; jacket extremities worn, else fine. Ownership rubber stamp of Norman Horowitz, California Institute of Technology.
S7447 $ 10









RESEARCHES OF THE DEPARTMENT OF TERRESTRIAL MAGNETISM

LAND MAGNETIC OBSERVATIONS

1905-1910

BY

L. A. BAUER

Director of the Department

WASHINGTON, D. C.

PUBLISHED BY THE CARNEGIE INSTITUTION OF WASHINGTON

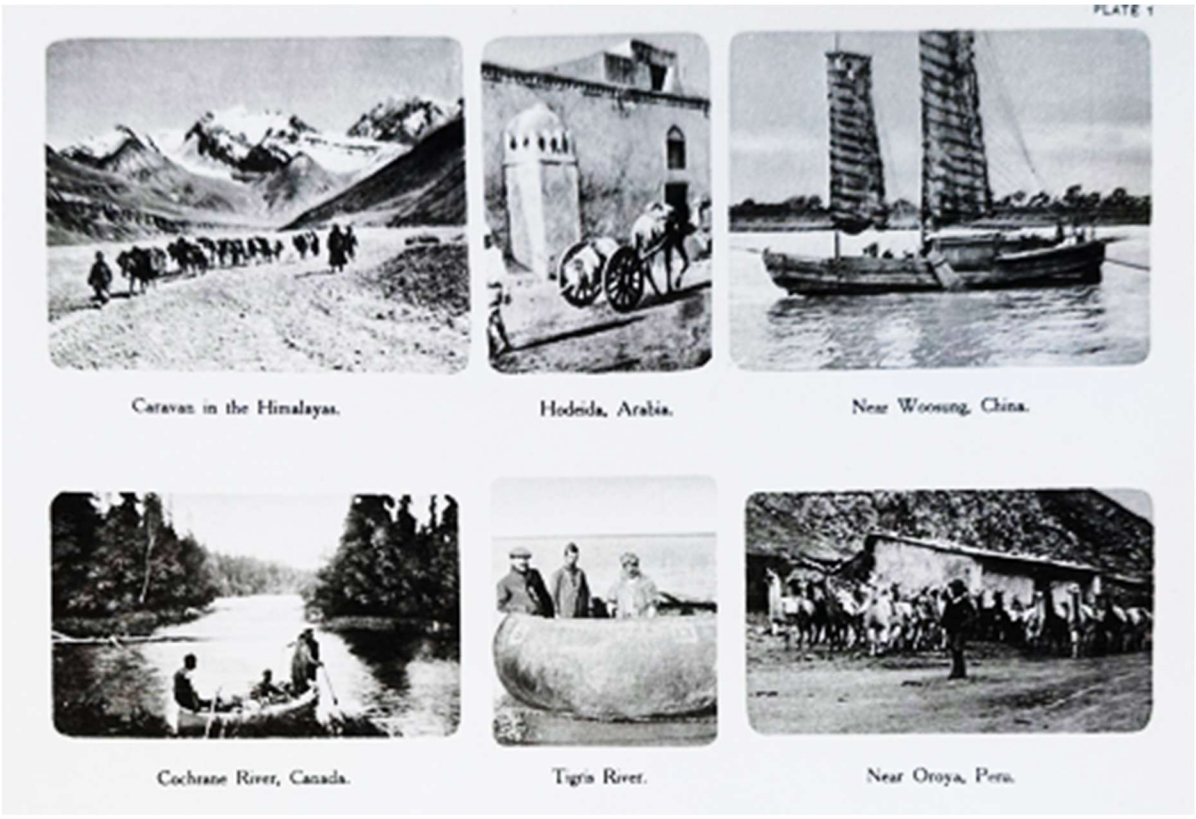
1912

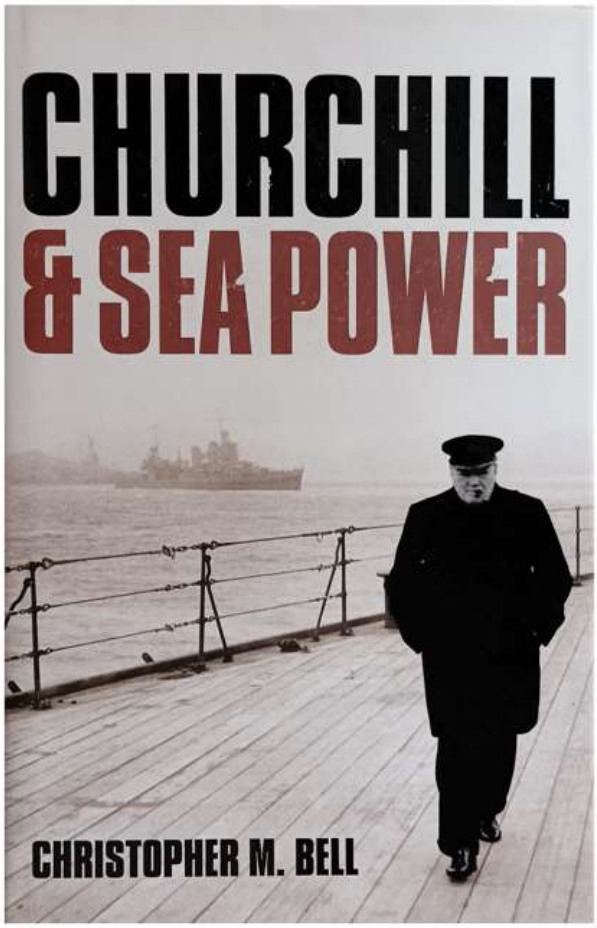
113 BAUER

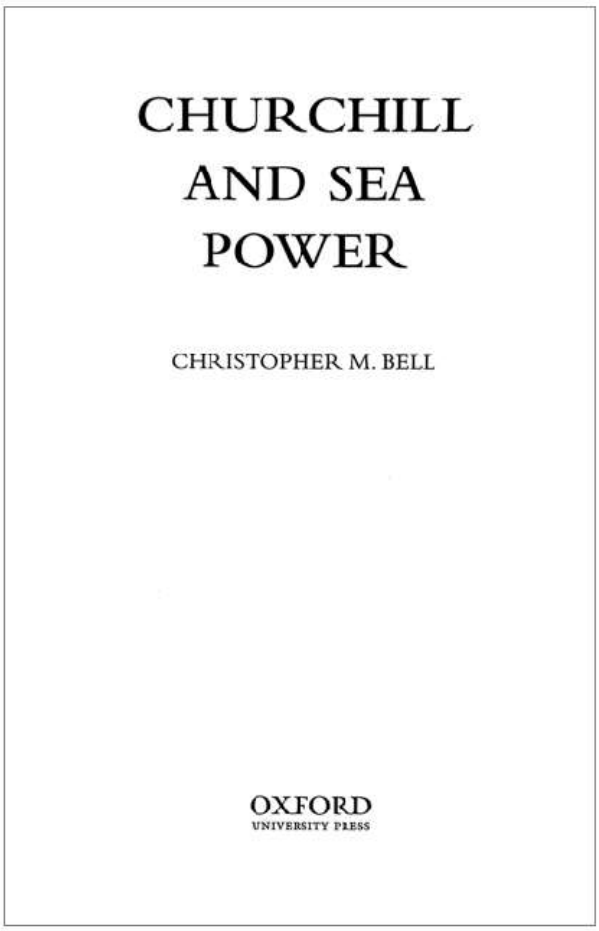
113. **BAUER, Louis Agricola** (1865-1932). *Land magnetic observations, 1905-1910*. Washington, D.C.: Carnegie Institution of Washington, 1912. Series: *Researches Dept. of Terrestrial Magnetism*, Publication, no. 175. 31 cm. iv, 185 pp. 10 plates with illus. Dark green blind-stamped cloth. Fine. With Carnegie Mount Wilson Observatory blind-stamp. S1201

$ 85

Mapping the Earth's magnetic field. Louis Agricola Bauer was an American geophysicist, astronomer and magnetician. He was the first director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, having been established in 1904. In this position, he set up and carried out a large-scale program of two and a half decades to map the Earth's magnetic field on land and at sea in an attempt to provide accurate, up-to-date information about this important feature.

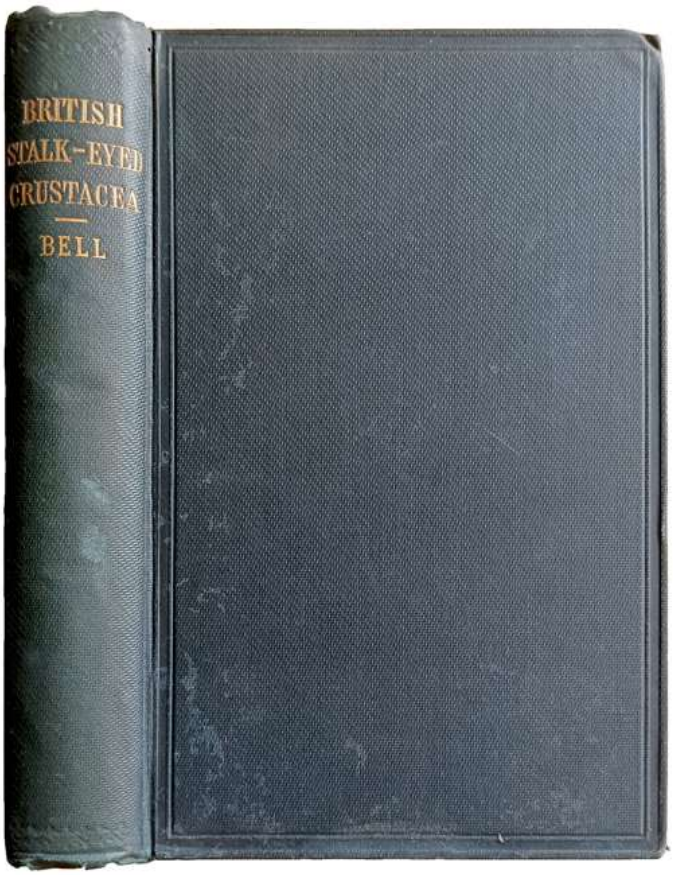


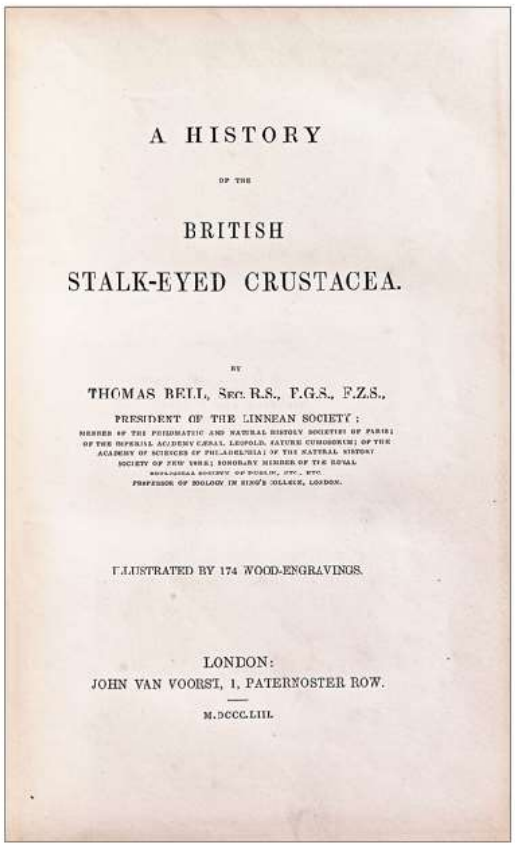




114. **BELL, Christopher M.** (1966-2024). *Churchill and Sea power*. Oxford: University Press, 2013. ¶ 8vo. xii, 429 pp. Cloth, dust-jacket. Fine. S11926 $ 10

Chris Bell joined the Dalhousie University History Department in 2003, after earning his PhD at the University of Calgary in 1998 and working for several years as a research analyst at the Naval War College in Newport, Rhode Island. He went on to become an internationally respected historian of Winston Churchill and the Royal Navy.




A HISTORY

OF THE

BRITISH

STALK-EYED CRUSTACEA.

BY

THOMAS BELL, SEC. R.S., F.G.S., F.Z.S.,

PRESIDENT OF THE LINNEAN SOCIETY;

MEMBER OF THE PHILOMATIC AND NATURAL HISTORY SOCIETIES OF PARIS; OF THE IMPERIAL ACADEMY CÆSAL. LEOPOLD. NATURÆ CURIOSORUM; OF THE ACADEMY OF SCIENCES OF PHILADELPHIA; OF THE NATURAL HISTORY SOCIETY OF NEW YORK; HONORARY MEMBER OF THE ROYAL ZOOLOGICAL SOCIETY OF DUBLIN, ETC. ETC.

PROFESSOR OF BOTANY IN KING'S COLLEGE, LONDON.

ILLUSTRATED BY 174 WOOD-ENGRAVINGS.

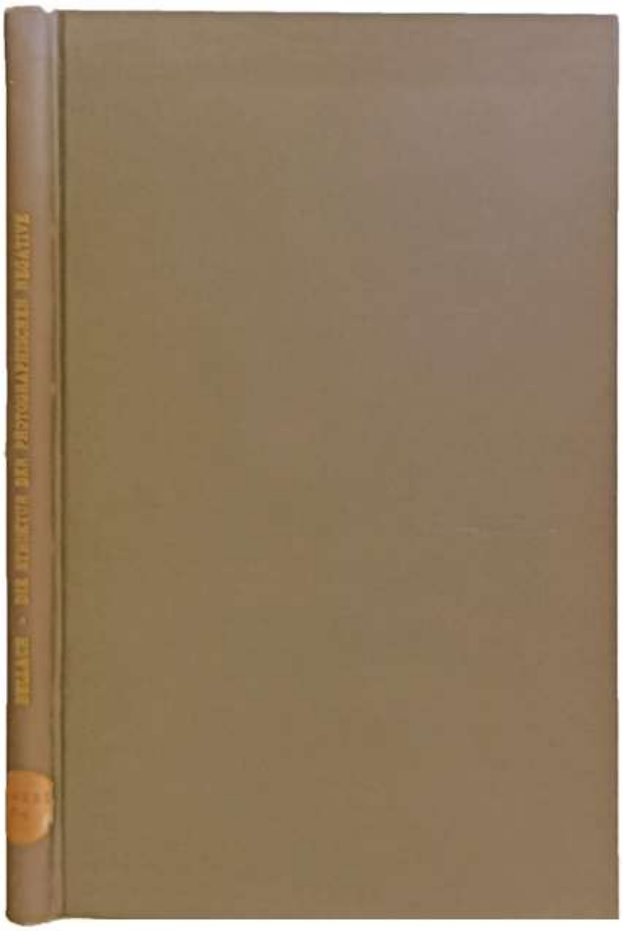
LONDON:
JOHN VAN VOORST, 1, PATERNOSTER ROW.

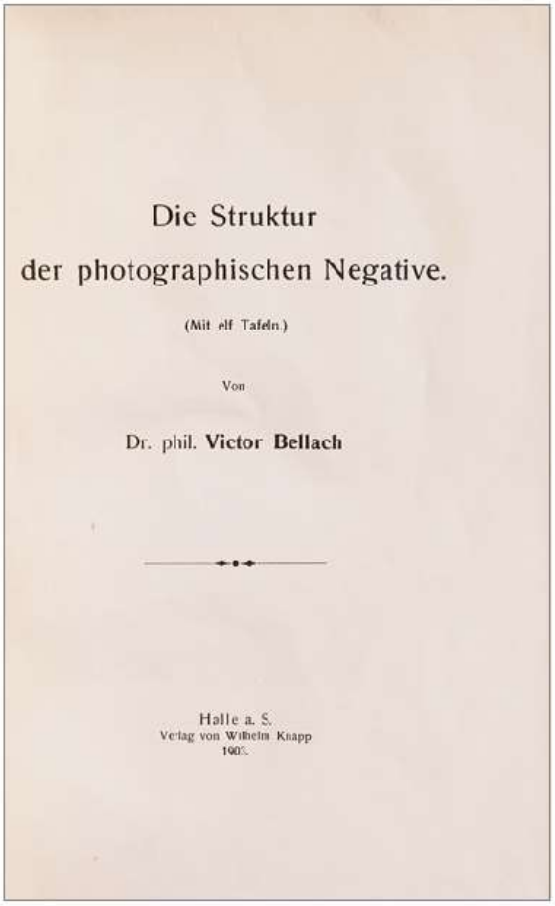
M.DCCC.LIII.

115. **BELL, Thomas, Sec. R.S., F.G.S., F.Z.S.** (1792-1880). *A History of the British Stalk-Eyed Crustacea*. London: John van Voorst, 1853. ¶ First edition. 8vo. lxv, 386, [ads.] 4 pp. 174 text engravings; occasional light foxing. Original blue-green cloth, gilt spine. Early ownership rubber stamp of A. A. Baker. Very good. S8478

$ 30

"Bell was at the heart of the scientific establishment and when Charles Darwin returned to London from the Beagle expedition on 2 December 1836, Bell was quick to take on the task of describing the reptile specimens. He was also entrusted with the specimens of Crustacea collected on the voyage. He was the authority in this field; his book British Stalk-eyed Crustacea is a masterwork. He played a significant part in the inception of Darwin's theory of natural selection in March 1837 when he confirmed that the giant Galápagos tortoises were native to the islands, not brought in by buccaneers for food as Darwin had thought." [Wikip.] Thomas Bell was President of the Linnean Society.

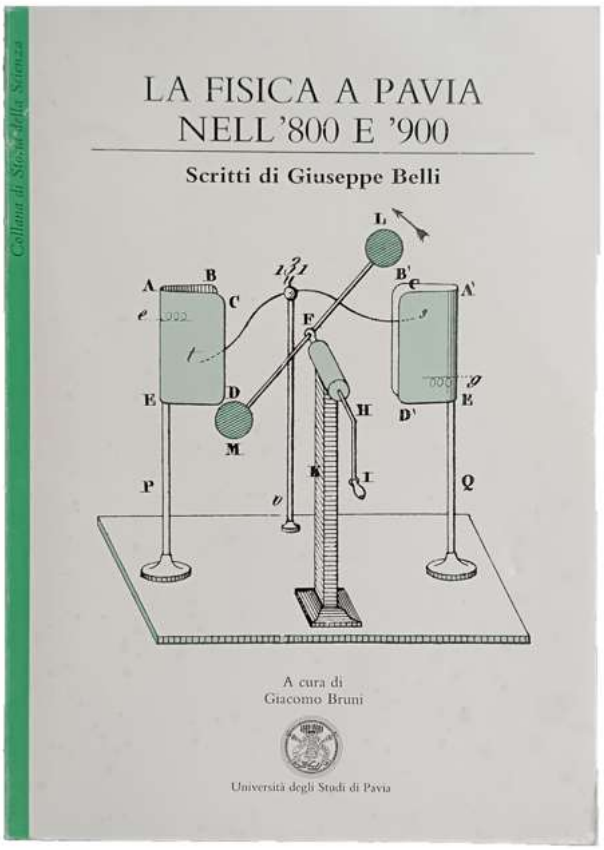




116. **BELLACH, Victor** (1877-). *Die Struktur der photographischen Negative.* [Marburg]: 1903. ¶ Thesis (doctoral) - Universitat Marburg. 8vo. 91 pp. 9 plates. Brown cloth, gilt spine. With Carnegie Mount Wilson Observatory blind-stamp. S1204

$ 15

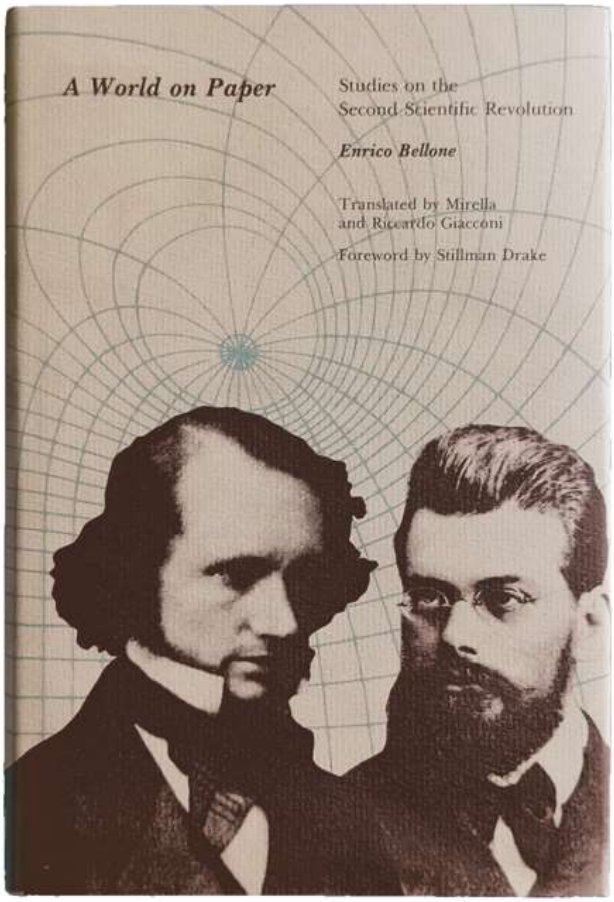
Astronomical photography was carefully studied under George Ellery Hale and his work on spectroscopic observations of solar prominences.



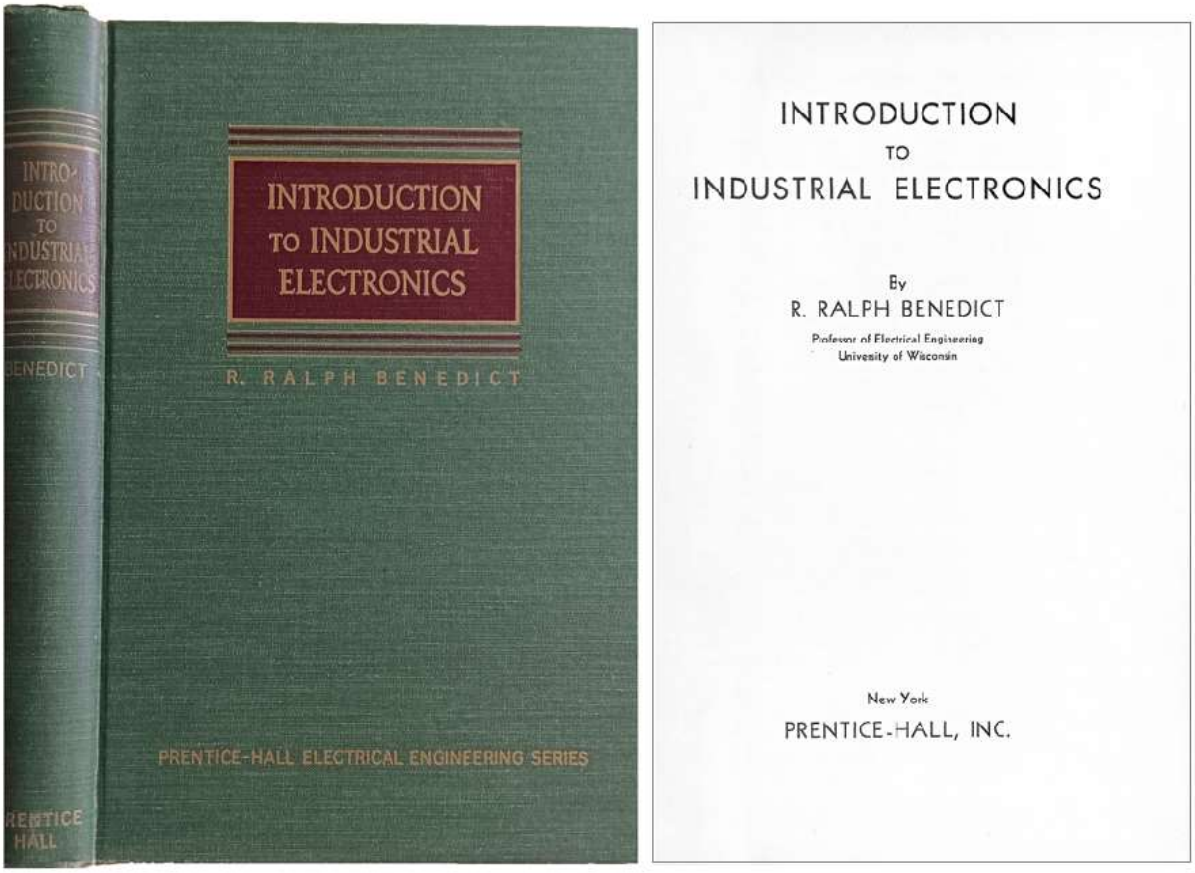
117. **BELLI, Giuseppe Gioachino** (1791-1860/3). *La Fisica a Pavia nell '800 e '900. A cura di Giacomo Bruni.* Pavia & Milan: Universita degli Studi di Pavia, & Overseas, 1988. ¶ Series: *Collana di storia della scienza.* 8vo. 506 pp. Figs. Printed wrappers. Very good copy. RH1333

$ 25

Belli was an Italian poet, famous for his sonnets in Romanesco, the dialect of Rome. In 1842 he was made director of the Istituto di Fisica, the appointment lasting until 1860.



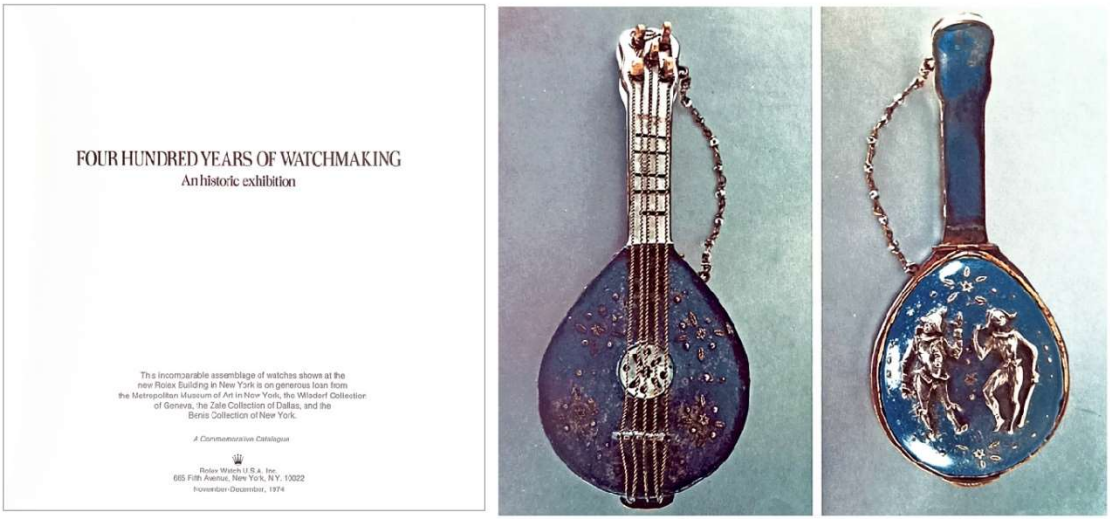
118. **BELLONE, Enrico** (1938-2011). *A world on paper; studies on the second scientific revolution. English translation by Mirella and Riccardo Giacconi.* Cambridge, MA and London: MIT Press, 1980. ¶ 236 x 160 mm. 8vo. xiii, [3], 220 pp. Figs., tables, chronology, index. Green cloth, dust-jacket. Very good. S5515 $ 7.95



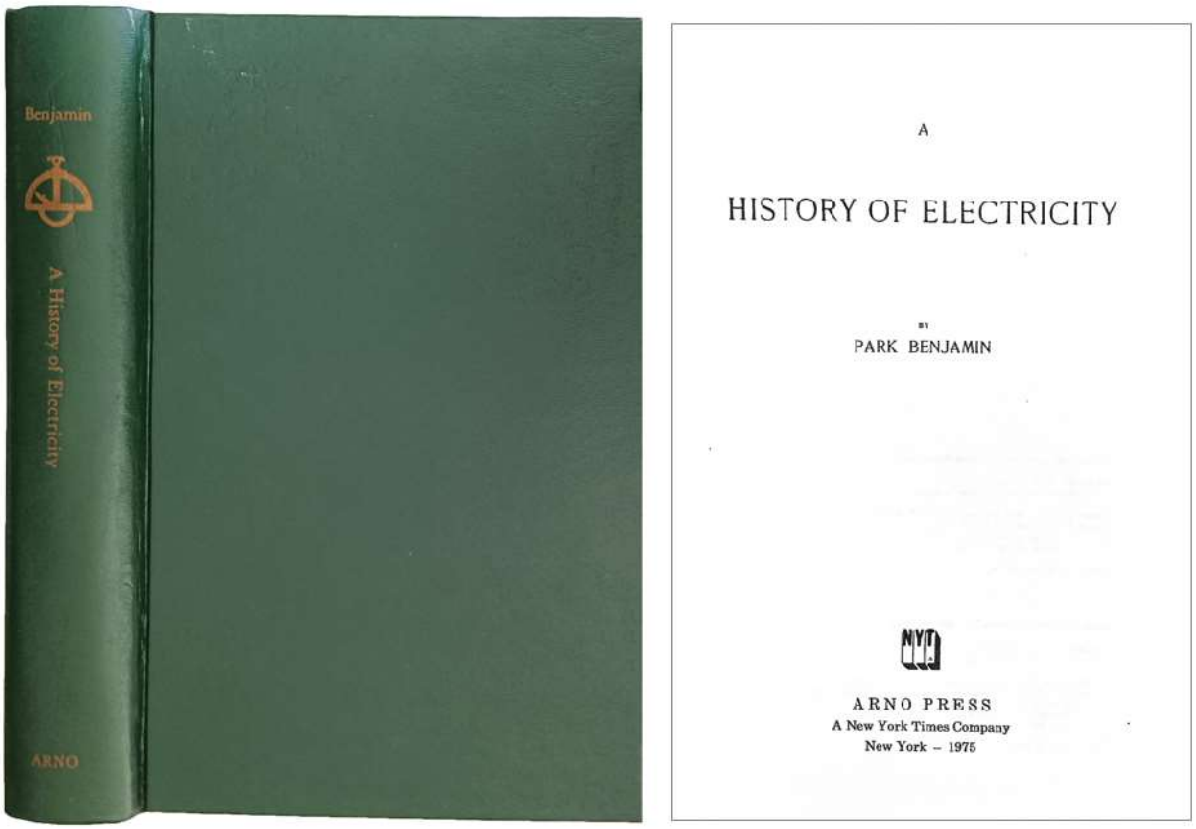
119. **BENEDICT, R. Ralph**. *Introduction to industrial electronics.* New York: Prentice-Hall, 1954. ¶ *Prentice-Hall electrical Engineering Series*. Fourth printing. 8vo. x, 436 pp. Frontis., illus., index. Green cloth. Very good. S1205

$ 7

Benedict was a professor of electrical engineering at the University of Wisconsin.



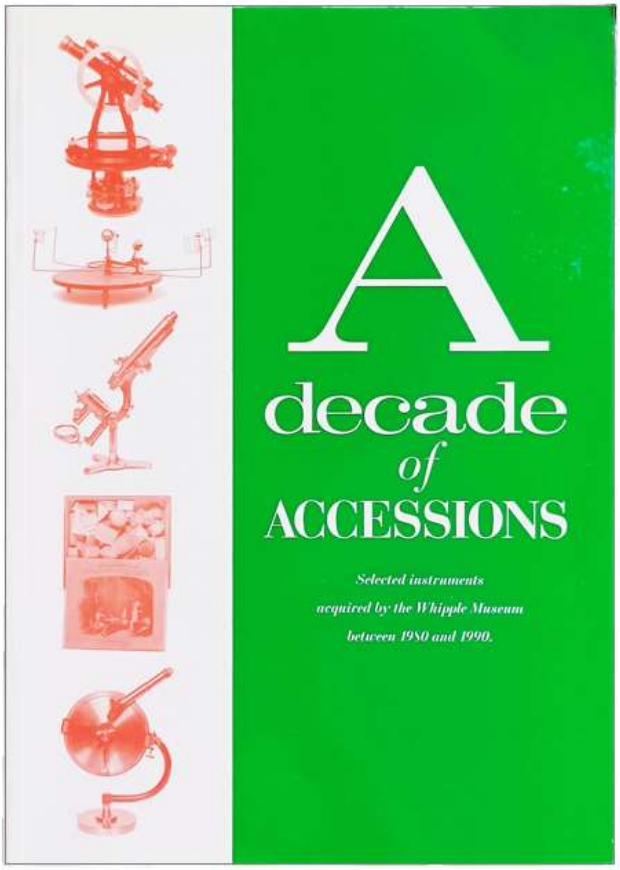
120. **BENIS, Anthony**. *Four Hundred Years of Watchmaking. An Historic Exhibition.* New York: Rolex Watch U. S. A., 1974. ¶ Square 8vo. 56 pp. Color photos of watches, list of exhibits. Printed wrappers. FINE. S8215 $ 10

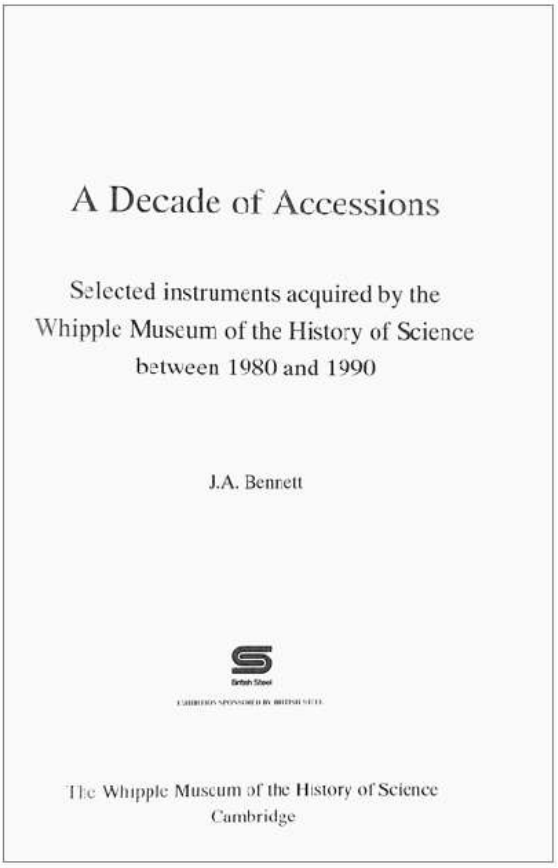


121. **BENJAMIN, Park** (1849-1922). *A History of Electricity.* New York: Arno Press, 1975. ¶ Reprint. 8vo. 611, [1] pp. Figs., index. Gilt-stamped green cloth. Fine. S9092

$ 40

Originally published in 1895 under another title.

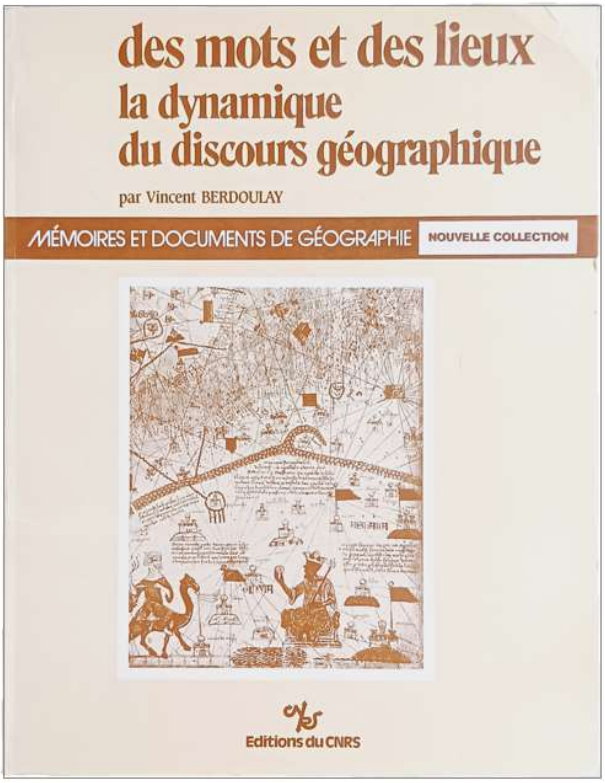


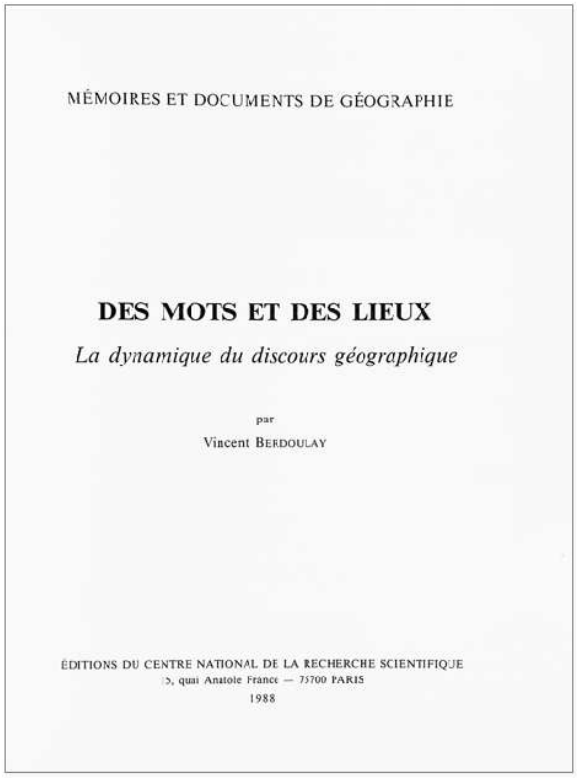


122. **BENNETT, J. A.** *A Decade of Accessions. Selected Instruments Acquired by the Whipple Museum of the History of Science Between 1980 and 1990.* Cambridge: Whipple Museum, 1992. ¶ 4to. Not paginated. List of 125 instruments many with photos. Pictorial wrappers. FINE. S7884

$ 12

Instruments include: slide rules, sectors, quadrants, sextants, levels, sounders, telescopes, air pumps, barometers, & microscopes.

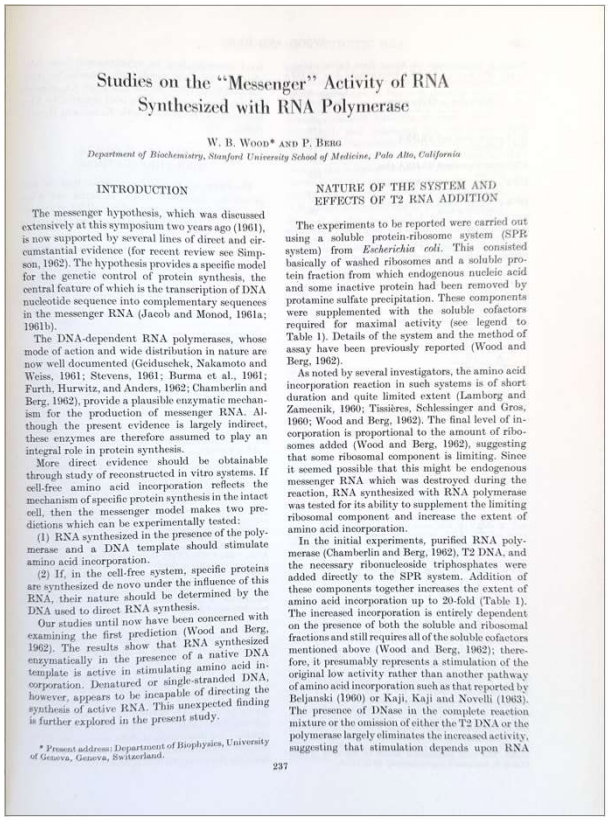




123. **BERDOULAY, Vincent** (1947-). *Des mots et des lieux la dynamique du discours géographique.* Paris: Centre National de la Recherche Scientifique, 1988. ¶ Series: *Mémoires et documents de géographie.* 4to. 106 pp. Printed wrappers; corner dented. Very good. S11583

$ 18

Professor Berdoulay is Emeritus of Geography and Planning, University of Pau and Pays de l'Adour



Studies on the "Messenger" Activity of RNA Synthesized with RNA Polymerase

W. B. Wood* and P. Berg

Department of Biochemistry, Stanford University School of Medicine, Palo Alto, California

INTRODUCTION

The messenger hypothesis, which was discussed extensively at this symposium two years ago (1961), is now supported by several lines of direct and circumstantial evidence (for recent review see Simpson, 1962). The hypothesis provides a specific model for the genetic control of protein synthesis, the central feature of which is the transcription of DNA nucleotide sequence into complementary sequences in the messenger RNA (Jacob and Monod, 1961a; 1961b).

The DNA-dependent RNA polymerases, whose mode of action and wide distribution in nature are now well documented (Geiduschek, Nakamoto and Weiss, 1961; Stevens, 1961; Burma et al., 1961; Furth, Hurwitz, and Anders, 1962; Chamberlin and Berg, 1962), provide a plausible enzymatic mechanism for the production of messenger RNA. Although the present evidence is largely indirect, these enzymes are therefore assumed to play an integral role in protein synthesis.

More direct evidence should be obtainable through study of reconstructed in vitro systems. If cell-free amino acid incorporation reflects the mechanism of specific protein synthesis in the intact cell, then the messenger model makes two predictions which can be experimentally tested:

(1) RNA synthesized in the presence of the polymerase and a DNA template should stimulate amino acid incorporation.

(2) If, in the cell-free system, specific proteins are synthesized de novo under the influence of this RNA, their nature should be determined by the DNA used to direct RNA synthesis.

Our studies until now have been concerned with examining the first prediction (Wood and Berg, 1962). The results show that RNA synthesized enzymatically in the presence of a native DNA template is active in stimulating amino acid incorporation. Denatured or single-stranded DNA, however, appears to be incapable of directing the synthesis of active RNA. This unexpected finding is further explored in the present study.

* Present address: Department of Biophysics, University of Geneva, Geneva, Switzerland.

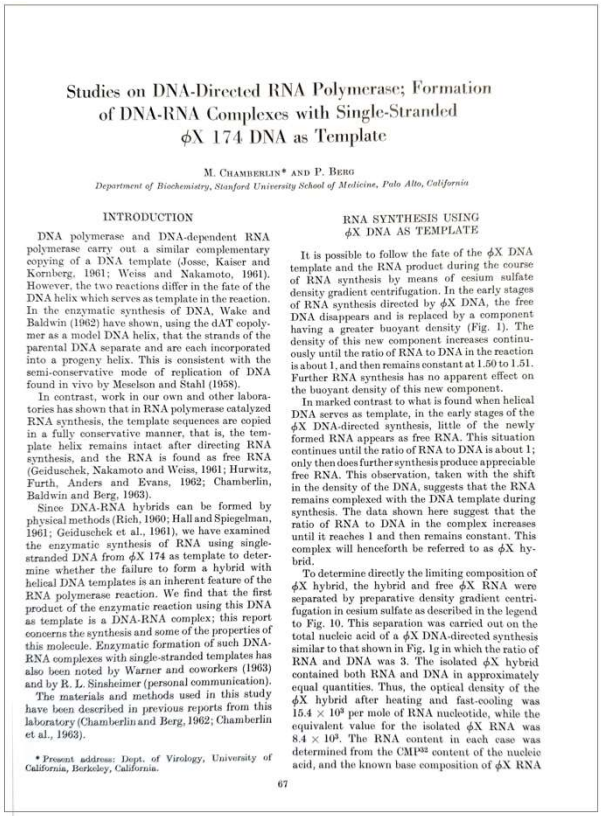
NATURE OF THE SYSTEM AND EFFECTS OF T2 RNA ADDITION

The experiments to be reported were carried out using a soluble protein-ribosome system (SPR system) from *Escherichia coli*. This consisted basically of washed ribosomes and a soluble protein fraction from which endogenous nucleic acid and some inactive protein had been removed by protamine sulfate precipitation. These components were supplemented with the soluble cofactors required for maximal activity (see legend to Table 1). Details of the system and the method of assay have been previously reported (Wood and Berg, 1962).

As noted by several investigators, the amino acid incorporation reaction in such systems is of short duration and quite limited extent (Lamborg and Zamecnik, 1960; Tissières, Schlessinger and Gros, 1960; Wood and Berg, 1962). The final level of incorporation is proportional to the amount of ribosomes added (Wood and Berg, 1962), suggesting that some ribosomal component is limiting. Since it seemed possible that this might be endogenous messenger RNA which was destroyed during the reaction, RNA synthesized with RNA polymerase was tested for its ability to supplement the limiting ribosomal component and increase the extent of amino acid incorporation.

In the initial experiments, purified RNA polymerase (Chamberlin and Berg, 1962), T2 DNA, and the necessary ribonucleoside triphosphates were added directly to the SPR system. Addition of these components together increases the extent of amino acid incorporation up to 20-fold (Table 1). The increased incorporation is entirely dependent on the presence of both the soluble and ribosomal fractions and still requires all of the soluble cofactors mentioned above (Wood and Berg, 1962); therefore, it presumably represents a stimulation of the original low activity rather than another pathway of amino acid incorporation such as that reported by Beljanski (1960) or Kaji, Kaji and Novelli (1963). The presence of DNase in the complete reaction mixture or the omission of either the T2 DNA or the polymerase largely eliminates the increased activity, suggesting that stimulation depends upon RNA

237



Studies on DNA-Directed RNA Polymerase; Formation of DNA-RNA Complexes with Single-Stranded ϕX 174 DNA as Template

M. Chamberlin* and P. Berg

Department of Biochemistry, Stanford University School of Medicine, Palo Alto, California

INTRODUCTION

DNA polymerase and DNA-dependent RNA polymerase carry out a similar complementary copying of a DNA template (Josse, Kaiser and Kornberg, 1961; Weiss and Nakamoto, 1961). However, the two reactions differ in the fate of the DNA helix which serves as template in the reaction. In the enzymatic synthesis of DNA, Wake and Baldwin (1962) have shown, using the dAT copolymer as a model DNA helix, that the strands of the parental DNA separate and are each incorporated into a progeny helix. This is consistent with the semi-conservative mode of replication of DNA found in vivo by Meselson and Stahl (1958).

In contrast, work in our own and other laboratories has shown that in RNA polymerase catalyzed RNA synthesis, the template sequences are copied in a fully conservative manner, that is, the template helix remains intact after directing RNA synthesis, and the RNA is found as free RNA (Geiduschek, Nakamoto and Weiss, 1961; Hurwitz, Furth, Anders and Evans, 1962; Chamberlin, Baldwin and Berg, 1963).

Since DNA-RNA hybrids can be formed by physical methods (Rich, 1960; Hall and Spiegelman, 1961; Geiduschek et al., 1961), we have examined the enzymatic synthesis of RNA using single-stranded DNA from ϕX 174 as template to determine whether the failure to form a hybrid with helical DNA templates is an inherent feature of the RNA polymerase reaction. We find that the first product of the enzymatic reaction using this DNA as template is a DNA-RNA complex; this report concerns the synthesis and some of the properties of this molecule. Enzymatic formation of such DNA-RNA complexes with single-stranded templates has also been noted by Warner and coworkers (1963) and by R. L. Sinsheimer (personal communication).

The materials and methods used in this study have been described in previous reports from this laboratory (Chamberlin and Berg, 1962; Chamberlin et al., 1963).

* Present address: Dept. of Virology, University of California, Berkeley, California.

RNA SYNTHESIS USING ϕX DNA AS TEMPLATE

It is possible to follow the fate of the ϕX DNA template and the RNA product during the course of RNA synthesis by means of cesium sulfate density gradient centrifugation. In the early stages of RNA synthesis directed by ϕX DNA, the free DNA disappears and is replaced by a component having a greater buoyant density (Fig. 1). The density of this new component increases continuously until the ratio of RNA to DNA in the reaction is about 1, and then remains constant at 1.50 to 1.51. Further RNA synthesis has no apparent effect on the buoyant density of this new component.

In marked contrast to what is found when helical DNA serves as template, in the early stages of the ϕX DNA-directed synthesis, little of the newly formed RNA appears as free RNA. This situation continues until the ratio of RNA to DNA is about 1; only then does further synthesis produce appreciable free RNA. This observation, taken with the shift in the density of the DNA, suggests that the RNA remains complexed with the DNA template during synthesis. The data shown here suggest that the ratio of RNA to DNA in the complex increases until it reaches 1 and then remains constant. This complex will henceforth be referred to as ϕX hybrid.

To determine directly the limiting composition of ϕX hybrid, the hybrid and free ϕX RNA were separated by preparative density gradient centrifugation in cesium sulfate as described in the legend to Fig. 10. This separation was carried out on the total nucleic acid of a ϕX DNA-directed synthesis similar to that shown in Fig. 1g in which the ratio of RNA and DNA was 3. The isolated ϕX hybrid contained both RNA and DNA in approximately equal quantities. Thus, the optical density of the ϕX hybrid after heating and fast-cooling was 15.4×10^3 per mole of RNA nucleotide, while the equivalent value for the isolated ϕX RNA was 8.4×10^3. The RNA content in each case was determined from the CMP^{32} content of the nucleic acid, and the known base composition of ϕX RNA

67

124. **BERG, Paul** (1926-2023); **William B. WOOD** (1938-2024). *"Studies on the 'Messenger' Activity of RNA Synthesized with RNA Polymerase."* WITH **Michael John CHAMBERLIN** (1937-): *"Studies on DNA-Directed RNA Polymerase; Formation of DNA-RNA Complexes with Single-Stranded OX 174 DNA as Template."* In: *Cold Spring Harbor Symposia on Quantitative Biology*, vol. XXVIII. Cold Spring Harbor: The Biological Laboratory, 1963. ¶ 4to. (Article): 67+; 237-246 pp. (Whole volume): xix, 610 pp. Figs., tables. Maroon cloth, gilt spine; top edge bumped, else fine. Ownership rubber stamp of Norman Horowitz. S7886

$ 35

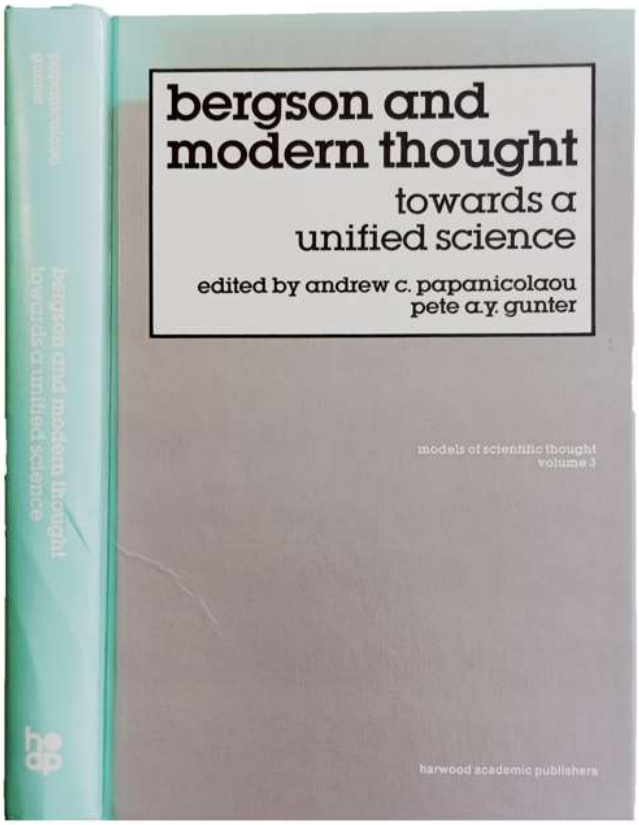
"DNA polymerase and DNA-dependent RNA polymerase carry out a similar complementary copying of a DNA template (Jose, Kaiser and Kornberg, 1961; Weiss and Nakamoto, 1961). However, the two reactions differ in the fate of the DNA helix which serves as template in the reaction, In the enzymatic synthesis of DNA, Wake and Baldwin (1962) have shown, using the dAT copolymer as a model DNA helix, that the strands of the parental DNA separate and are each incorporated into a progeny helix. This is consistent with the semi-conservative mode of replication of DNA found in vivo by Meselson and Stahl (1968)."

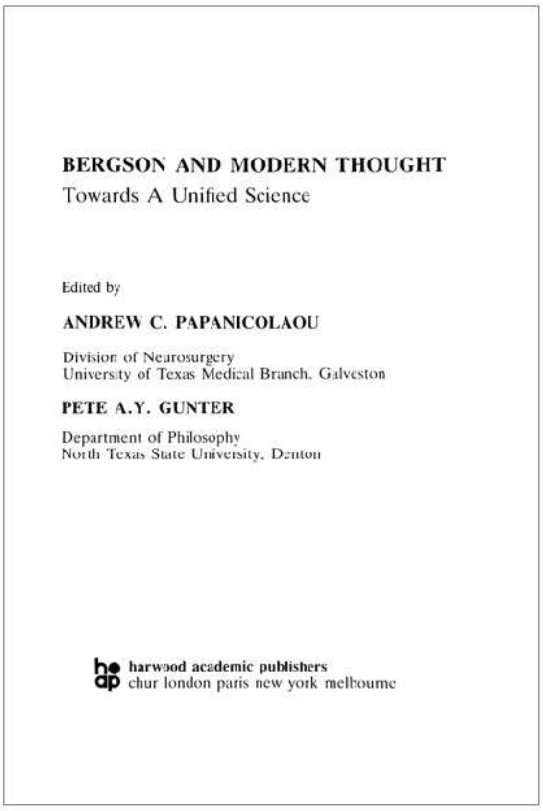
"In contrast, work in our own and other laboratories has shown that in RNA polymerase catalyzed RNA synthesis, the template sequences are copied in a fully conservative manner, that is, the template helix remains intact after directing RNA

synthesis, and the RNA is found as free RNA (Geiduschek, Nakamoto and Weiss, 1961 . . .” [Abstract].

Paul Berg, of Stanford University, won the 1980 Nobel Prize in Chemistry for his work on recombinant DNA, sharing the honor and prize jointly with Walter Gilbert and Frederick Sanger. Wood was Emeritus Professor of Molecular Biology, University of Colorado, Boulder. After taking his degree in chemistry from Harvard he joined Paul Berg at Stanford where he took his PhD.

Chamberlin was at the Dept. of Virology, University of California, Berkeley, California.




BERGSON AND MODERN THOUGHT
Towards A Unified Science

Edited by

ANDREW C. PAPANICOLAOU

Division of Neurosurgery
University of Texas Medical Branch, Galveston

PETE A.Y. GUNTER

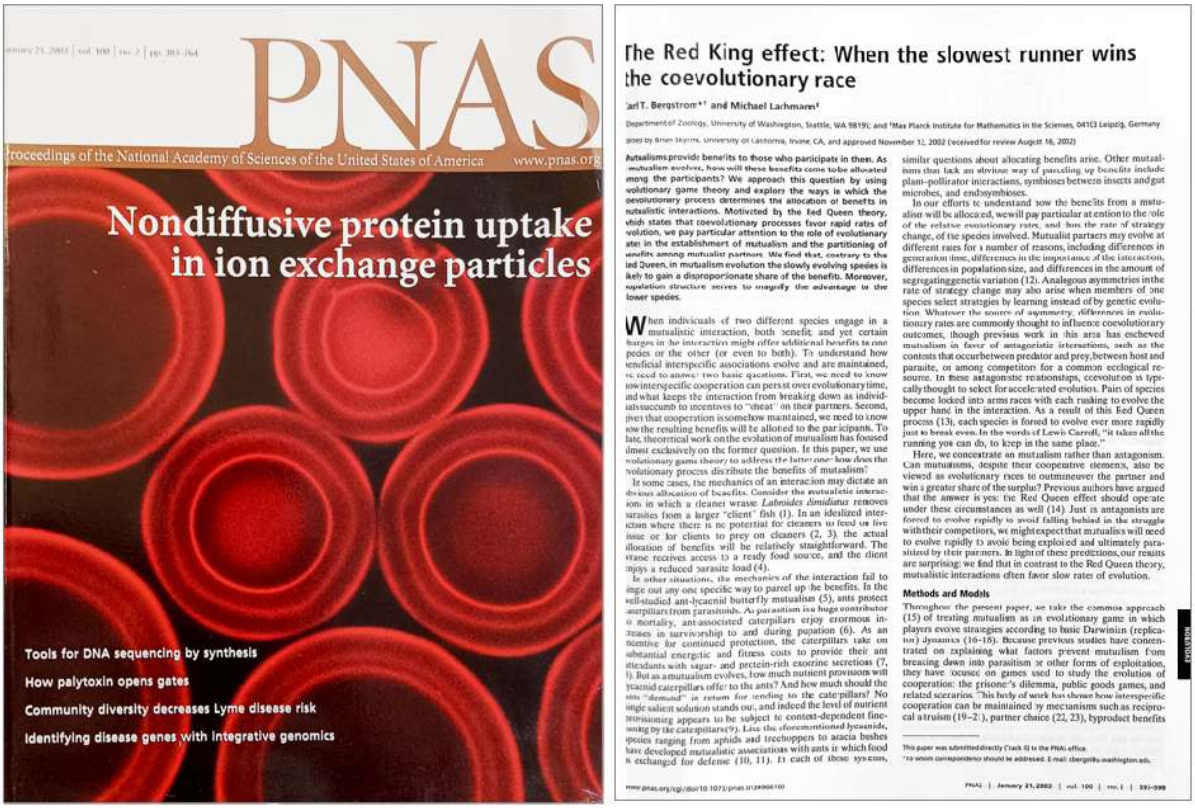
Department of Philosophy
North Texas State University, Denton

harwood academic publishers
chur london paris new york melbourne

125. [**BERGSON, Henri** (1859-1941)] **PAPANICOLAOU, Andrew C.**, et al (editors). *Bergson and Modern Thought; towards a unified science*. Chur, et al: Harwood Academic Publishers, 1987. ¶ Series: Models of Scientific Thought, vol. 3; series editor: Roger Hahn (his copy). 8vo. xxi, 394 pp. Illus., index. Printed boards. Very good +. RH1018

$ 35

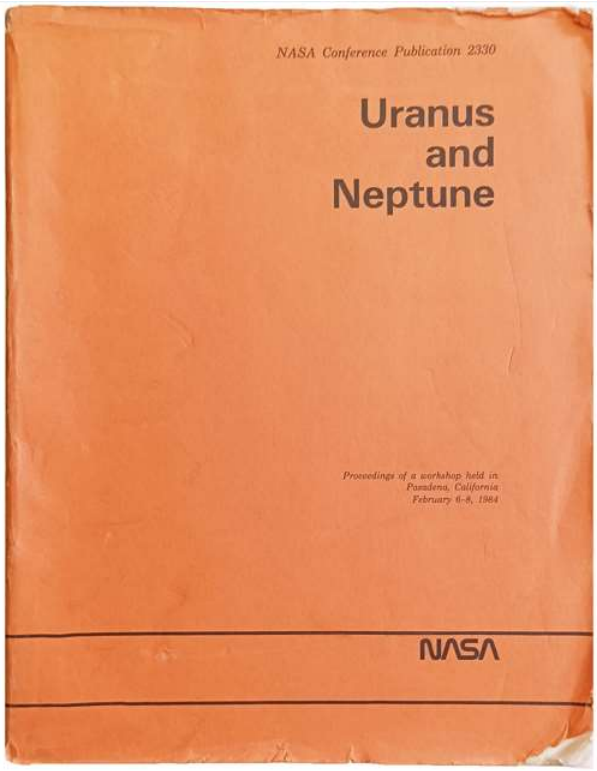
Henri-Louis Bergson was a French philosopher who was influential in the traditions of analytic philosophy and continental philosophy. Bergson was awarded the 1927 Nobel Prize in Literature "in recognition of his rich and vitalizing ideas and the brilliant skill with which they have been presented".

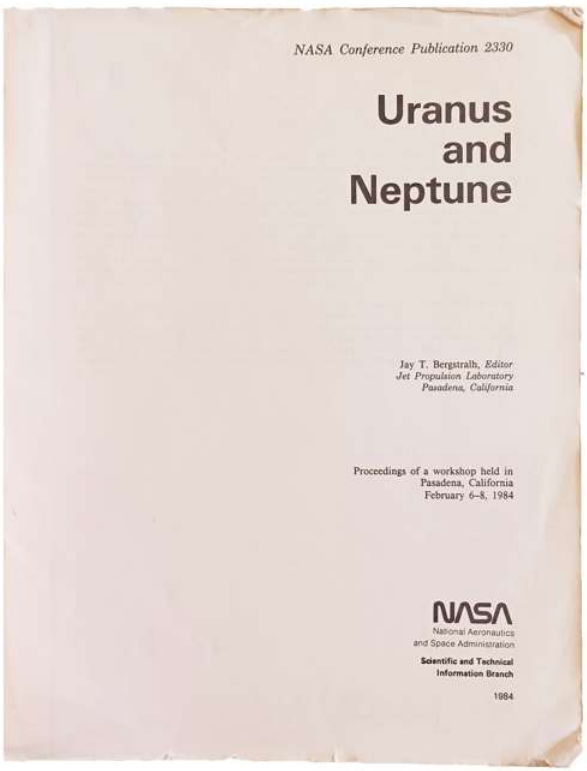


126. **BERGSTROM, Carl T.; Michael LACHMANN**. *"The Red King Effect: When the Slowest Runner Wins the Coevolutionary Race."* In: *Proceedings of the National Academy of Sciences of the United States of America*, vol. 100, no. 2, 2003. No place: National Academy of Sciences, 2003. ¶ 4to. (Article): 593-598 pp. Figs. (some color). (Whole issue): 383-764 pp. Articles, figs., photos (some color). Pictorial wrappers. FINE. S7888

$ 8

Carl Theodore Bergstrom is a theoretical and evolutionary biologist and a professor at the University of Washington in Seattle, Washington.

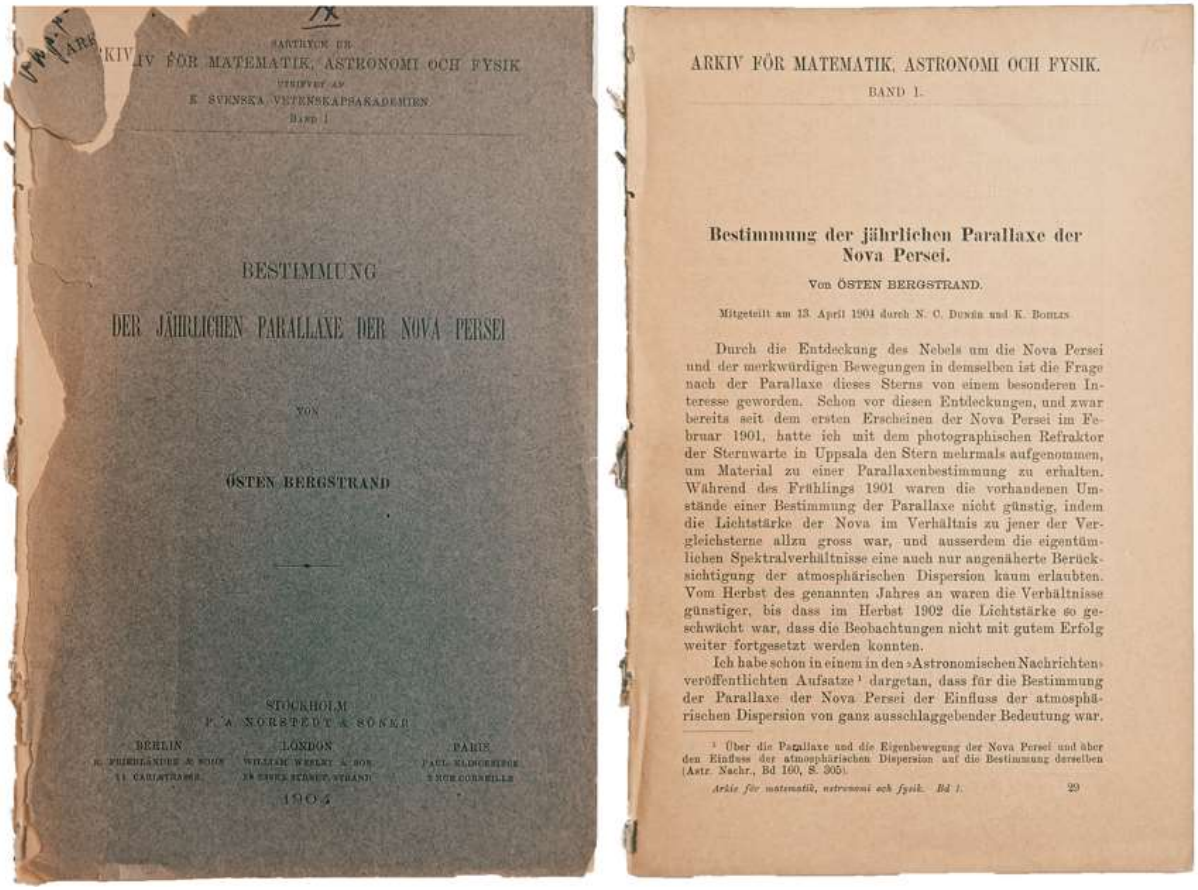




127. **BERGSTRALH, Jay T.** (1943-2019). *Uranus and Neptune. Proceedings of a workshop held in Pasadena, California, February 6-8, 1984. NASA Conference Pub. 2330.* Washington, DC: NASA, 1984. ¶ Thick 4to. vii, 627, [1] pp. Printed wrappers; edges worn. Good. S12107

$ 10

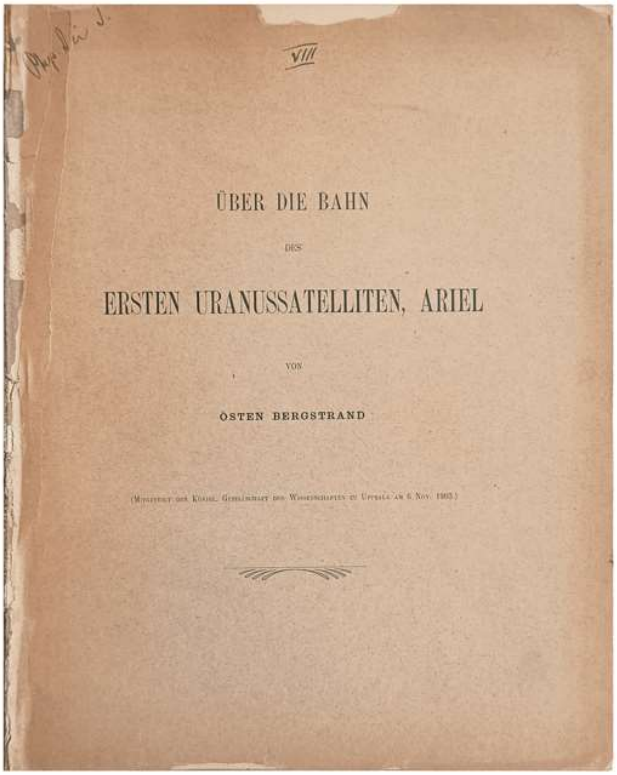
"This volume contains the papers presented to a workshop sponsored by the Voyager project. The principal goal of the workshop was to establish a scientific framework within which to plan the Voyager encounters with Uranus and Neptune." Contains nearly thirty papers. Jay Bergstralh, was a member of the technical staff at Jet Propulsion Laboratory, and has been "on detail at NASA Headquarters in the Planetary Astronomy Program Office for the last two years."



128. **BERGSTRAND, Osten** (1873-1948). *"Bestimmung der jahrlichen Parallaxe der Nova Persei."* Offprint from: *Arkiv for Matematik, Astronomi och Fysik*, Band 1. Stockholm: P. A. Norstedt & Soner; Berlin: R. Friedlander & Sohn; London: William Wesley & Son; Paris: Paul Klincksieck, 1904. ¶ 8vo. (354)-394 pp. Tables. Printed wrappers; top cover loose, edges of top cover chipped. Ms. notation on top cover. Good. S5834

$ 5

Determination of the annual parallax of Nova Persei. Carl Östen Emanuel Bergstrand was a Swedish astronomer, director of the Uppsala Observatory.


VIII

ÜBER DIE BAHN

DES

ERSTEN URANUSSATELLITEN, ARIEL

VON

ÖSTEN BERGSTRAND


ÜBER DIE BAHN

DES

ERSTEN URANUSSATELLITEN, ARIEL

VON

ÖSTEN BERGSTRAND

UPPSALA 1904

129. **BERGSTRAND, Osten** (1873-1948). *"Uber die Bahn des ersten Uranussatelliten, Ariel."* Offprint from: *Konigl. Gesellschaft der Wissenschaften zu Uppsala*, am 6 Nov. 1903. Uppsala: Edv. Berling, 1904. ¶ 4to. [iv], 57 pp. Tables. Printed wrappers; paper brittle, edges chipped. Ex library rubber stamp on title, ms. notation on top cover. Good. S5905

$ 10

About the orbit of the first uranium satellite, Ariel. Carl Östen Bergstrand was a Swedish astronomer, director of the Uppsala Observatory.


ÜBER DIE BAHN

DES

ERSTEN URANUSSATELLITEN, ARIEL

J. Theoret. Biol. (1964) 6, 347–370

On the Mechanism of Intragenic Recombination
II. *Neurospora crassa*†

HARRIS BERNSTEIN‡

Department of Biology
Josiah Willard Gibbs Research Laboratories
Yale University, New Haven, Conn., U.S.A.

(*Received* 12 *April* 1963)

A mechanically simple model of intragenic recombination is described. In the first paper of this set the quantitative expectations of this model were compared with data from phage T4. Here, the model is discussed with respect to the extensive intragenic recombination data available from *Neurospora crassa*. The following aspects are considered: (a) linearity; (b) additivity; (c) non-reciprocity; (d) high negative interference; (e) the conservativeness of the chromosome replications associated with meiosis; (f) evidence bearing on whether intragenic and intergenic recombination occur by separate mechanisms; (g) chromatid interference; and (h) segregations occurring at divisions subsequent to meiosis. An appendix is included which gives the predictions of the model with respect to three standard types of genetic analysis.

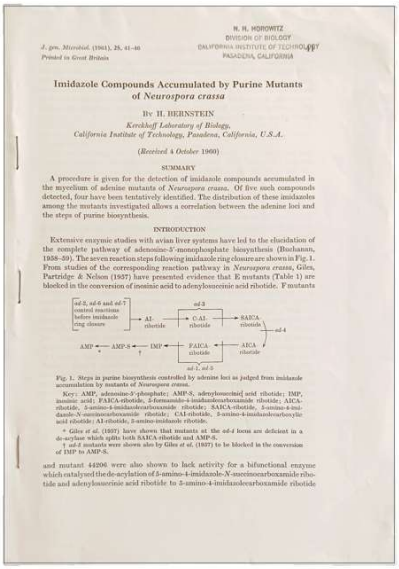
1. Introduction

This paper is the second in a series on the mechanism of intragenic recombination. In the first paper (Bernstein, 1962) a molecular model of recombination was presented and shown to account quantitatively for the data from crosses of phage T4 defective in the *r*II region.

It is now proposed that this same model serves to explain in a simple fashion the extensive intragenic recombination data obtained with *Neurospora crassa*. The model has been extended somewhat over its original form to include a consideration of the events at the end of the gene. This extension was necessitated by data in *N. crassa* of a kind not available in phage T4. The *N. crassa* data came primarily from crosses where both inter- and intragenic markers were used, whereas the phage crosses included only intragenic markers.

† This work was supported by Fellowship Grant GF 12,106 from the National Institutes of Health, Public Health Service.
‡ Present Address: Department of Genetics, University of California, Davis, California, U.S.A.

349



J. gen. Microbiol. (1961), 25, 41–46
Printed in Great Britain

H. H. HOROWITZ
DIVISION OF BIOLOGY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

Imidazole Compounds Accumulated by Purine Mutants of *Neurospora crassa*

By H. BERNSTEIN

Kerckhoff Laboratory of Biology,
California Institute of Technology, Pasadena, California, U.S.A.

(*Received* 4 *October* 1960)

SUMMARY

A procedure is given for the detection of imidazole compounds accumulated in the mycelium of adenine mutants of *Neurospora crassa*. Of five such compounds detected, four have been tentatively identified. The distribution of these imidazoles among the mutants investigated allows a correlation between the adenine loci and the steps of purine biosynthesis.

INTRODUCTION

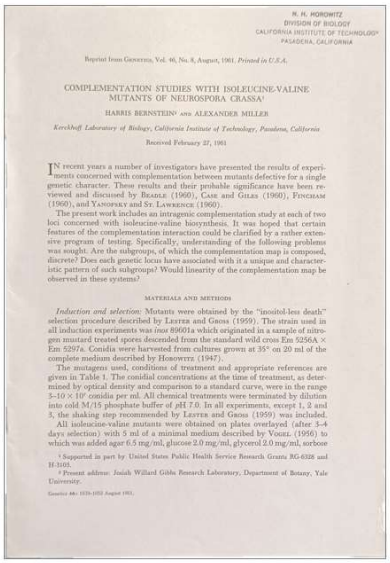
Extensive enzymic studies with avian liver systems have led to the elucidation of the complete pathway of adenosine-5′-monophosphate biosynthesis (Buchanan, 1958–59). The seven reaction steps following imidazole ring-closure are shown in Fig. 1. From studies of the corresponding reaction pathway in *Neurospora crassa*, Giles, Partridge & Nelson (1957) have presented evidence that E mutants (Table 1) are blocked in the conversion of inosinic acid to adenylosuccinic acid ribotide. F mutants

Fig. 1. Steps in purine biosynthesis controlled by adenine loci as judged from imidazole accumulation by mutants of *Neurospora crassa*.

Key: AMP, adenosine-5′-phosphate; AMP-S, adenylosuccinic acid ribotide; IMP, inosinic acid; FAICA-ribotide, 5-formamido-4-imidazolecarboxamide ribotide; AICA-ribotide, 5-amino-4-imidazolecarboxamide ribotide; SAICA-ribotide, 5-amino-4-imidazole-*N*-succinocarboxamide ribotide; CAI-ribotide, 5-amino-4-imidazolecarboxylic acid ribotide; AI-ribotide, 5-amino-imidazole ribotide.

* Giles *et al.* (1957) have shown that mutants at the ad-4 locus are deficient in a de-acylase which splits both SAICA-ribotide and AMP-S.
† ad-3 mutants were shown also by Giles *et al.* (1957) to be blocked in the conversion of IMP to AMP-S.

and mutant 44206 were also shown to lack activity for a bifunctional enzyme which catalysed the de-acylation of 5-amino-4-imidazole-*N*-succinocarboxamide ribotide and adenylosuccinic acid ribotide to 5-amino-4-imidazolecarboxamide ribotide



H. H. HOROWITZ
DIVISION OF BIOLOGY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

Reprint from Genetics, Vol. 46, No. 8, August, 1961. *Printed in U.S.A.*

COMPLEMENTATION STUDIES WITH ISOLEUCINE-VALINE MUTANTS OF NEUROSPORA CRASSA[1]

HARRIS BERNSTEIN[2] AND ALEXANDER MILLER

Kerckhoff Laboratory of Biology, California Institute of Technology, Pasadena, California

Received February 27, 1961

IN recent years a number of investigators have presented the results of experiments concerned with complementation between mutants defective for a single genetic character. These results and their probable significance have been reviewed and discussed by BEADLE (1960), CASE and GILES (1960), FINCHAM (1960), and YANOFSKY and ST. LAWRENCE (1960).

The present work includes an intragenic complementation study at each of two loci concerned with isoleucine-valine biosynthesis. It was hoped that certain features of the complementation interaction could be clarified by a rather extensive program of testing. Specifically, understanding of the following problems was sought: Are the subgroups, of which the complementation map is composed, discrete? Does each genetic locus have associated with it a unique and characteristic pattern of such subgroups? Would linearity of the complementation map be observed in these systems?

MATERIALS AND METHODS

Induction and selection: Mutants were obtained by the "inositol-less death" selection procedure described by LESTER and GROSS (1959). The strain used in all induction experiments was *inos* 89601a which originated in a sample of nitrogen mustard treated spores descended from the standard wild cross Em 5256A × Em 5297a. Conidia were harvested from cultures grown at 35° on 20 ml of the complete medium described by HOROWITZ (1947).

The mutagens used, conditions of treatment and appropriate references are given in Table 1. The conidial concentrations at the time of treatment, as determined by optical density and comparison to a standard curve, were in the range $5\text{–}10 \times 10^7$ conidia per ml. All chemical treatments were terminated by dilution into cold M/15 phosphate buffer of pH 7.0. In all experiments, except 1, 2 and 3, the shaking step recommended by LESTER and GROSS (1959) was included.

All isoleucine-valine mutants were obtained on plates overlayed (after 3–4 days selection) with 5 ml of a minimal medium described by VOGEL (1956) to which was added agar 6.5 mg/ml, glucose 2.0 mg/ml, glycerol 2.0 mg/ml, sorbose

[1] Supported in part by United States Public Health Service Research Grants RG-6328 and H-3105.
[2] Present address: Josiah Willard Gibbs Research Laboratory, Department of Botany, Yale University.

Genetics 46: 1039-1052 August 1961.

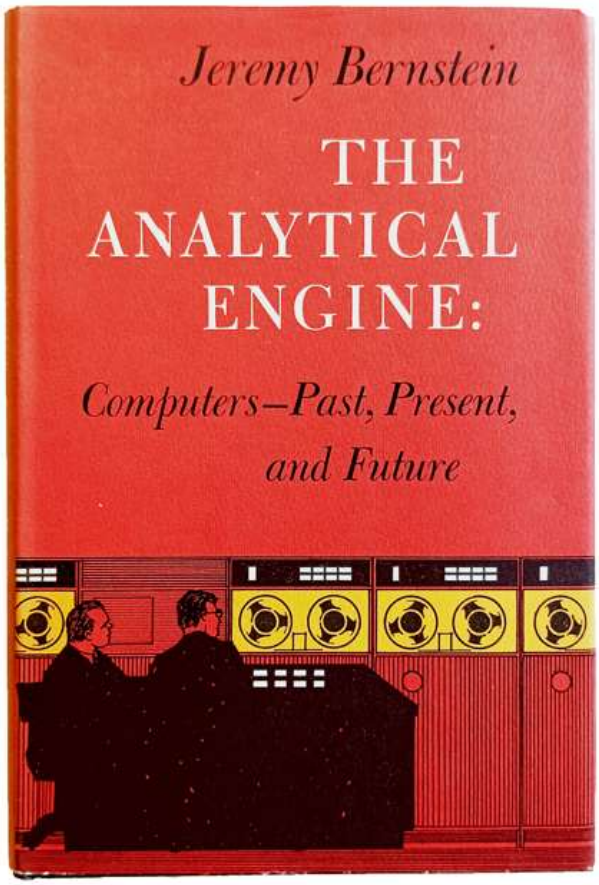
130. **BERNSTEIN, Harris**. [Group of 3 offprints]. Includes: **BERNSTEIN**. *"On the Mechanism of Intragenic Recombination. II. Neurospora Crassa."* Offprint from: *Journal of Theoretical Biology*, 6, 1964. ¶ 8vo. 347-370 pp. Tables. Self-wraps. Fine.

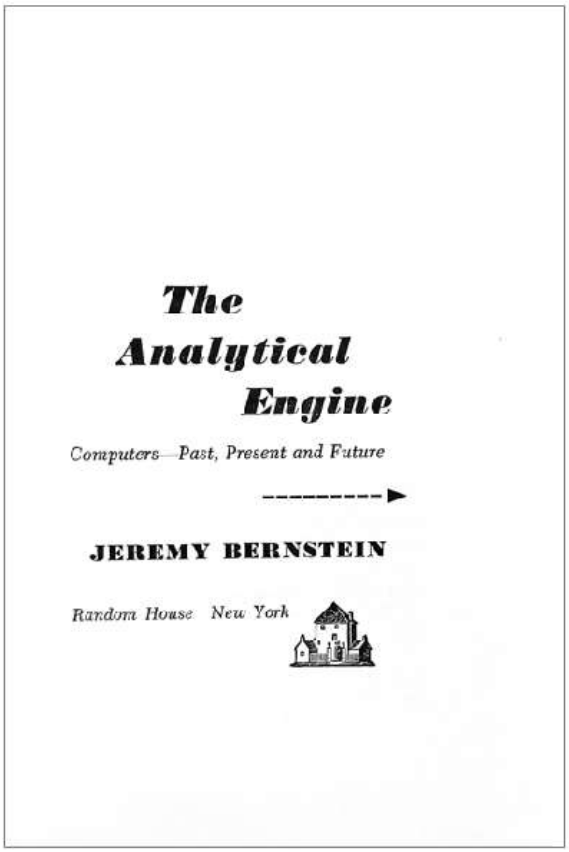
WITH: **BERNSTEIN**. *"Imidazole Compounds Accumulated by Purine Mutants of Neurospora Crassa."* Offprint from: *J. Gen. Microbiol.*, 25, 1961. ¶ 8vo. 41-46 pp. Figs. Self-wraps. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine.

WITH: **BERNSTEIN**, & **Alexander MILLER**. *"Complementation Studies with Isoleucine-Valine Mutants of Neurospora Crassa."* Offprint from: *Genetics*, vol. 46, no. 8, 1961. ¶ 8vo. 1039-1052 pp. Self-wraps. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine. S7643

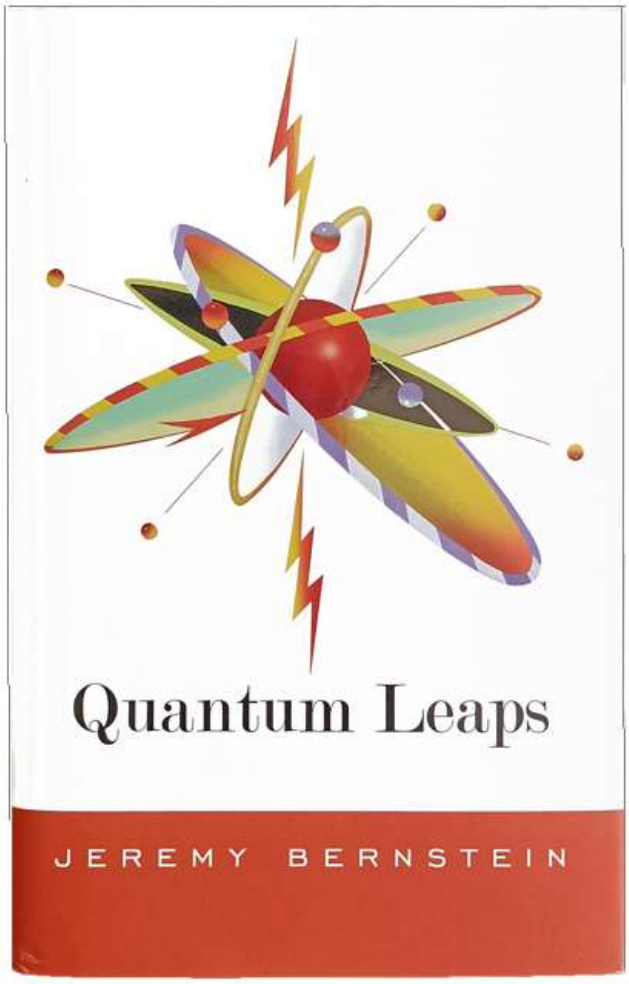
$ 20

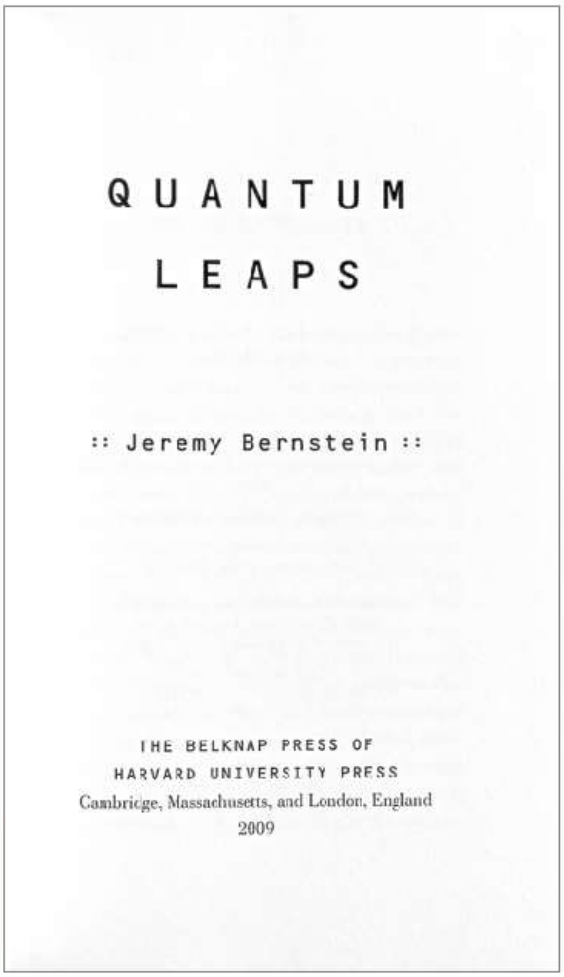
Harris Bernstein was associated with the Dept. of Biology, Josiah Willard Gibbs Research Laboratories, Yale University & the Kerckhoff Laboratory of Biology, Caltech.



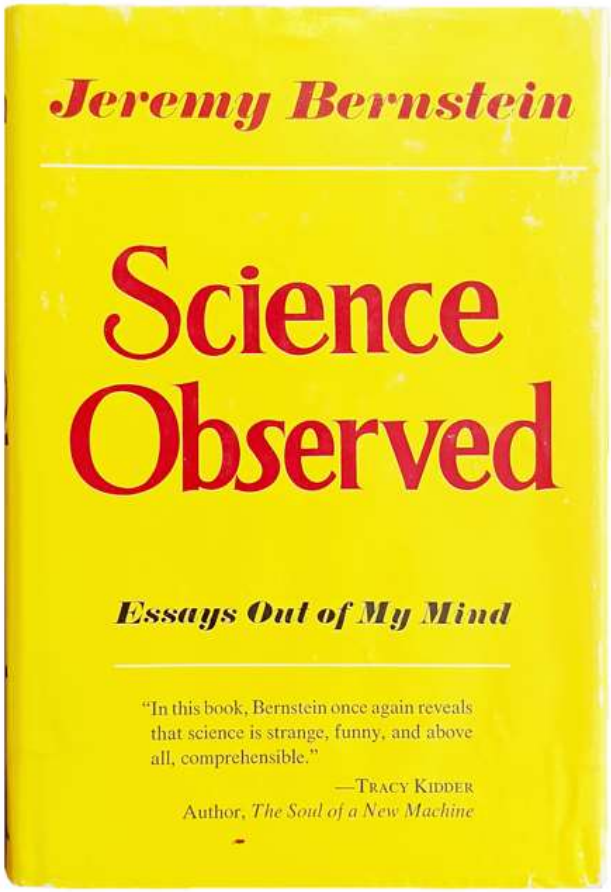


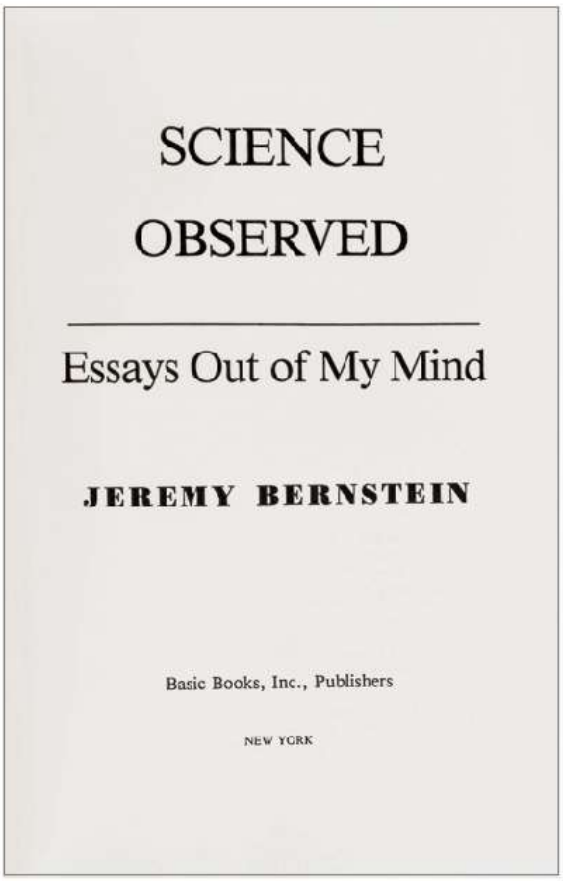
131. **BERNSTEIN, Jeremy** (1929-). *The analytical engine, computers - past, present and future*. New York: Random House, 1964. ¶ Small 8vo. xi, 113 pp. Index. Blind-stamped black cloth, gilt spine, dust-jacket; jacket spine lightly faded, else fine. S5598 $ 6





132. **BERNSTEIN, Jeremy** (1929-). *Quantum Leaps*. Cambridge: The Belknap Press of Harvard University Press, 2009. ¶ Sm. 8vo. vi, 230 pp. Index. Quarter black silver-stamped red boards, dust-jacket. S11929 $ 4.95



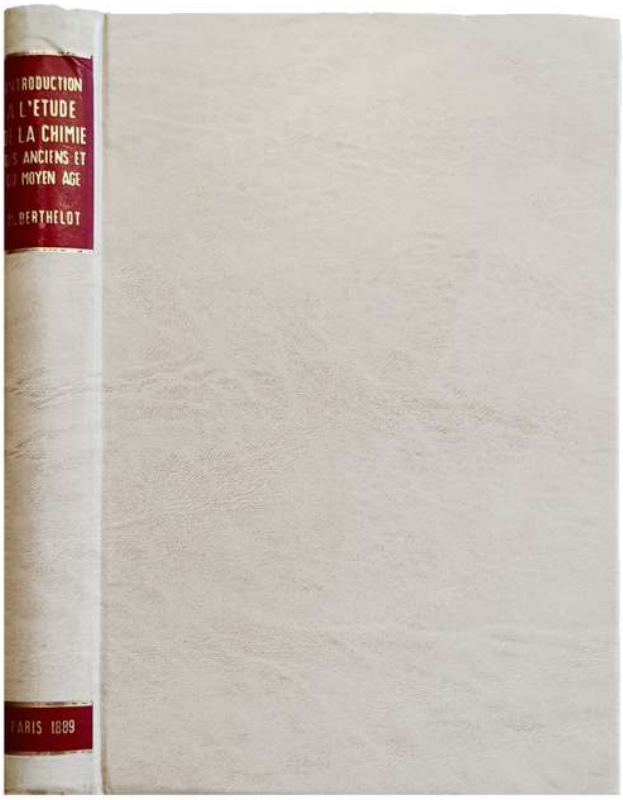


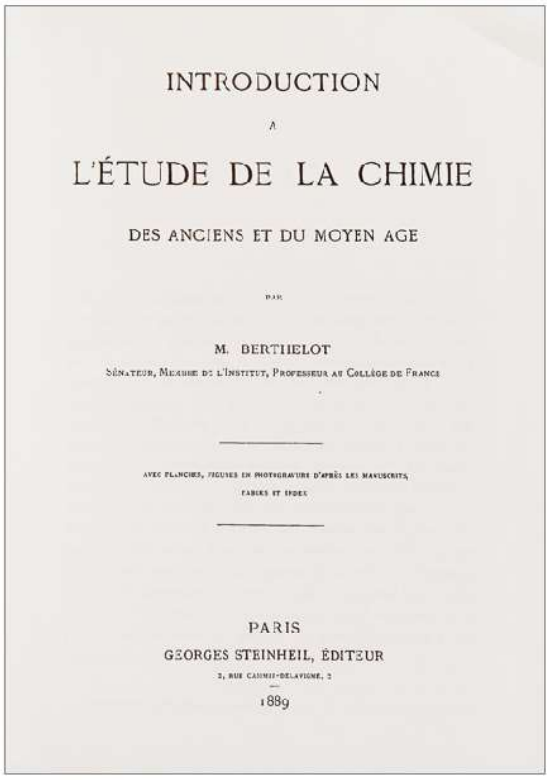
Essays Out of My Mind

133. **BERNSTEIN, Jeremy** (1929-). *Science Observed; Essays Out of My Mind.* New York: Basic Books, 1982. ¶ 216 x 146 mm. 8vo. vii, 376 pp. Bibliog., index. Black gilt-stamped cloth, dust-jacket. Near fine. S11928

$ 12.95

First edition. With essays on hacking, intelligent machines, programming intelligence, Schrodinger, Oppenheimer, nuclear research, Gell-Mann, etc.




INTRODUCTION

A

L'ÉTUDE DE LA CHIMIE

DES ANCIENS ET DU MOYEN AGE

PAR

M. BERTHELOT

SÉNATEUR, MEMBRE DE L'INSTITUT, PROFESSEUR AU COLLÈGE DE FRANCE

AVEC PLANCHES, FIGURES EN PHOTOGRAVURE D'APRÈS LES MANUSCRITS,
TABLES ET INDEX

PARIS

GEORGES STEINHEIL, ÉDITEUR

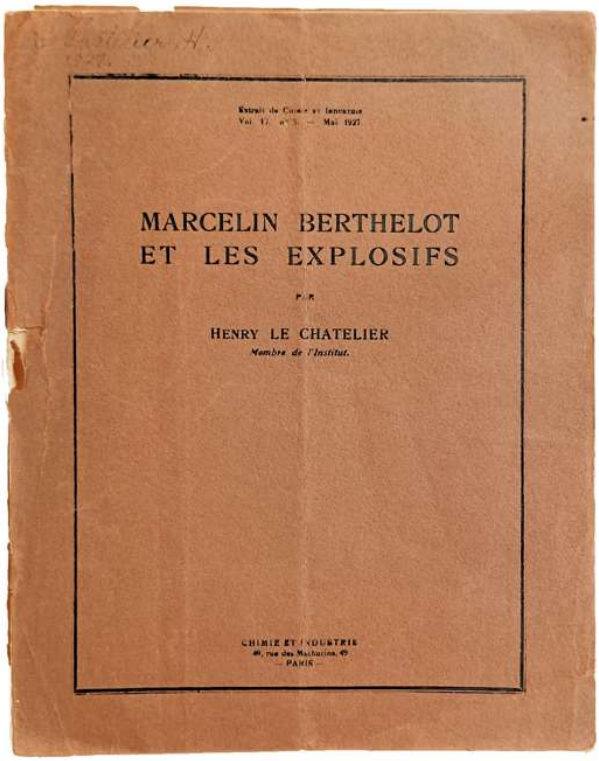
1889

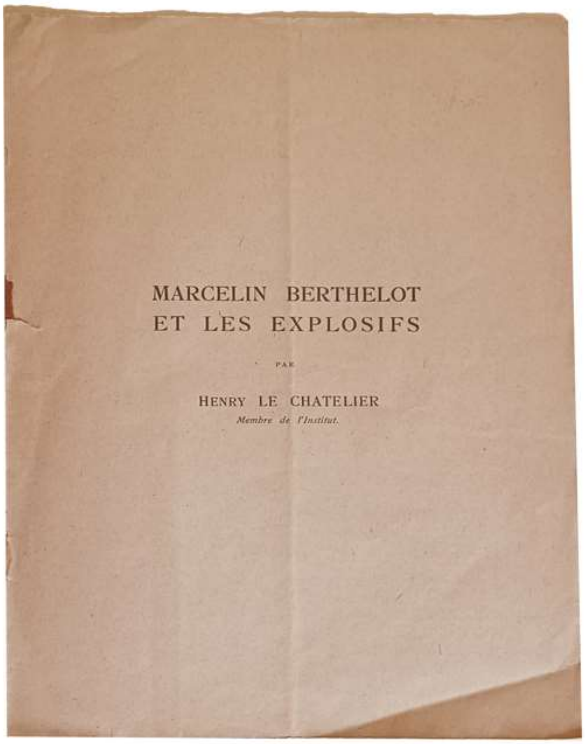
134. **BERTHELOT, Pierre Eugene** (1827-1907). *Introduction a l'Etude de la Chimie des Anciens et du Moyen Age*. Brussels: Impression Anastaltique Culture et Civilisation, 1983. ¶ Facsimile of the Paris edition of 1889. 8vo. [2], xii, 330 pp. Illus., appendix, index. Light tan leatherette, gilt-stamped red spine title. Very good. S9602

$ 35

Reprint of the first edition of this classic history of alchemy and ancient chemistry.

Marcellin Berthelot is one of the first great historiographers of ancient chemistry and alchemy. In 1885, he published *Les Origines de l'alchimie* and in 1887-1888 a *Collection des anciens alchimistes grecs*. In the present Introduction, written in French, he continues his research into the history of alchemy: "the chemical science of the Ancients had hitherto been little known, especially as regards its origins, its theoretical ideas and its philosophy; ignorance all the more prejudicial as it rendered incomprehensible the alchemical doctrine, which reigned throughout the Middle Ages and continued until the end of the last century."

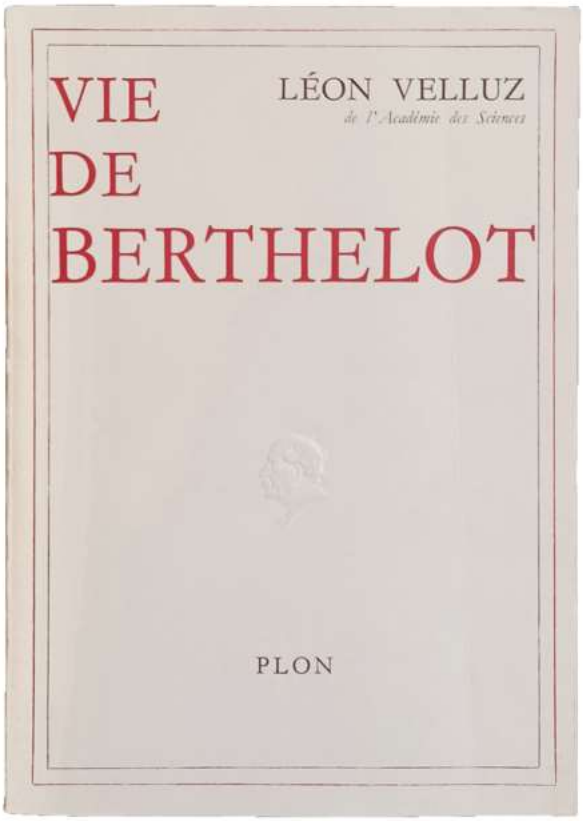




135. [**BERTHELOT, Marcelin** (1827-1907)] **CHATELIER, Henry Le** (1850-1936). *"Marcelin Berthelot et les explosifs."* Offprint from: *Chimie et Industrie*, Vol. 17, No. 5, May 1927. Paris: Chimie et Industrie, 1927. ¶ 4to. 6, [ads 2] pp. 3 figs. Original printed wrappers; spine torn, cover off. Ms. notation on top cover. Good. S5906

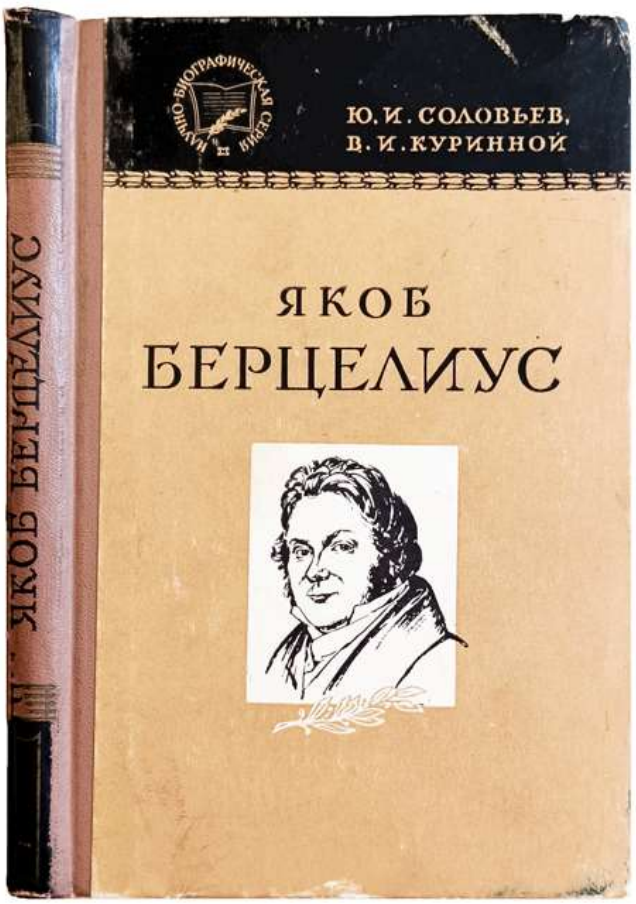
$ 18

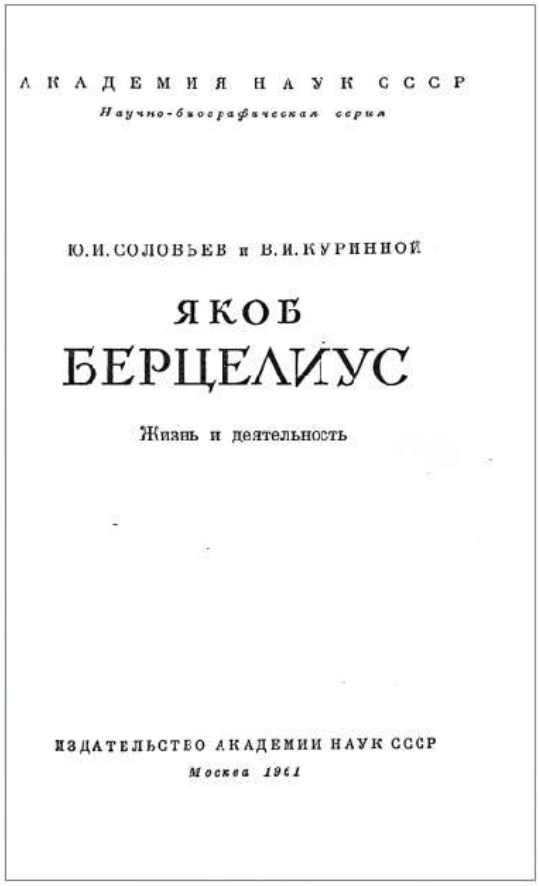
Pierre Eugène Marcellin Berthelot was a French chemist and Republican politician noted for the Thomsen–Berthelot principle of thermochemistry. Henry Louis Le Chatelier was a French chemist of the late 19th and early 20th centuries. He devised Le Chatelier's principle, used by chemists and chemical engineers to predict the effect a changing condition has on a system in chemical equilibrium.



136. [**BERTHELOT, Marcellin** (1827-1907)] **VELLUZ, Léon** (1900-). *Vie de Berthelot*. Paris: Plon, 1964. ¶ Sm. 8vo. 251 pp. Plates. Printed wrappers. Fine. RH1327 $ 8

From the library of Roger Hahn.

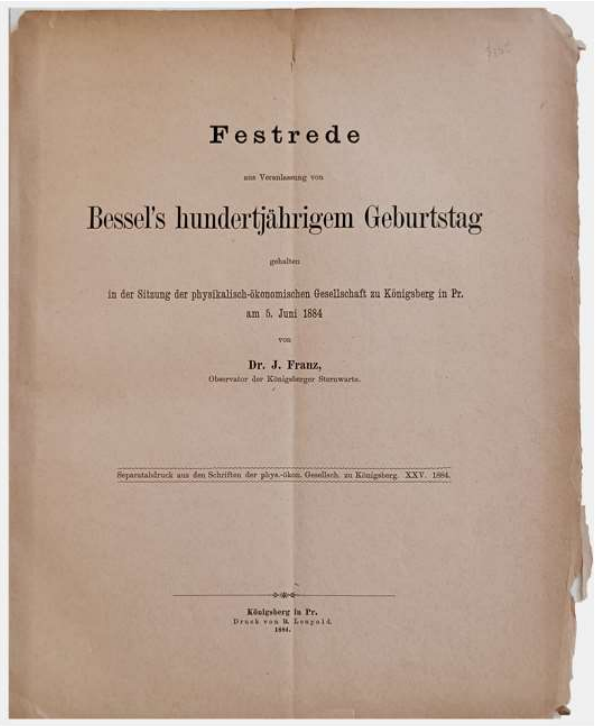




137. [**BERZELIUS, Jons Jacob, Baron** (1779-1848)] **Iurii Ivanovich [Yuri] SOLOVIEV** (1924-2005); **Viktor Ivanovich KURINNOI**. *Jacob Berzelius: Zhin i Deiatelnost*. Moscow: Academy of Sciences, 1961. ¶ Text in Russian. 8vo. 172, [4] pp. Frontispiece, publisher's note laid-in. Quarter pebbled brown cloth over paper-backed boards; covers rubbed. SCARCE. Very good. S11041

$ 15

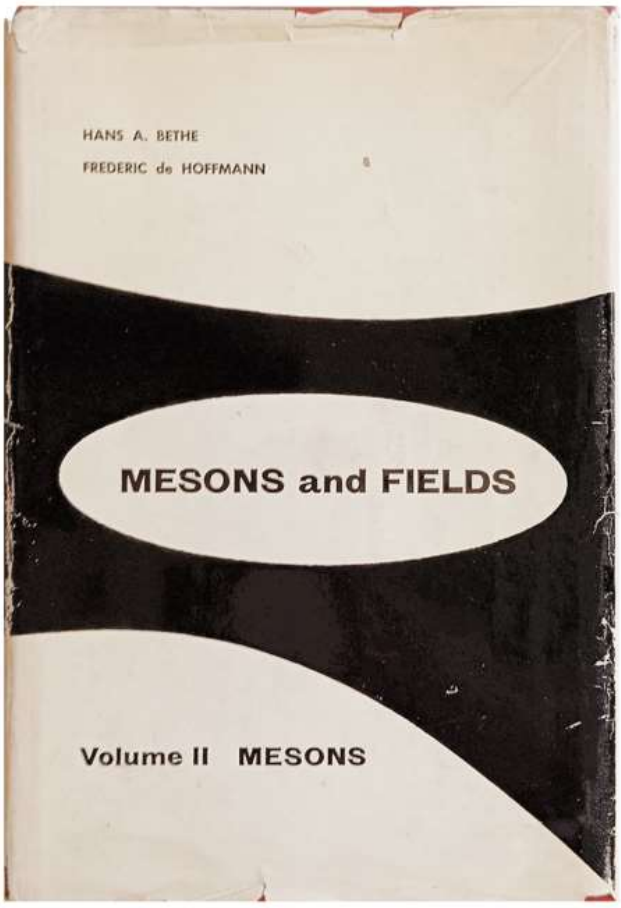
"Jons Jacob Berzelius (1779-1848) was a Swedish chemist . . . [who] worked out the modern technique of chemical formula notation, and is together with John Dalton, Antoine Lavoisier, and Robert Boyle considered a father of modern chemistry." [web-source]. In 1957, Yuri Ivanovich Soloviev became head of the history of chemistry section. His work focuses on the history of chemistry for which he had written numerous biographies of chemists.

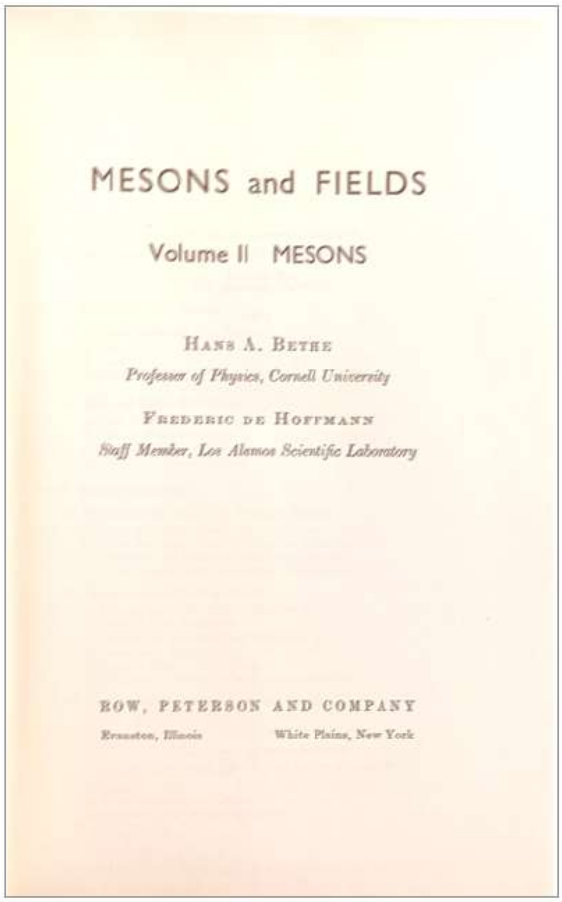


138. [**BESSEL, F. W**. (1784-1846)] **FRANZ, Julius Heinrich Georg** (1847-1913). *"Festrede aus Veranlassung von Bessel's hundertjahrigem Geburstag gehalten in der Sitzung der physikalisch-okonomischen Gesellschaft zu Konigsberg in Pr. am 5. Juni 1884."* Offprint from: Schriften der phys.-okon. Gesellsch. zu Konigsberg, Vol. XXV, 1884. Konigsberg in Pr.: R. Leupold, 1884. ¶ 4to. 24 pp. Original printed wrappers; paper brittle, edges chipped and torn. Ex library rubber stamps on top cover, ms. notation. Good. S5907

$ 10

'Commemorative speech on the occasion of Bessel's centenary held at the meeting of the physico-economic society in Konigsberg in Prussia on June 5, 1884.'



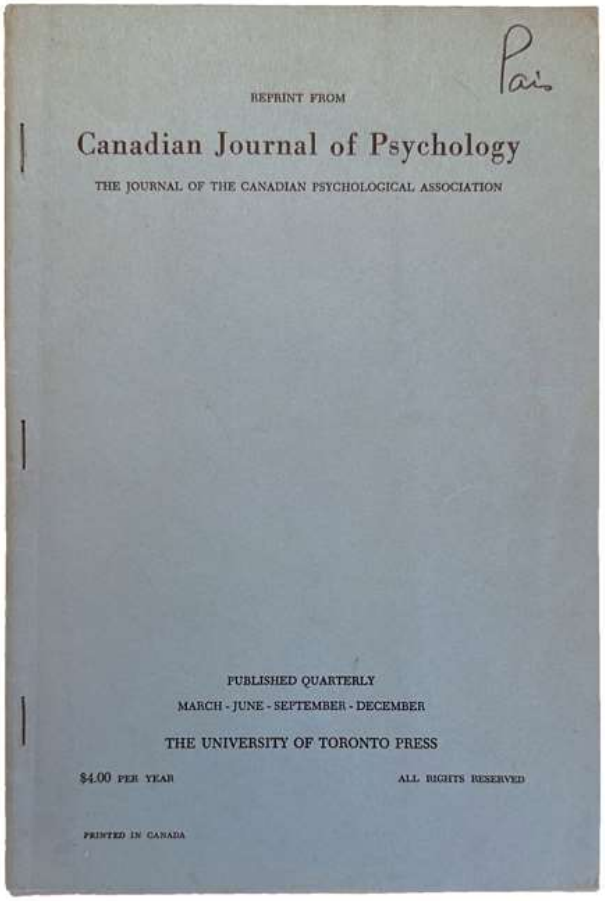


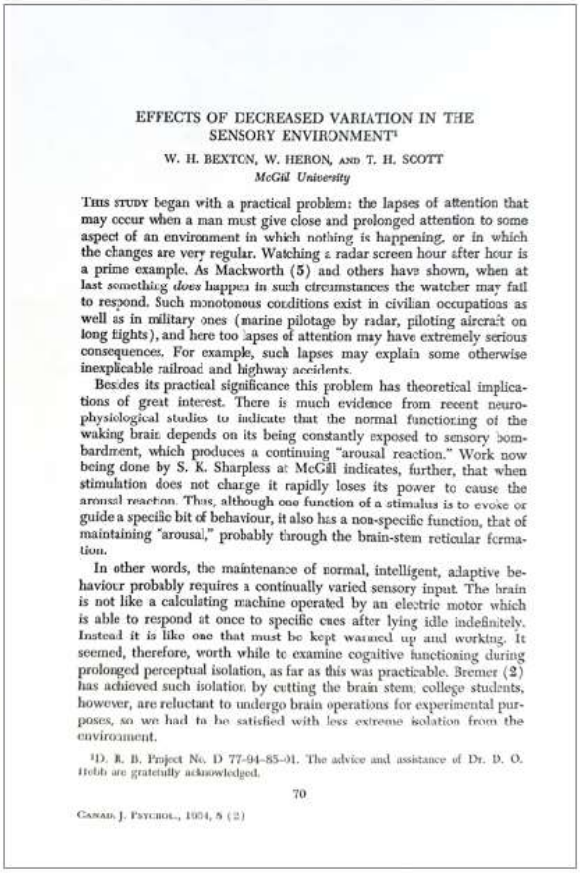
139. **BETHE, Hans A.** (1906-2005); **Frederic de HOFFMANN** (1924-1989). *Mesons and fields. Vol. II. Mesons.* Evanston, Illinois & White Plains, New York: Row, Peterson, (1955). ¶ Volume two only. 235 x 160 mm. 8vo. xiii, [1 blank], 446 pp. Figs., tables, bibliog., index. Red cloth, dust-jacket; jacket chipped. Ownership signature of Abraham Pais. Very good. S4809

$ 12.95

Hans Albrecht Bethe was a German-American theoretical physicist who made major contributions to nuclear physics, astrophysics, quantum electrodynamics, and solid-state physics, and who won the 1967 Nobel Prize in Physics for his work on the theory of stellar nucleosynthesis. For most of his career, Bethe was a professor at Cornell University.

Frederic de Hoffmann was a nuclear physicist who worked on the Manhattan Project. De Hoffmann joined the Salk Institute for Biological Studies in 1970 and served as its president for 18 years.





EFFECTS OF DECREASED VARIATION IN THE SENSORY ENVIRONMENT[1]

W. H. BEXTON, W. HERON, AND T. H. SCOTT
McGill University

THIS STUDY began with a practical problem: the lapses of attention that may occur when a man must give close and prolonged attention to some aspect of an environment in which nothing is happening, or in which the changes are very regular. Watching a radar screen hour after hour is a prime example. As Mackworth (5) and others have shown, when at last something *does* happen in such circumstances the watcher may fail to respond. Such monotonous conditions exist in civilian occupations as well as in military ones (marine pilotage by radar, piloting aircraft on long flights), and here too lapses of attention may have extremely serious consequences. For example, such lapses may explain some otherwise inexplicable railroad and highway accidents.

Besides its practical significance this problem has theoretical implications of great interest. There is much evidence from recent neurophysiological studies to indicate that the normal functioning of the waking brain depends on its being constantly exposed to sensory bombardment, which produces a continuing "arousal reaction." Work now being done by S. K. Sharpless at McGill indicates, further, that when stimulation does not change it rapidly loses its power to cause the arousal reaction. Thus, although one function of a stimulus is to evoke or guide a specific bit of behaviour, it also has a non-specific function, that of maintaining "arousal," probably through the brain-stem reticular formation.

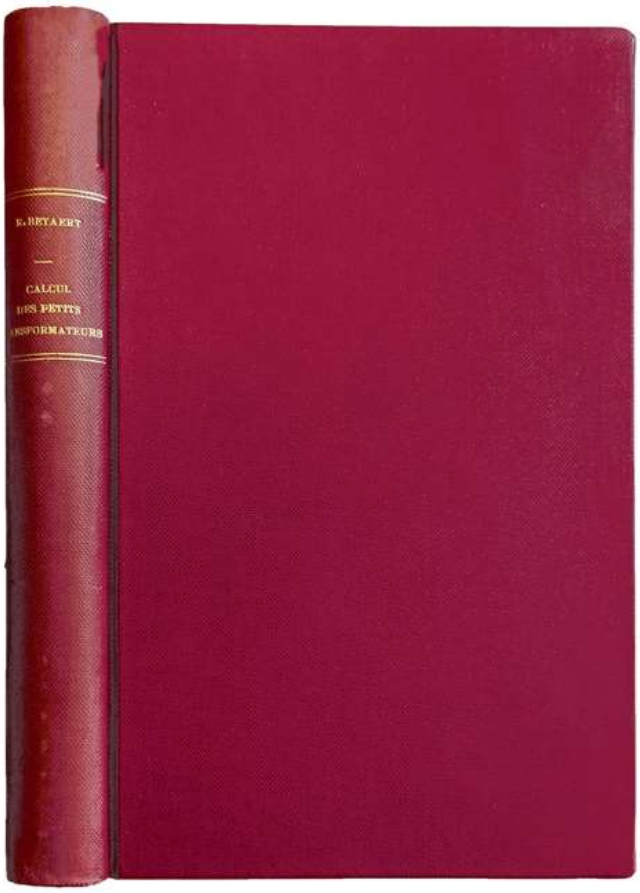
In other words, the maintenance of normal, intelligent, adaptive behaviour probably requires a continually varied sensory input. The brain is not like a calculating machine operated by an electric motor which is able to respond at once to specific cues after lying idle indefinitely. Instead it is like one that must be kept warmed up and working. It seemed, therefore, worth while to examine cognitive functioning during prolonged perceptual isolation, as far as this was practicable. Bremer (2) has achieved such isolation by cutting the brain stem; college students, however, are reluctant to undergo brain operations for experimental purposes, so we had to be satisfied with less extreme isolation from the environment.

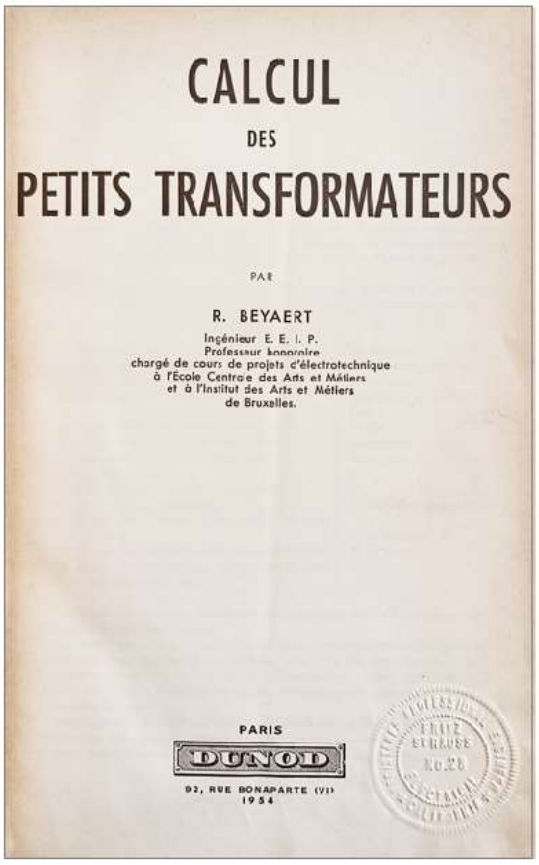
[1]D. R. B. Project No. D 77-04-85-01. The advice and assistance of Dr. D. O. Hebb are gratefully acknowledged.

140. **BEXTON, William Harold**; **Woodburn HERON**; **Thomas H. SCOTT**. *"Effects of Decreased Variation in the Sensory Environment."* Offprint from: *Canadian Journal of Psychology*. Toronto: Univ. of Toronto Press, 1954. ¶ 8vo. pp. 70-76 pp. Figs. Blue printed wrappers. Very good. S7174

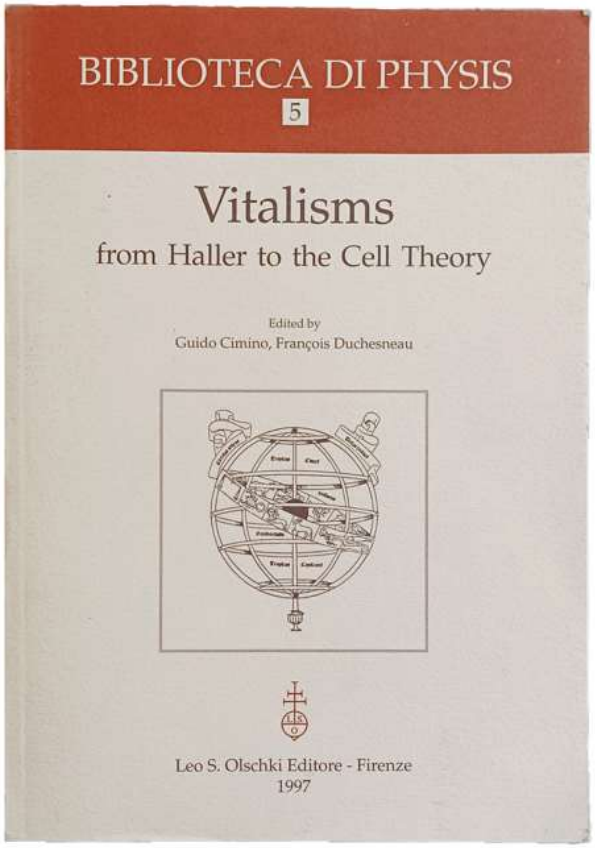
$ 125

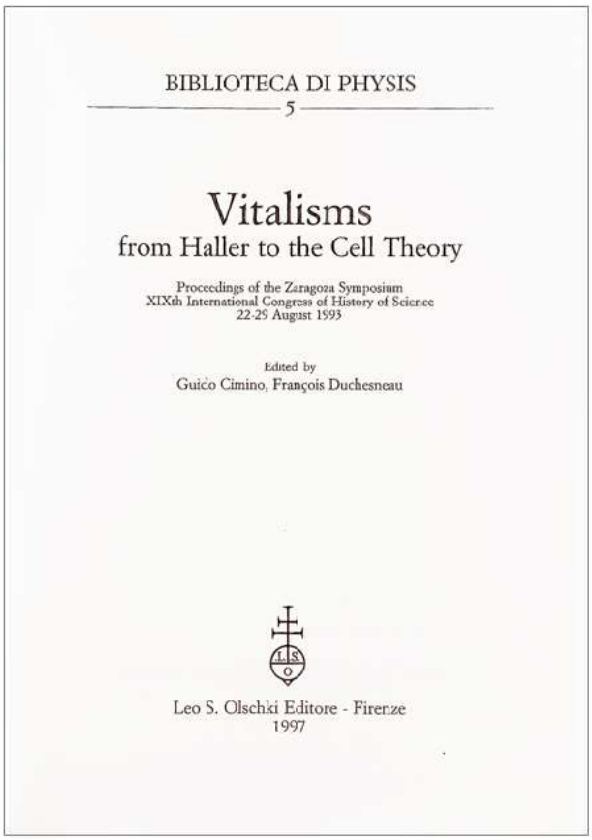
Important study in psychology that revealed that people experiencing sensory deprivation often spontaneously reported vivid, intrusive, and sometimes bizarre mental imagery. "Their work is a long step toward dealing with the realities of motivation in the well-fed, physically comfortable, adult human being." "Drives and the C. N. S.", D. O. Hebb.





141. **BEYAERT, René**. *Calcul des petits transformateurs*. Paris: Dunod, 1954. ¶ 240 x 155 mm. 8vo. xix, 397 pp. Figs., tables. Maroon cloth, gilt spine; end-leaves browned. Ownership blind-stamp of Fritz Strauss, engineer. Very good. S2151 $ 18



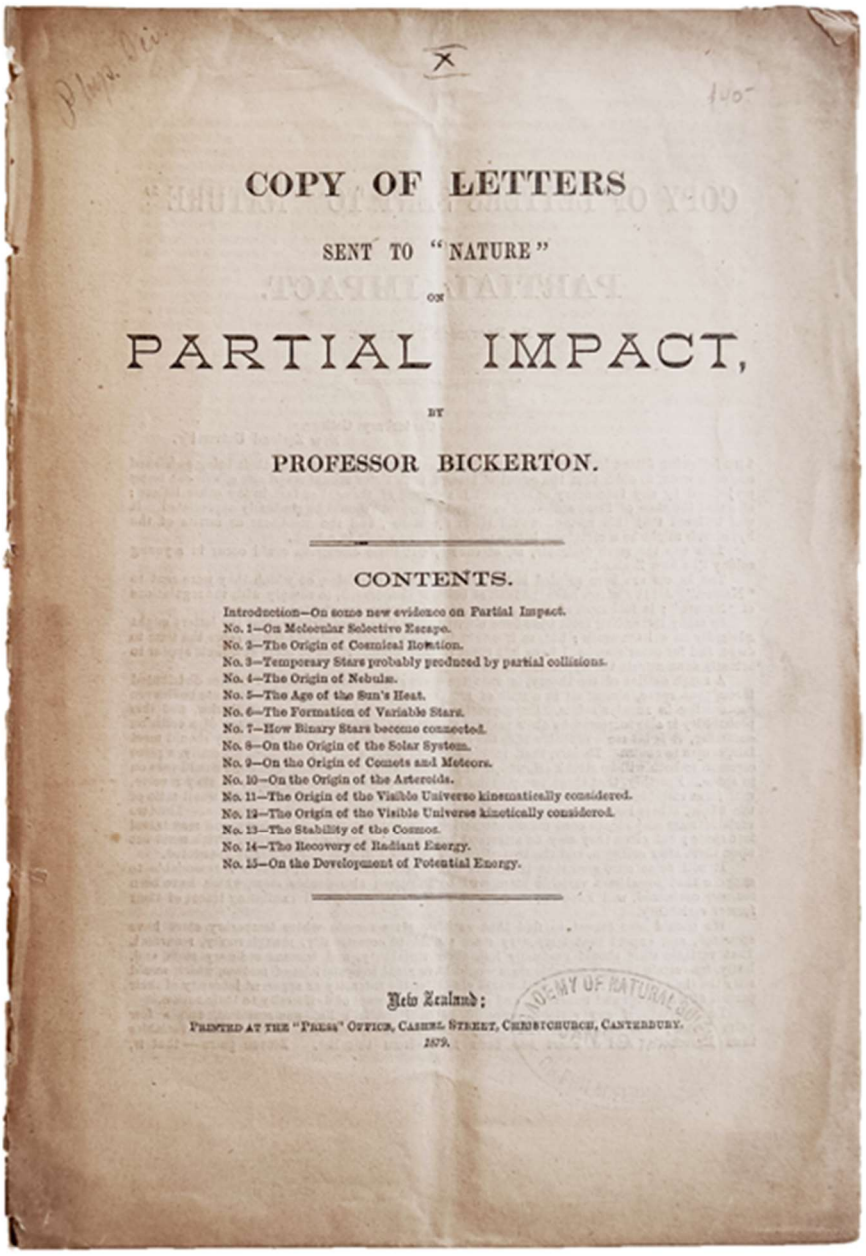


142. **Biblioteca di Physis; Guido CIMINO** (co-ed.); **International Congress on the History of Sciences**. *Vitalisms from Haller to the Cell Theory; proceedings of the Zaragoza symposium, XIXth International Congress of History of Science, 22-29 August 1993. Edited by Guido Cimino, François Duchesneau.* Firenze: Leo S. Olschki, 1997. ¶ Series: *Biblioteca di Physis*, 5. Articles in English and French. 8vo. 357 pp. Index. Printed wrappers. Scarce. Very good. RH1559

$ 50

This volume of conference proceedings contains the following contributions: Guido Cimino, "Introduction: La problématique du vitalisme"; Roselyne Rey, "Lignes de force et tendances actuelles des études sur le vitalisme"; Richard Toellner, "Principles and Forces of Life in Haller"; Maria Teresa Monti, "Les dynamismes du corps et les forces du vivant dans la physiologie de Haller"; Giulio Barsanti, "Les phénomènes 'étranges' et 'paradoxaux' aux origines de la première révolution biologique (1740-1810)"; Federico Di Trocchio, "The Vital Principle in Therapy: Barthez and the Theory of Fluxions"; Francois Azouvi, "Le vitalisme de Maine de Biran"; Brigitte Lohff, "The Concept of Vital Forces as a Research Program (from mid-XVIIIth Century to Johannes Muller)"; Frederick Gregory, "The Newtonian Vitalism of J. F. Fries"; Dietrich von Engelhardt, "Vitalism between Science and Philosophy in Germany around 1800"; Roselyne Rey, "Bichat au carrefour des vitalismes"; Jacalyn Duffin, "Cadavers and Patients: Laennec's Vital Principle and the Historical Diagnosis of Vitalism"; Francois Duchesneau,

"Vitalism and Anti-vitalism in Schwann's Program for the Cell Theory"; Guido Cimino, "Propriétés ou forces nerveuses dans l'œuvre de Flourens"; Frederic L. Holmes, "Claude Bernard and the Vitalism of His Time"; and Francois Duchesneau, "Territoires et frontières du vitalisme (1750-1850)." Reviewed: Journal of the History of Biology, 33, (2000).



COPY OF LETTERS

SENT TO "NATURE"

ON

PARTIAL IMPACT,

BY

PROFESSOR BICKERTON.

CONTENTS.

New Zealand:

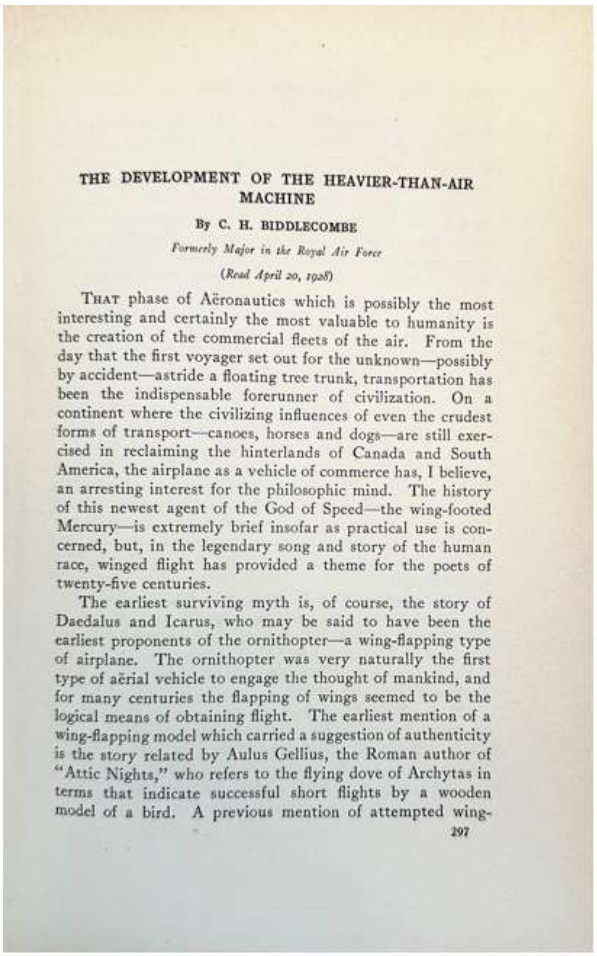
PRINTED AT THE "PRESS" OFFICE, CASHEL STREET, CHRISTCHURCH, CANTERBURY.

1879.

143. **BICKERTON, William Alexander** (1842-1929). *Copy of letters sent to "Nature" on partial impact, by Professor Bickerton*. New Zealand: Printed at the "Press" Office, 1879. ¶ 8vo. 16 pp. Dis-bound, margins soiled. Ex library rubber stamp. Good. S6267

$ 20

In 1874 Alexander Bickerton was appointed professor of chemistry at Canterbury College, New Zealand University. Here Bickerton provides a series of letters that put forth his theory of "partial impact," which stated that the partial impact of heavenly bodies was the origin of new stars and the cause of other unexplained astronomical phenomena, such as the origin of nebulae, the formation of variable stars, binary stars, and more. Bickerton claimed that his theory succeeded in carrying the principle of evolution beyond a mere planet or even a solar system, and showed it to be a universal law controlling the cosmos.



THE DEVELOPMENT OF THE HEAVIER-THAN-AIR MACHINE

By C. H. BIDDLECOMBE

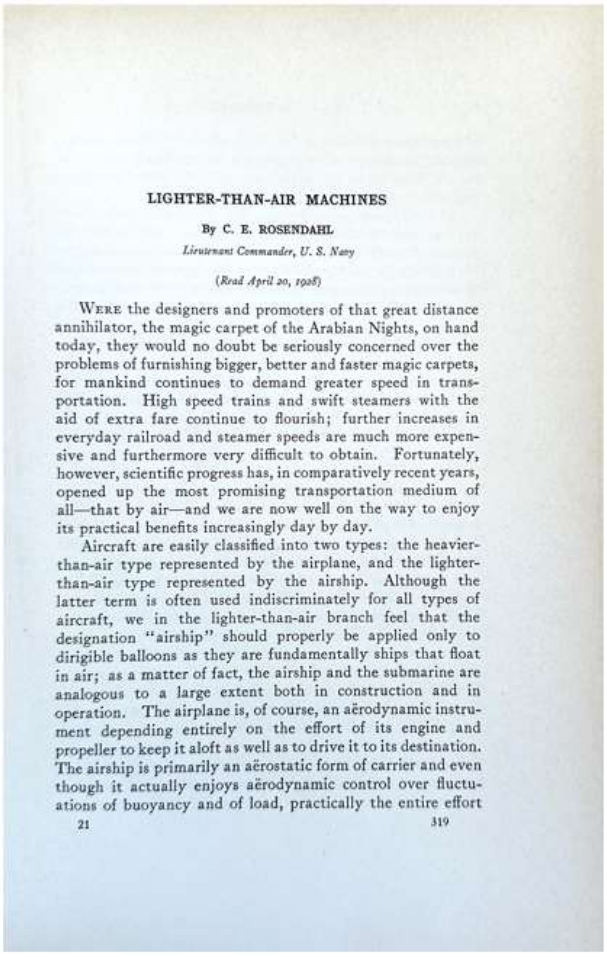
Formerly Major in the Royal Air Force

(*Read April 20, 1928*)

That phase of Aëronautics which is possibly the most interesting and certainly the most valuable to humanity is the creation of the commercial fleets of the air. From the day that the first voyager set out for the unknown—possibly by accident—astride a floating tree trunk, transportation has been the indispensable forerunner of civilization. On a continent where the civilizing influences of even the crudest forms of transport—canoes, horses and dogs—are still exercised in reclaiming the hinterlands of Canada and South America, the airplane as a vehicle of commerce has, I believe, an arresting interest for the philosophic mind. The history of this newest agent of the God of Speed—the wing-footed Mercury—is extremely brief insofar as practical use is concerned, but, in the legendary song and story of the human race, winged flight has provided a theme for the poets of twenty-five centuries.

The earliest surviving myth is, of course, the story of Daedalus and Icarus, who may be said to have been the earliest proponents of the ornithopter—a wing-flapping type of airplane. The ornithopter was very naturally the first type of aërial vehicle to engage the thought of mankind, and for many centuries the flapping of wings seemed to be the logical means of obtaining flight. The earliest mention of a wing-flapping model which carried a suggestion of authenticity is the story related by Aulus Gellius, the Roman author of "Attic Nights," who refers to the flying dove of Archytas in terms that indicate successful short flights by a wooden model of a bird. A previous mention of attempted wing-

297



LIGHTER-THAN-AIR MACHINES

By C. E. ROSENDAHL

Lieutenant Commander, U. S. Navy

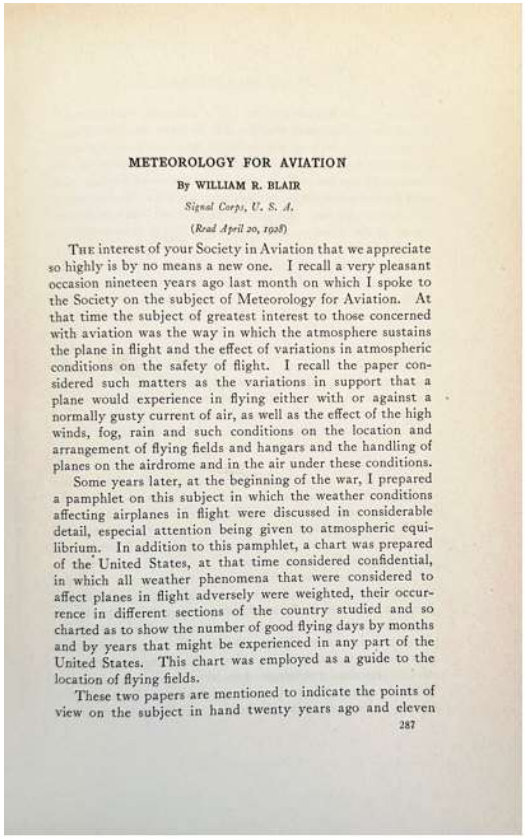
(*Read April 20, 1928*)

Were the designers and promoters of that great distance annihilator, the magic carpet of the Arabian Nights, on hand today, they would no doubt be seriously concerned over the problems of furnishing bigger, better and faster magic carpets, for mankind continues to demand greater speed in transportation. High speed trains and swift steamers with the aid of extra fare continue to flourish; further increases in everyday railroad and steamer speeds are much more expensive and furthermore very difficult to obtain. Fortunately, however, scientific progress has, in comparatively recent years, opened up the most promising transportation medium of all—that by air—and we are now well on the way to enjoy its practical benefits increasingly day by day.

Aircraft are easily classified into two types: the heavier-than-air type represented by the airplane, and the lighter-than-air type represented by the airship. Although the latter term is often used indiscriminately for all types of aircraft, we in the lighter-than-air branch feel that the designation "airship" should properly be applied only to dirigible balloons as they are fundamentally ships that float in air; as a matter of fact, the airship and the submarine are analogous to a large extent both in construction and in operation. The airplane is, of course, an aërodynamic instrument depending entirely on the effort of its engine and propeller to keep it aloft as well as to drive it to its destination. The airship is primarily an aërostatic form of carrier and even though it actually enjoys aërodynamic control over fluctuations of buoyancy and of load, practically the entire effort

21 319

3 Papers on Early Aviation [144]



METEOROLOGY FOR AVIATION

By WILLIAM R. BLAIR

Signal Corps, U. S. A.

(*Read April 20, 1928*)

THE interest of your Society in Aviation that we appreciate so highly is by no means a new one. I recall a very pleasant occasion nineteen years ago last month on which I spoke to the Society on the subject of Meteorology for Aviation. At that time the subject of greatest interest to those concerned with aviation was the way in which the atmosphere sustains the plane in flight and the effect of variations in atmospheric conditions on the safety of flight. I recall the paper considered such matters as the variations in support that a plane would experience in flying either with or against a normally gusty current of air, as well as the effect of the high winds, fog, rain and such conditions on the location and arrangement of flying fields and hangars and the handling of planes on the airdrome and in the air under these conditions.

Some years later, at the beginning of the war, I prepared a pamphlet on this subject in which the weather conditions affecting airplanes in flight were discussed in considerable detail, especial attention being given to atmospheric equilibrium. In addition to this pamphlet, a chart was prepared of the United States, at that time considered confidential, in which all weather phenomena that were considered to affect planes in flight adversely were weighted, their occurrence in different sections of the country studied and so charted as to show the number of good flying days by months and by years that might be experienced in any part of the United States. This chart was employed as a guide to the location of flying fields.

These two papers are mentioned to indicate the points of view on the subject in hand twenty years ago and eleven

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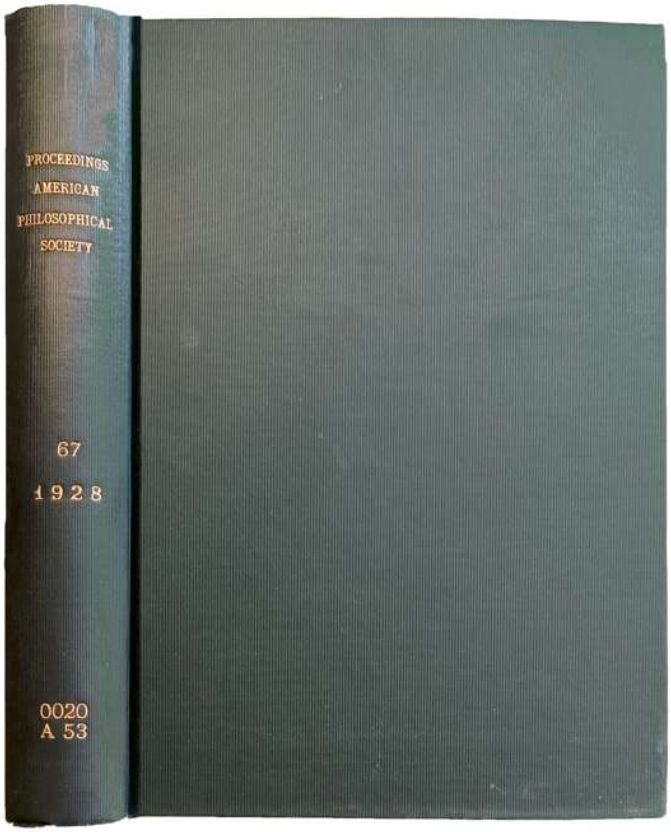


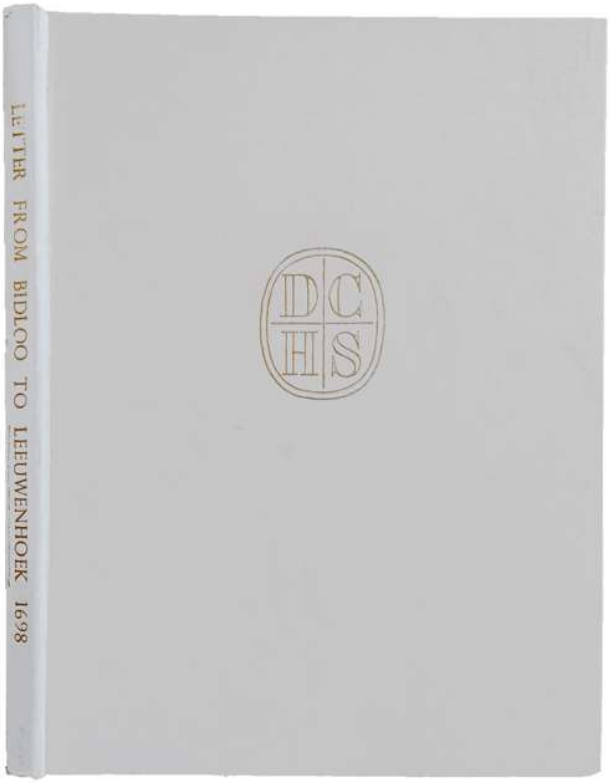
144. **BIDDLECOMBE, C. H.** *The development of the heavier-than-air machine.*

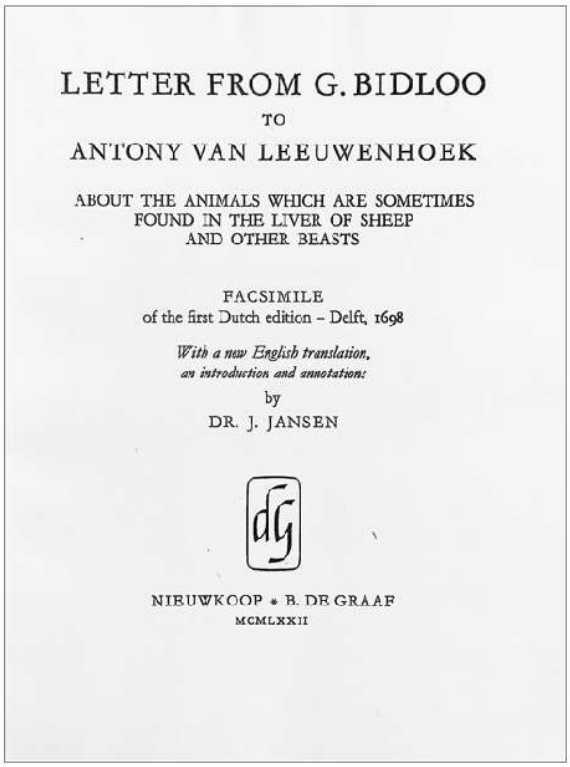
with: **BLAIR, William R**. (1874-1962). *"Meteorology for aviation."*

with: **ROSENDAHL, Charles Emery** (1892-1977). *"Lighter-than-air machines."*
In: *Proceedings of the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge,* Vol. LXVII, 1928. Philadelphia: The American Philosophical Society, 1928. ¶ 245 x 174 mm. 8vo. Pages 297-306; 287-296; 319-334. [Entire volume: xx, 384 pp.]. Dark green buckram, gilt spine. Ex library blind-stamp of the Carnegie Institution of Washington Mount Wilson Observatory. Fine. S2467

$ 100

Bibblecombe's article gives an historical overview of the development of heavier-than-air flight and discusses its implications for commercial air travel. Blair's article, with 1 figure, discusses the French example of the practical concerns of meteorology in the daily management of air travel. Rosendahl reviews the recent development of lighter-than-air transport as a means of general travel and predicts its growing importance for commercial purposes.




LETTER FROM G. BIDLOO
TO
ANTONY VAN LEEUWENHOEK

ABOUT THE ANIMALS WHICH ARE SOMETIMES FOUND IN THE LIVER OF SHEEP AND OTHER BEASTS

FACSIMILE
of the first Dutch edition – Delft, 1698

With a new English translation, an introduction and annotations
by
DR. J. JANSEN

NIEUWKOOP • B. DE GRAAF
MCMLXXII

145. **BIDLOO, Govard** (1649-1713); **Jacob JANSEN** (ed.). *Letter from G. Bidloo to Antony van Leeuwenhoek about the Animals Which Are Sometimes Found in the Liver of Sheep and Other Beasts. Facsimile of the first Dutch edition – Delft, 1968. With a New English Translation, an Introduction and Annotations by Dr. J. Jansen.* Nieuwkoop: B. De Graaf, 1972. ¶ Series: Dutch Classics in History of Science, Vol. XVIII. 8vo. 61, facsimile 34 pp. Frontis., plate. White paper boards, gilt-stamped cover acronym and spine title; small scuff to spine title, else fine. Bookplate of the Burndy Library. S9588

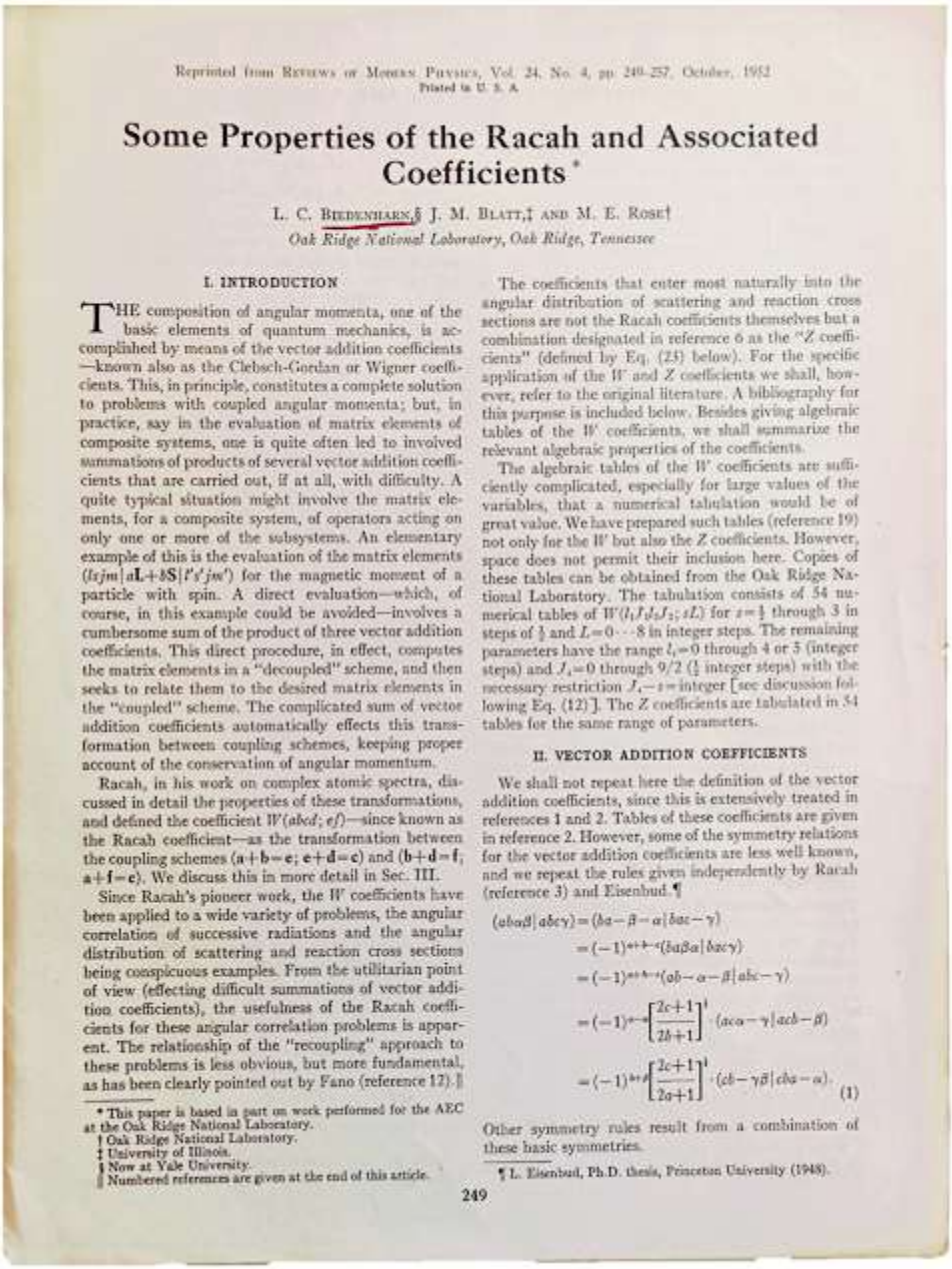
$ 20

Limited Edition of 500 copies. Harshly reviewed by John Farley, Dalhousie University.

The letter of 1698, from the Dutch naturalist and surgeon Govard Bidloo (1649-1713), reflects this interest in worms, and on these grounds the facsimile edition is to be welcomed.

Late-seventeenth-century naturalists became fascinated by the new world revealed to them by the microscope, and literature of that period abounds with detailed descriptions of many and varied organisms. One of the results of this was an interest in parasitic worms, climaxing in the first treatise on worms written by Nicolas Andry in 1700 (*De le génération des vers dans le corps de l'homme*). Many historians may consider worms to be a rather disgusting or esoteric group, but they

hold an important place in the history of the biological sciences, not only because of their obvious medical and veterinary importance, but also because partisans of spontaneous generation derived major support from them. [John Farley].



Reprinted from REVIEWS OF MODERN PHYSICS, Vol. 24, No. 4, pp. 249–257, October, 1952
Printed in U. S. A.

Some Properties of the Racah and Associated Coefficients*

L. C. BIEDENHARN,§ J. M. BLATT,‡ AND M. E. ROSE†
Oak Ridge National Laboratory, Oak Ridge, Tennessee

I. INTRODUCTION

THE composition of angular momenta, one of the basic elements of quantum mechanics, is accomplished by means of the vector addition coefficients—known also as the Clebsch-Gordan or Wigner coefficients. This, in principle, constitutes a complete solution to problems with coupled angular momenta; but, in practice, say in the evaluation of matrix elements of composite systems, one is quite often led to involved summations of products of several vector addition coefficients that are carried out, if at all, with difficulty. A quite typical situation might involve the matrix elements, for a composite system, of operators acting on only one or more of the subsystems. An elementary example of this is the evaluation of the matrix elements $(lsjm|\mathbf{aL}+b\mathbf{S}|l's'jm')$ for the magnetic moment of a particle with spin. A direct evaluation—which, of course, in this example could be avoided—involves a cumbersome sum of the product of three vector addition coefficients. This direct procedure, in effect, computes the matrix elements in a "decoupled" scheme, and then seeks to relate them to the desired matrix elements in the "coupled" scheme. The complicated sum of vector addition coefficients automatically effects this transformation between coupling schemes, keeping proper account of the conservation of angular momentum.

Racah, in his work on complex atomic spectra, discussed in detail the properties of these transformations, and defined the coefficient $W(abcd;ef)$—since known as the Racah coefficient—as the transformation between the coupling schemes $(\mathbf{a}+\mathbf{b}=\mathbf{e};\ \mathbf{e}+\mathbf{d}=\mathbf{c})$ and $(\mathbf{b}+\mathbf{d}=\mathbf{f};\ \mathbf{a}+\mathbf{f}=\mathbf{c})$. We discuss this in more detail in Sec. III.

Since Racah's pioneer work, the W coefficients have been applied to a wide variety of problems, the angular correlation of successive radiations and the angular distribution of scattering and reaction cross sections being conspicuous examples. From the utilitarian point of view (effecting difficult summations of vector addition coefficients), the usefulness of the Racah coefficients for these angular correlation problems is apparent. The relationship of the "recoupling" approach to these problems is less obvious, but more fundamental, as has been clearly pointed out by Fano (reference 12).‖

The coefficients that enter most naturally into the angular distribution of scattering and reaction cross sections are not the Racah coefficients themselves but a combination designated in reference 6 as the "Z coefficients" (defined by Eq. (25) below). For the specific application of the W and Z coefficients we shall, however, refer to the original literature. A bibliography for this purpose is included below. Besides giving algebraic tables of the W coefficients, we shall summarize the relevant algebraic properties of the coefficients.

The algebraic tables of the W coefficients are sufficiently complicated, especially for large values of the variables, that a numerical tabulation would be of great value. We have prepared such tables (reference 19) not only for the W but also the Z coefficients. However, space does not permit their inclusion here. Copies of these tables can be obtained from the Oak Ridge National Laboratory. The tabulation consists of 54 numerical tables of $W(l_1l_2Ll_3;sL)$ for $s=\frac{1}{2}$ through 3 in steps of $\frac{1}{2}$ and $L=0\cdots 8$ in integer steps. The remaining parameters have the range $l_1=0$ through 4 or 5 (integer steps) and $l_3=0$ through 9/2 ($\frac{1}{2}$ integer steps) with the necessary restriction $l_3-s=$ integer [see discussion following Eq. (12)]. The Z coefficients are tabulated in 54 tables for the same range of parameters.

II. VECTOR ADDITION COEFFICIENTS

We shall not repeat here the definition of the vector addition coefficients, since this is extensively treated in references 1 and 2. Tables of these coefficients are given in reference 2. However, some of the symmetry relations for the vector addition coefficients are less well known, and we repeat the rules given independently by Racah (reference 3) and Eisenbud.¶

$$\begin{aligned}(aba\beta|ab c\gamma) &= (ba-\beta-\alpha|bac-\gamma)\\ &= (-1)^{a+b-c}(ba\beta\alpha|bac\gamma)\\ &= (-1)^{a+b-c}(ab-\alpha-\beta|abc-\gamma)\\ &= (-1)^{a-\alpha}\left[\frac{2c+1}{2b+1}\right]^{\frac{1}{2}}(ac\alpha-\gamma|acb-\beta)\\ &= (-1)^{b+\beta}\left[\frac{2c+1}{2a+1}\right]^{\frac{1}{2}}(cb-\gamma\beta|cb\alpha-\alpha)\end{aligned} \tag{1}$$

Other symmetry rules result from a combination of these basic symmetries.

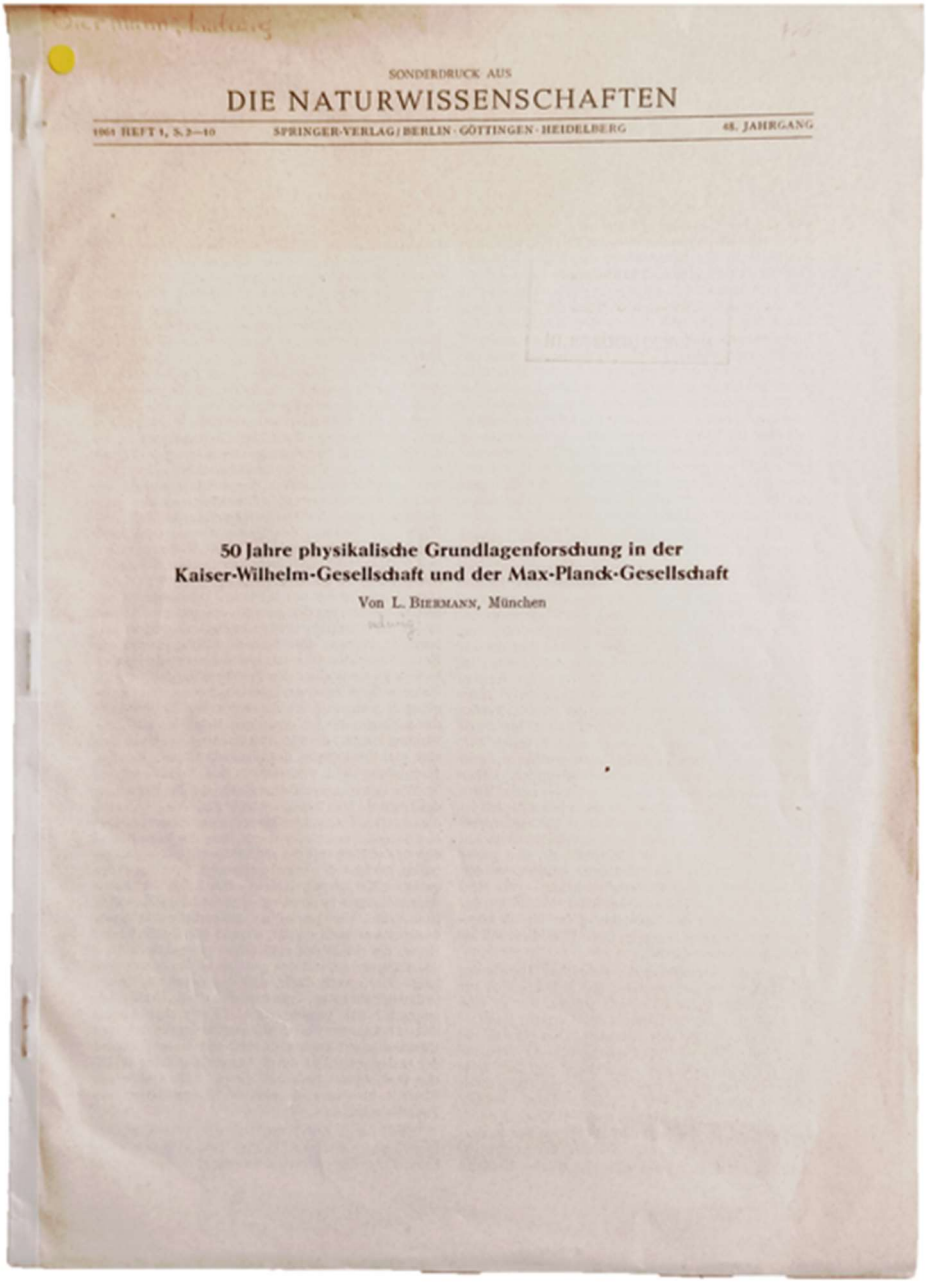
* This paper is based in part on work performed for the AEC at the Oak Ridge National Laboratory.
† Oak Ridge National Laboratory.
‡ University of Illinois.
§ Now at Yale University.
‖ Numbered references are given at the end of this article.
¶ L. Eisenbud, Ph.D. thesis, Princeton University (1948).

146. **BIEDENHARN, Lawrence C.; J. M. BLATT; M. E. ROSE**. *"Some Properties of the Racah and Associated Coefficients."* Offprint from: *Reviews of Modern Physics*, vol. 24, no. 4, Oct. 1952. ¶ 4to. pp. 249-257. Self-wraps. FINE. S7175

$ 25

Biedenharn was a well-known mathematical and theoretical nuclear physicist who taught at Duke University. This represents one of his often cited papers on

symmetry groups in nuclear physics, and is still regarded as a classic. From the Oak Ridge National Laboratory, Oak Ridge, Tennessee.


SONDERDRUCK AUS

DIE NATURWISSENSCHAFTEN

1961 HEFT 1, S. 2–10 SPRINGER-VERLAG / BERLIN · GÖTTINGEN · HEIDELBERG 48. JAHRGANG

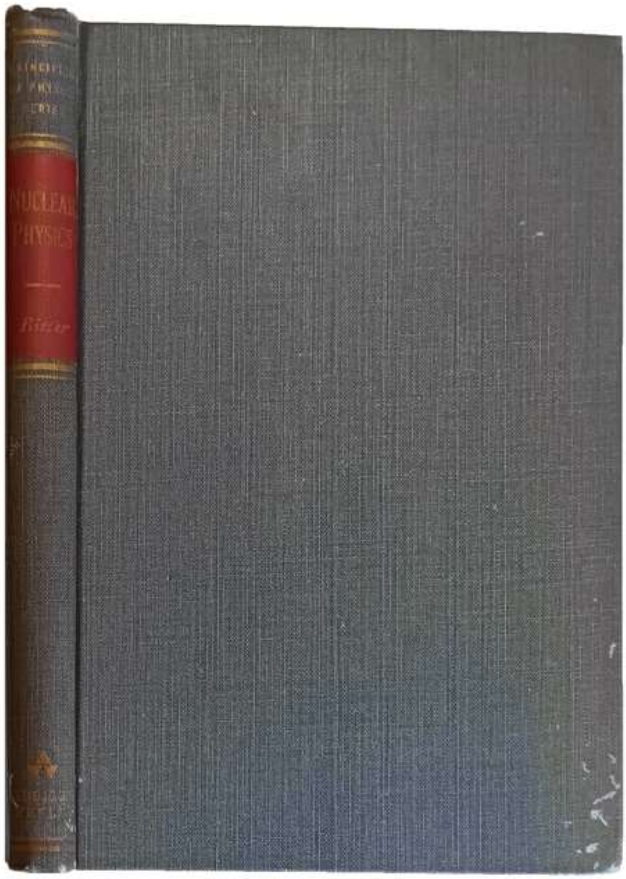
50 Jahre physikalische Grundlagenforschung in der Kaiser-Wilhelm-Gesellschaft und der Max-Planck-Gesellschaft

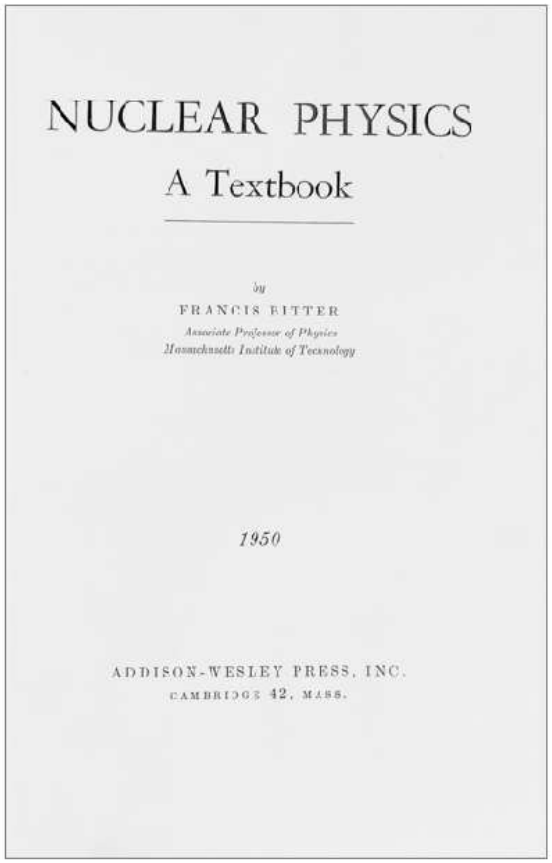
Von L. Biermann, München

147. **BIERMANN, Ludwig** (1907-1986). *"50 Jahre physikalische Grundlagenforschung in der Kaiser-Wilhelm-Gesellschaft und her Max-Planck-Gesellschaft."* Offprint from: *Die Naturwissenschaften*, 48 Jahrgang, Heft 1, S.2-10, 1961. Berlin, etc.: Springer-Verlag, 1961. ¶ 4to. 10 pp. Self-wraps. Ex library rubber stamps and ms. notations on top cover. Very good. S5909

$ 15

Ludwig Franz Benedikt Biermann was a German astronomer, obtaining his Ph.D. from Göttingen University in 1932. He made important contributions to astrophysics and plasma physics, discovering the Biermann battery. He predicted the existence of the solar wind which in 1947 he dubbed "solar corpuscular radiation".



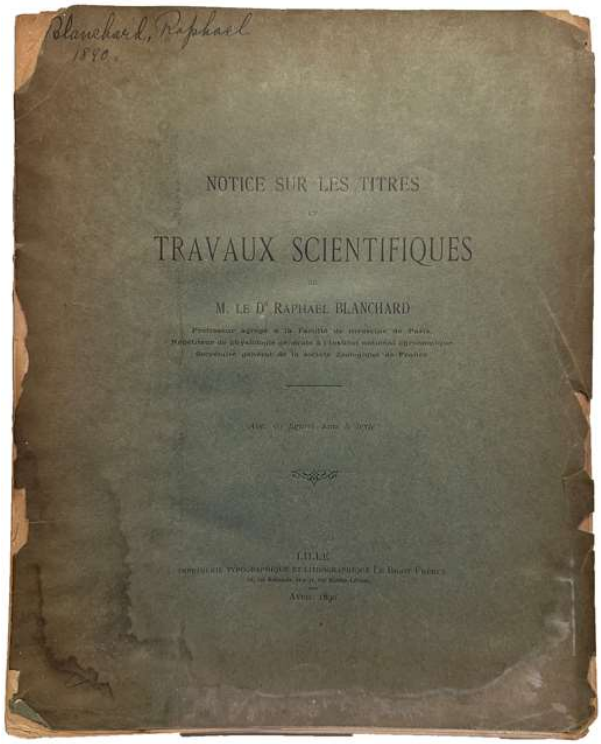


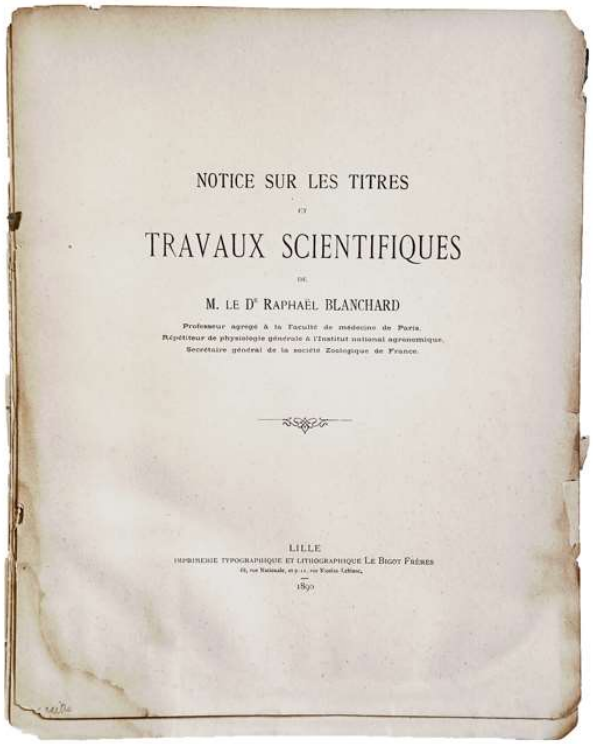
148. **BITTER, Francis** (1902-1967). *Nuclear physics*. Cambridge, Mass.: Addison-Wesley, 1950. ¶ *Addison-Wesley Physics Series*. 236 x 160 mm. 8vo. viii, 200 pp. Illus., tables, index, 15-page colored "A-W chart of nuclear data" at rear. Gray cloth. Very good. S2153

$ 15

Bitter helped to establish the Massachusetts Institute of Technology Magnet Lab during the late 1930s. His major affiliations include: Westinghouse Co., Pittsburgh, PA, USA, 1930-1934; Massachusetts Institute of Technology, Cambridge, MA, USA, 1934-1967.

Fig. 24. — Extraction de la Filaire de Médine et du Loa, d'après Pigafetta.





149. **BLANCHARD, Raphaël Anatole Émile** (1857-1919). *Notice sur les Titres et Travaux Scientifiques*. Lille: Bigot Freres, April 1890. ¶ 4to. 142, [2] pp. 50 figures. Printed wrappers; heavily chipped, lacking spine, covers off. Heavily browned, margins water-stained. Very rare. AS IS. S7647

$ 10

With material on zoology, comparative anatomy, helminthology (worms), teratology, etc.

Reprinted from THE PHYSICAL REVIEW, Vol. 76, No. 1, 18-37, July 1, 1949
Printed in U. S. A.

On the Interpretation of Neutron-Proton Scattering Data by the Schwinger Variational Method*

JOHN M. BLATT AND J. DAVID JACKSON
Department of Physics and Laboratory of Nuclear Science and Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts
(Received March 2, 1949)

Variational methods developed by Schwinger are applied to neutron-proton scattering at energies below 10 Mev. S-wave scattering alone is considered, and the tensor force is not taken into account. An expansion is obtained for the phase shift in powers of the energy. The coefficients can be evaluated explicitly from the wave function. The first term of the series is related to Fermi's scattering length, the second term involves an "effective range." The third and higher terms turn out to be negligible.
The results are used to define an "intrinsic range" for a potential well of arbitrary shape. Thus a reasonable comparison of potential wells of different shapes is made possible. The relation between intrinsic range and effective range is discussed.
The experimental data on coherent and incoherent neutron-proton scattering are discussed in terms of a "shape-independent" approximation. The best value for the effective range in the triplet state is $r_t = (1.56 \pm 0.13) \times 10^{-13}$ cm. The effective range in the singlet state is not well determined by the present data.
The effect of higher, shape-dependent terms in the expansion of the phase shift is considered. These terms become more important as the well shape becomes more long tailed, but they are found to be negligible within experimental uncertainties for the four well-shapes considered here (square, Gaussian, exponential, and Yukawa).
The results for the scattering phase shifts can be extrapolated to negative energy to give an approximate algebraic equation for the energy of the bound state of the deuteron.
All the numerical results are shown in graphical form; interpolation formulas are provided where higher accuracy may be needed.

I. INTRODUCTION

THE interpretation of nuclear scattering data commonly proceeds according to the scheme

(Experimental Cross Sections)→(Phase Shifts)
←(Theoretical Nuclear Potentials). (1.1)

That is, the phase shifts[1] constitute the common meeting ground between theory and experiment. The classic example of this type of analysis is the pioneer work of Breit and associates[2] on proton-proton scattering.
The scheme (1.1) involves a large amount of computation. There has long been a feeling that the low energy data really do not yield enough information to merit such a detailed approach. This feeling was expressed by Landau and Smorodinsky[3,4] among others. They developed a semi-empirical formula for the phase shifts. Unfortunately, they did not succeed in giving a rigorous mathematical justification for their method of approach. Consequently they were unable to relate the parameters which they introduce to the correct wave mechanical description of the two-body system in a precise way.

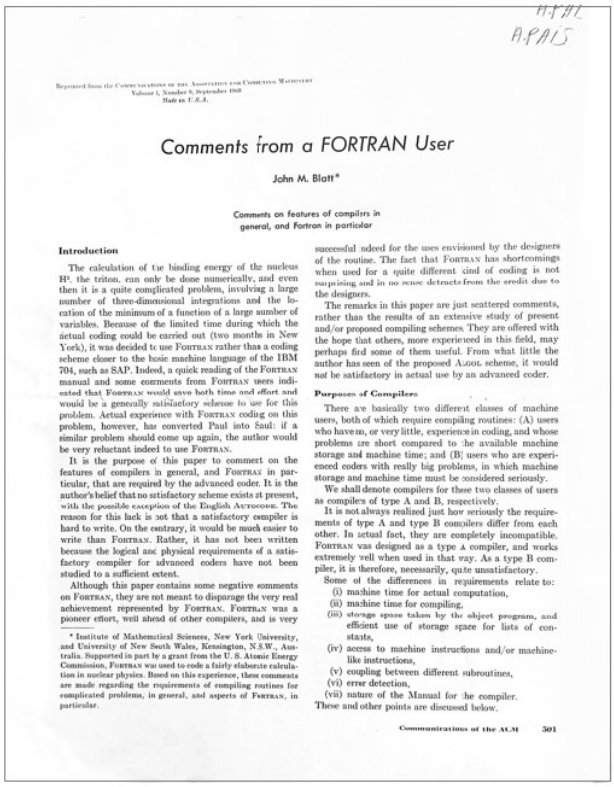
During the last few years, however, Schwinger[5] has developed a powerful variational method which provides a rigorous basis for the Landau-Smorodinsky approach to the analysis of scattering data. This method shortens the labor of computation materially for any one assumed form of the nuclear potential. In addition, this method provides a simple way to determine just what properties of the nuclear potential can and cannot be inferred from the experimental data.
The essence of the approach of Schwinger and Landau and Smorodinsky is its prediction of a simple functional form for the variation of the phase shifts with energy under very general assumptions about the nuclear potentials. This functional form involves some undetermined parameters, of course. The analysis then proceeds according to the scheme:

(Experimental Cross Sections)→(Phase Shifts)
→(Variational Parameters)
←(Theoretical Potentials). (1.2)

In contrast to (1.1), the meeting place between theory and experiment is not the phase shifts themselves but the values of the variational parameters implied by the phase shifts. This simplifies the numerical work since only a few parameters (actually 3 are sufficient for energies below 10 Mev) have to be computed for each choice of the theoretical potential energy, rather than a larger number of phase shifts. One can get a qualitative understanding of these parameters so that one can easily

* Assisted by the joint program of the ONR and the AEC.
[1] N. F. Mott and H. S. W. Massey, *Theory of Atomic Collisions* (Oxford University Press, London, 1933), p. 24.
[2] G. Breit, E. U. Condon, and R. D. Present, Phys. Rev. **50**, 825 (1936); G. Breit, H. M. Thaxton, and L. Eisenbud, Phys. Rev. **55**, 1018 (1939); L. E. Hoisington, S. S. Share, and G. Breit, Phys. Rev. **56**, 884 (1939); G. Breit, A. A. Broyles, and M. H. Hull, Phys. Rev. **73**, 869 (1948).
[3] L. Landau and J. Smorodinsky, J. Phys. U.S.S.R. **8**, 154 (1944).
[4] J. Smorodinsky, J. Phys. U.S.S.R. **8**, 219 (1944) and **11**, 195 (1947).
[5] J. Schwinger, Phys. Rev. **72**, 742A (1947); hectographed notes on nuclear physics, Harvard, 1947.

18



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Volume 3, Number 9, September 1960
Made in U.S.A.

A.PAIS

Comments from a FORTRAN User

John M. Blatt*

Comments on features of compilers in general, and Fortran in particular

Introduction

The calculation of the binding energy of the nucleus H^3, the triton, can only be done numerically, and even then it is a quite complicated problem, involving a large number of three-dimensional integrations and the location of the minimum of a function of a large number of variables. Because of the limited time during which the actual coding could be carried out (two months in New York), it was decided to use FORTRAN rather than a coding scheme closer to the basic machine language of the IBM 704, such as SAP. Indeed, a quick reading of the FORTRAN manual and some comments from FORTRAN users indicated that FORTRAN would save both time and effort and would be a generally satisfactory scheme to use for this problem. Actual experience with FORTRAN coding on this problem, however, has converted Paul into Saul: if a similar problem should come up again, the author would be very reluctant indeed to use FORTRAN.
It is the purpose of this paper to comment on the features of compilers in general, and FORTRAN in particular, that are required by the advanced coder. It is the author's belief that no satisfactory scheme exists at present, with the possible exception of the English AUTOCODE. The reason for this lack is not that a satisfactory compiler is hard to write. On the contrary, it would be much easier to write than FORTRAN. Rather, it has not been written because the logical and physical requirements of a satisfactory compiler for advanced coders have not been studied to a sufficient extent.
Although this paper contains some negative comments on FORTRAN, they are not meant to disparage the very real achievement represented by FORTRAN. FORTRAN was a pioneer effort, well ahead of other compilers, and is very successful indeed for the uses envisioned by the designers of the routine. The fact that FORTRAN has shortcomings when used for a quite different kind of coding is not surprising and in no sense detracts from the credit due to the designers.
The remarks in this paper are just scattered comments, rather than the results of an extensive study of present and/or proposed compiling schemes. They are offered with the hope that others, more experienced in this field, may perhaps find some of them useful. From what little the author has seen of the proposed ALGOL scheme, it would not be satisfactory in actual use by an advanced coder.

Purposes of Compilers

There are basically two different classes of machine users, both of which require compiling routines: (A) users who have no, or very little, experience in coding, and whose problems are short compared to the available machine storage and machine time; and (B) users who are experienced coders with really big problems, in which machine storage and machine time must be considered seriously.
We shall denote compilers for these two classes of users as compilers of type A and B, respectively.
It is not always realized just how seriously the requirements of type A and type B compilers differ from each other. In actual fact, they are completely incompatible. FORTRAN was designed as a type A compiler, and works extremely well when used in that way. As a type B compiler, it is therefore, necessarily, quite unsatisfactory.
Some of the differences in requirements relate to:
(i) machine time for actual computation,
(ii) machine time for compiling,
(iii) storage space taken by the object program, and efficient use of storage space for lists of constants,
(iv) access to machine instructions and/or machine-like instructions,
(v) coupling between different subroutines,
(vi) error detection,
(vii) nature of the Manual for the compiler.
These and other points are discussed below.

* Institute of Mathematical Sciences, New York University, and University of New South Wales, Kensington, N.S.W., Australia. Supported in part by a grant from the U. S. Atomic Energy Commission. FORTRAN was used to code a fairly elaborate calculation in nuclear physics. Based on this experience, these comments are made regarding the requirements of compiling routines for complicated problems, in general, and aspects of FORTRAN, in particular.

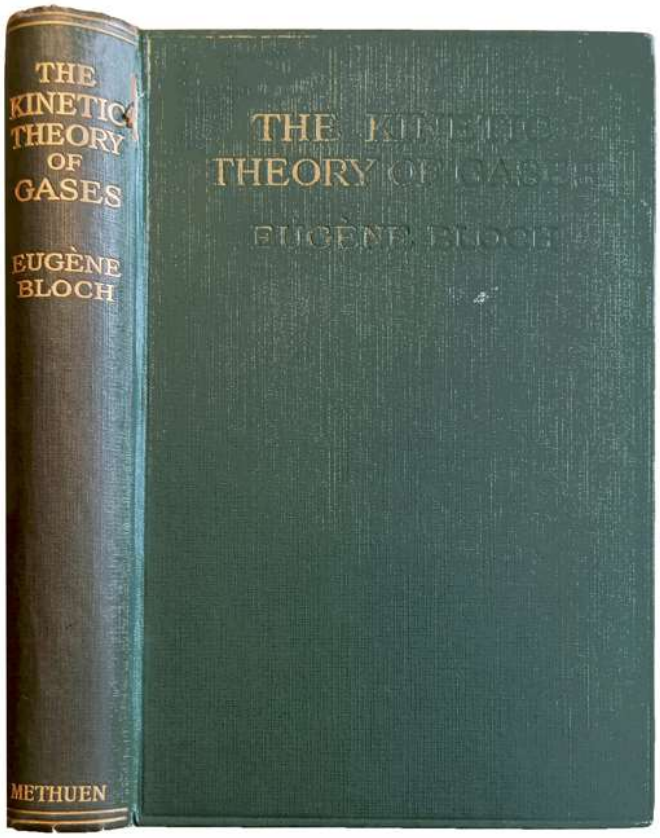
150. **BLATT, John Markus** (1921-1990); **J. [John] David JACKSON** (1925-2016). *"On the Interpretation of Neutron-Proton Scattering Data by the Schwinger Variational Method."* Offprint from *The Physical Review*, vol. 76, no. 1, July 1, 1949. ¶ 4to. pp. 18-37. Self-wraps; small dent at rear. Very good.

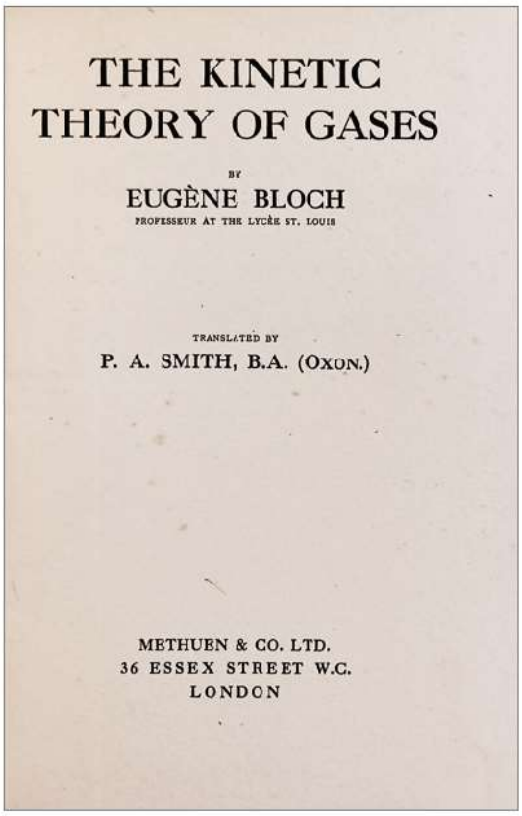
WITH: **BLATT**. *"Comments from a FORTRAN User."* Offprint from: Communications of the Assoc. for Computing Machinery, vol. 3, no. 9, Sept. 1960. 4to. pp. 501-505. Self-wraps. Ownership signature of A. [Bram] Pais. S7178

$ 25

The authors are associated with the physics dept. at M.I.T. From 1948 to 1953 Blatt was at the University of Illinois, where the Illiac computer was being built. Blatt was involved in the project and became a pioneer in the use of computers in theoretical nuclear physics. John David Jackson was a Canadian–American

theoretical physicist, becoming professor at the University of California, Berkeley and a faculty senior scientist emeritus at Lawrence Berkeley National Laboratory; he was a member of the National Academy of Sciences and was well known for his work in nuclear and particle physics.





151. **BLOCH, Eugene** (1879-1944). *The kinetic theory of gases. Translated by P. A. Smith*. London: Methuen, 1924. ¶ FIRST EDITION in English. 194 x 134 mm. 8vo. xiv, 178 pp. 7 figs., 6 tables, bibliog. Green cloth; small tear on top hinge, inner hinge cracked, edges foxed. Good. S0875

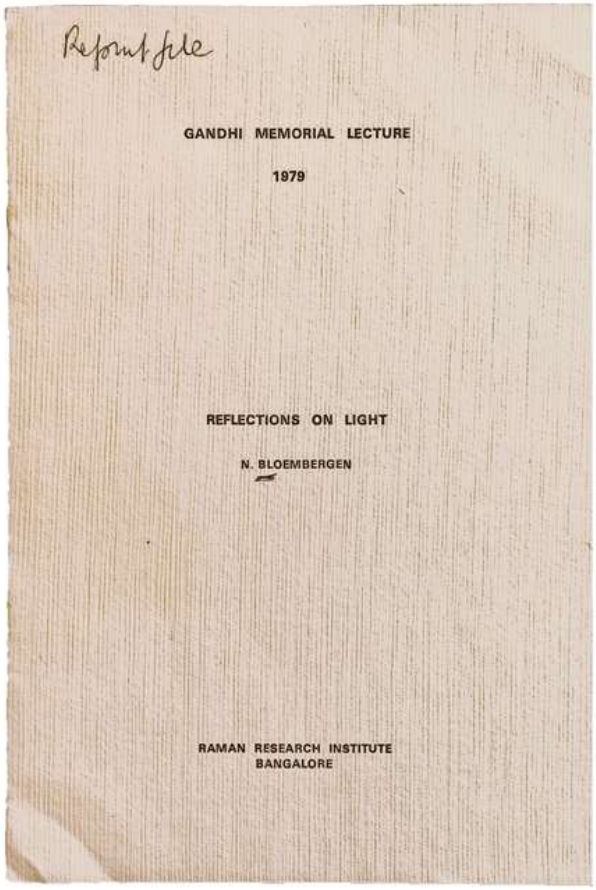
$ 15

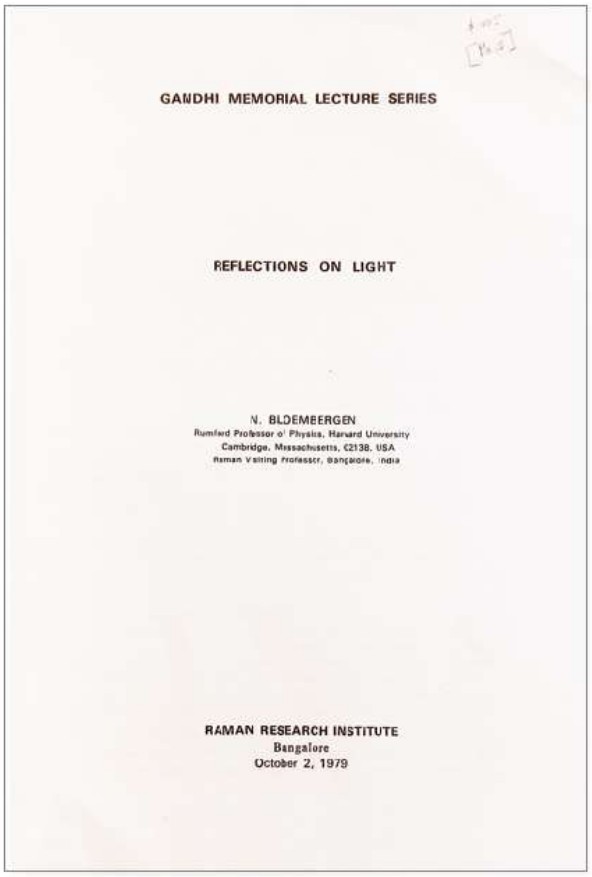
Originally issued in 1921. Philip Arthur Smith was the translator.

In 1906 Eugène Bloch became professor of physics in the special mathematics class at the Saint-Louis secondary school in Paris, where he taught for eleven years. In addition to his teaching, Eugène Bloch also carried out research in the physics laboratory of the École Normale Supérieure on the photoelectric effect and spectroscopy.

When the German army invaded the Free Zone in 1942, Eugène Bloch attempted unsuccessfully to flee to Switzerland. He then hid under a false identity in the mountains of Savoy. The Gestapo found and arrested him at Allevard on 24

January 1944. He was deported from Bobigny station by Convoy no. 69 of 7 March 1944 and was murdered at the Auschwitz concentration camp. [Wikip.].

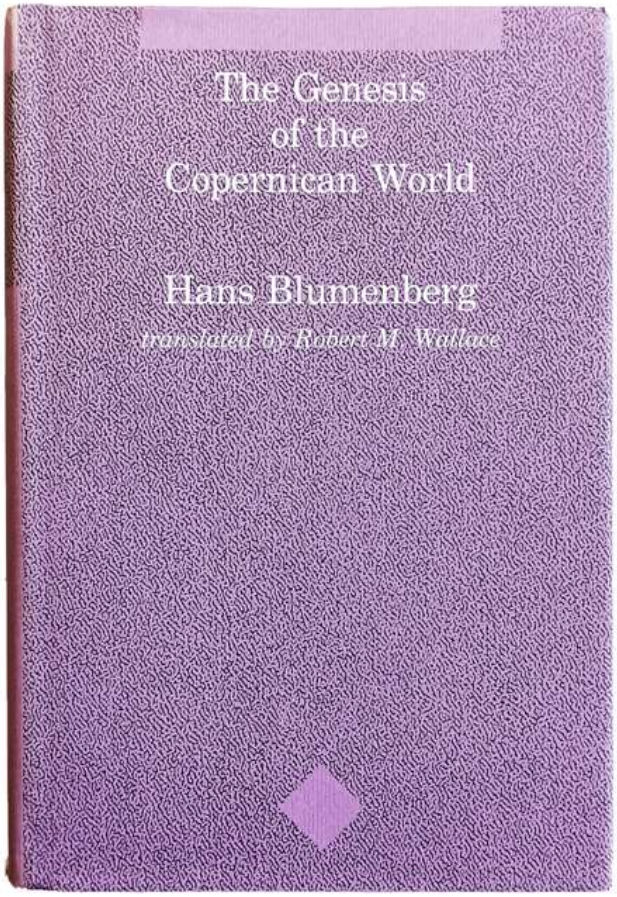


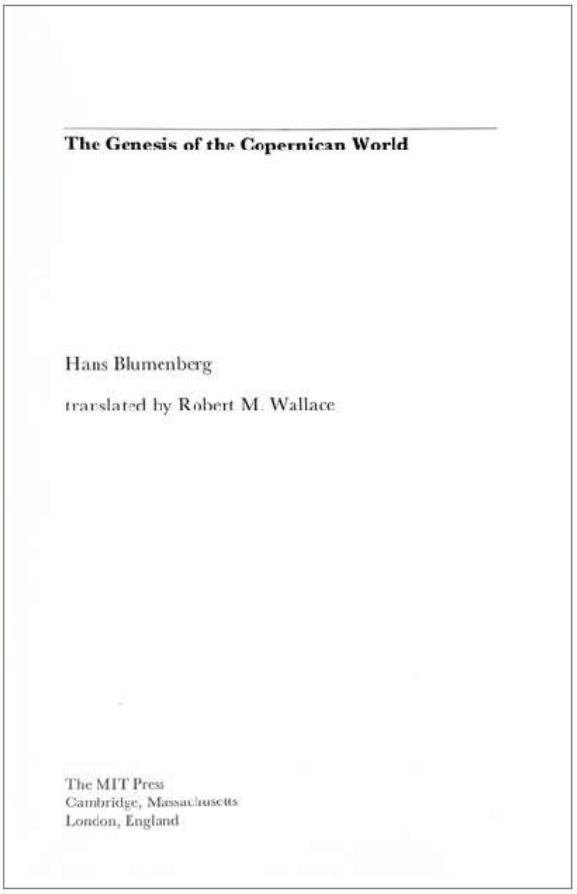


152. **BLOEMBERGEN, Nicolaas** (1920-2017). *Reflections on light.* Bangalore: Raman Research Institute, 1979. ¶ *Gandhi Memorial Lecture Series.* 262 x 180 mm. 8vo. [ii], 12 pp. Printed wrappers. Ms. notation on top cover. From the library of Abraham Pais. Very good. S5522

$ 85

Nicolaas Bloembergen was Rumford Professor of Physics at Harvard University. Bloembergen shared the 1981 Nobel Prize for Physics with Arthur L. Schawlow (b. 1921) "for their contribution to the development of laser spectroscopy." Wasson, *Nobel Prize winners*, pp. 106-108.



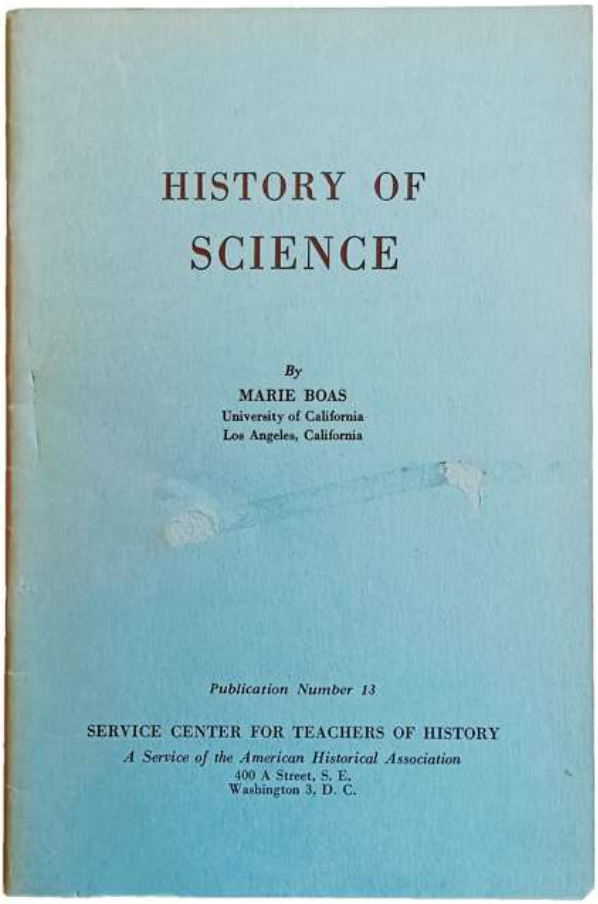


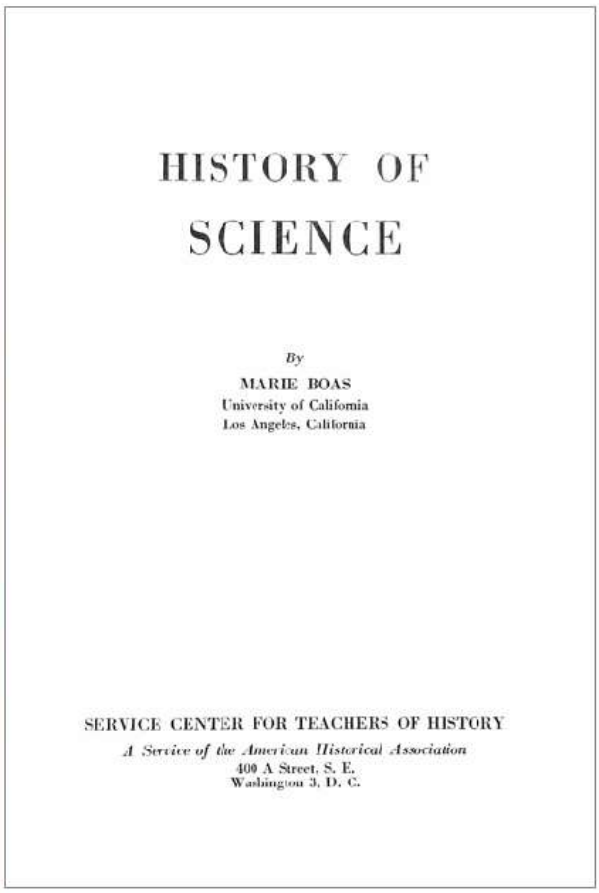
153. **BLUMBERG, Hans** (1920-1996). *The Genesis of the Copernican World. Translated by Robert M. Wallace*. Cambridge, MA: MIT Press, (1987). ¶ Series: *Studies in Contemporary German Social Thought*. Thick 8vo. xlviii, 772 pp. Index. Purple cloth, black-stamped spine, dust-jacket; front jacket slightly torn. Ownership signature. RARE in jacket. Fine in very good jacket. S10394

$ 85

In Blumenberg's many inquiries into the history of philosophy the threshold of the late Middle Ages and the early Renaissance provides a focal point, found within his two principle books, *Legitimacy of the Modern Age,* and, *The Genesis of the Copernican World.*

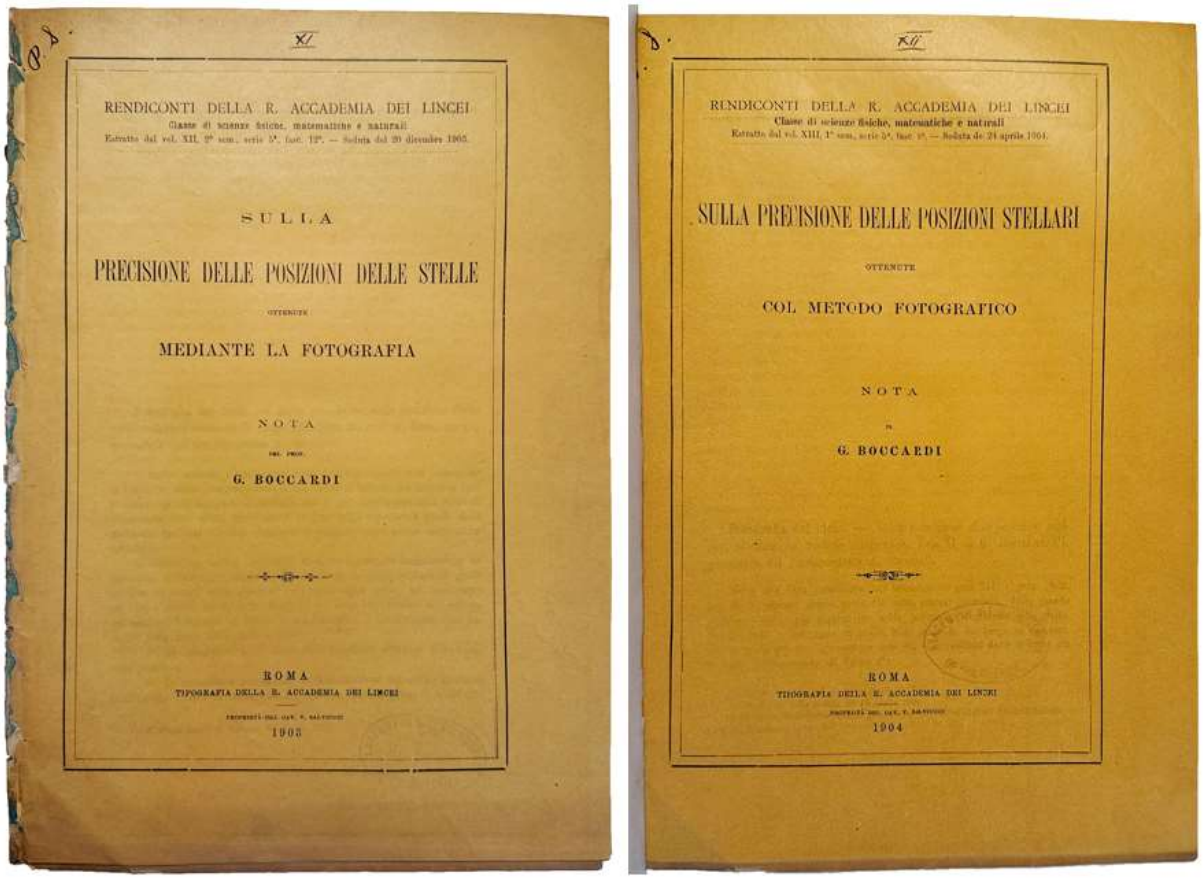
Hans Blumenberg was a German philosopher and intellectual historian. He studied philosophy, German studies and the classics (1939–47, interrupted by World War II) and is considered to be one of the most important German philosophers of the century. [Wikip.]





154. **BOAS, Marie** (1919-2009). *History of Science*. Washington, D.C.: American Historical Association, 1958. ¶ Series: *Service Center for Teachers of History,* 13. 8vo. 22 pp. Printed wrappers; abraded on upper cover. Very good. RH1329 $ 3.95

Marie Boas Hall was elected a Fellow of the American Academy of Arts and Sciences in 1955. She won the George Sarton Medal, the most prestigious award of the History of Science Society, together with her husband Alfred Rupert Hall in 1981.

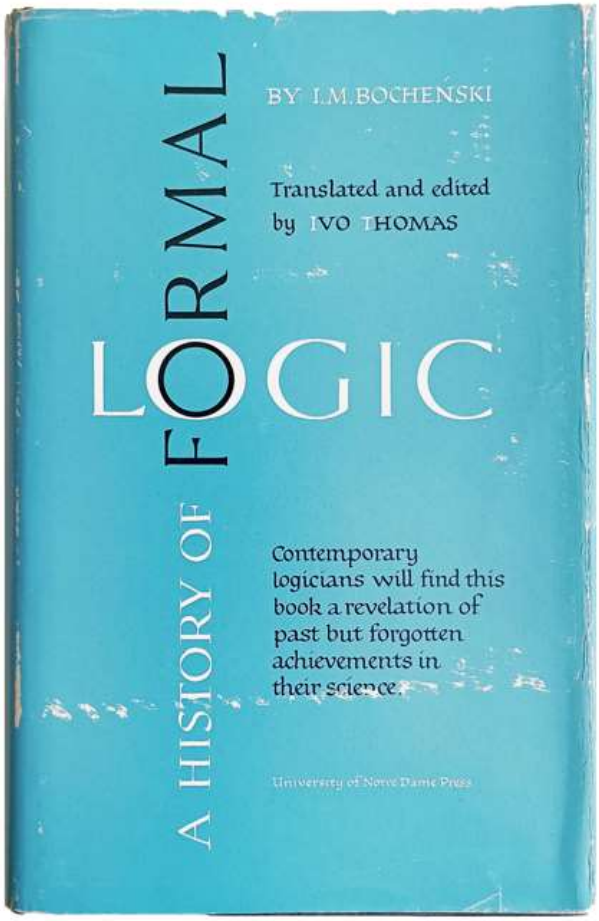


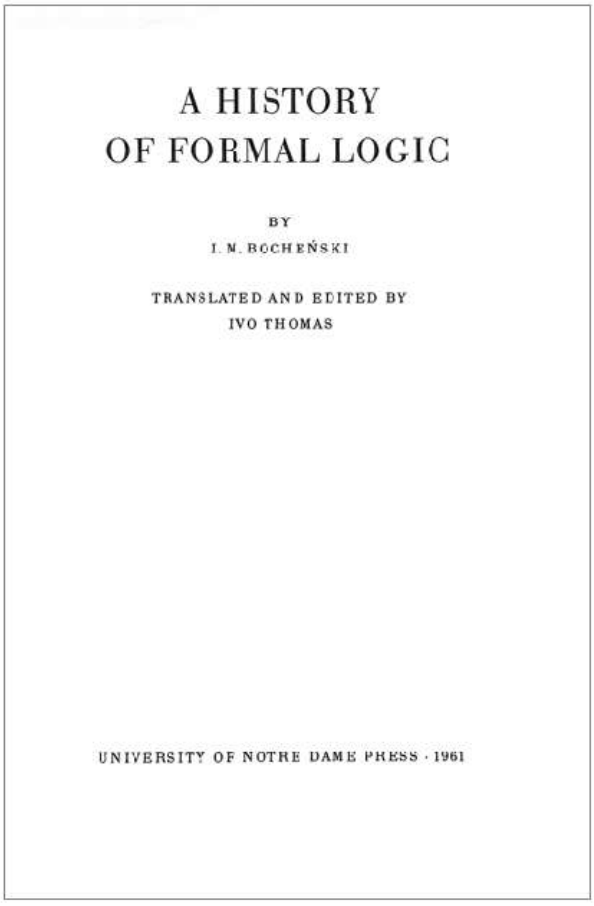
155. **BOCCARDI, Giovanni** (1859-1936). *"Sulla precisione delle posizioni delle stelle ottenute mediante la fotografia."* Offprint from: *Rendiconti della R. Accademia dei Lincei*, Classe di scienze fisiche, matematiche e naturali, Vol. XII, 2o sem., serie 5a, fasc. 12o. - Seduta del 20 dicembre 1903.

WITH: "Sulla precisione delle posizioni delle stelle ottenute mediante la fotografia." Offprint from: *Rendiconti della R. Accademia dei Lincei*, Classe di scienze fisiche, matematiche e naturali, Vol. XIII, 1o sem., serie 5a, fasc. 8o. - Seduta del 24 aprile 1904. Roma: R. Accademia dei Lincei, 1903-1904. ¶ Two parts. 4to. (601)-608; (392)-399 pp. Tables. Original printed wrappers; removed from bound work, causing spine to be rough. Ms. notations on top covers. Very good. S5911

$ 20

On the accuracy of star positions obtained by photography. Giovanni Boccardi was an Italian astronomer, mathematician, and priest. As a priest of the Congregazione della Missione, Boccardi was an astronomer in the observatories of Collurania (1890), Catania (1900–1903) and Turin (1903–1923). At Turin he served as the director of the observatory and as a docent of astronomy in the local university.



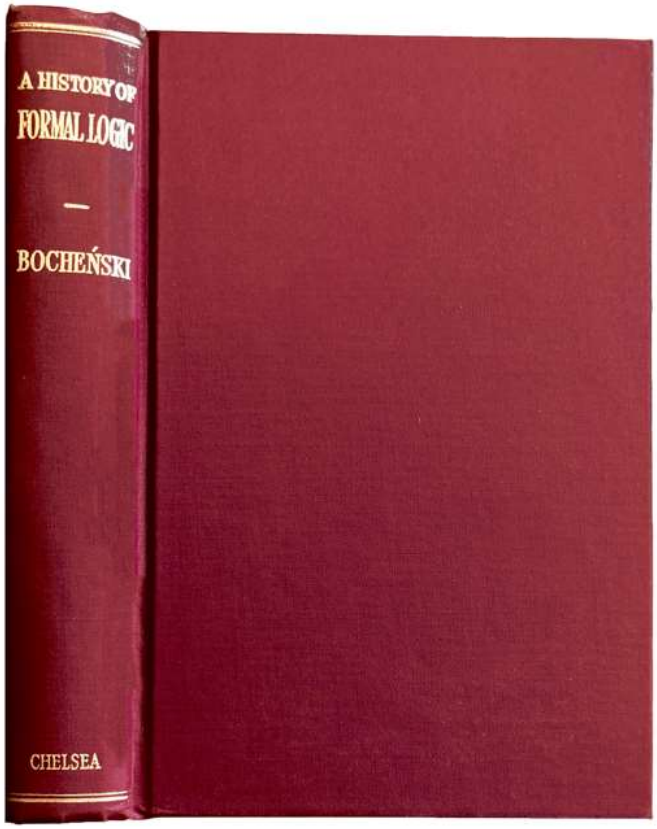


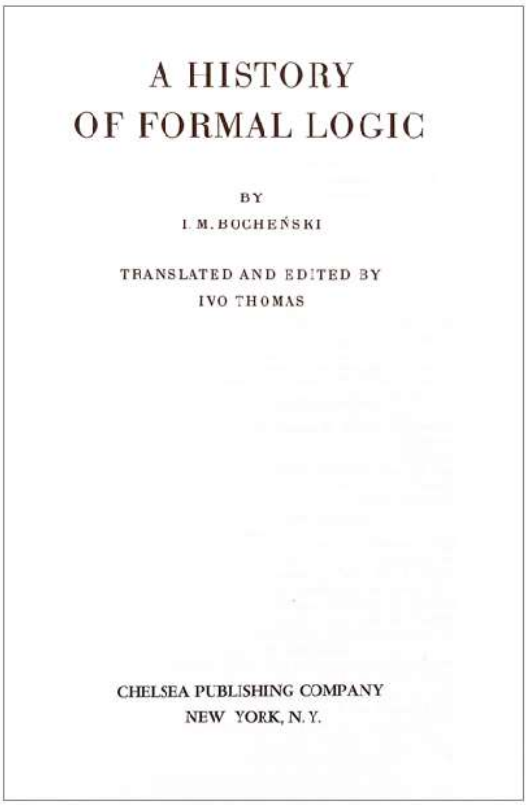
156. **BOCHEŃSKI, Innocent Marie-Joseph** (1902-1995). *A History of Formal Logic. Translated and edited by Ivo Thomas*. Notre Dame: University of Notre Dame Press, 1961. ¶ 8vo. xxii, 567 pp. Indexes. Gray cloth, blind stamped cover title and gilt-stamped spine title, dust jacket; jacket rubbed. Very good. S10230

$ 75

Joseph Maria Bocheński's main work was first published in 1956. After a systematic introduction, it contains in its four main sections the problematic history of Greek, scholastic, mathematical and Indian logic, which is presented on the basis of original documents. The result is twofold: on the one hand, there is the insight that the history of logic is not only made up of earlier stages of our present-day science, but that within it several high-level, autonomously developing and essentially different forms of formal logic can be distinguished. On the other hand, it becomes clear that the problems are essentially the same throughout this entire history. Thus the work, with its several hundred texts and their explanations, is also an easily readable textbook of logic that enables every learner to understand the basic doctrines, problems and theories of this science from its development and its various formations. Bocheński was a Polish-Swiss philosopher and logician. “In

addition to a number of works on questions of philosophy and the history of philosophy, Bocheński's work on logic is of particular importance. His historical research on logic, which he carried out over decades, culminated in the publication of a comprehensive textbook on the history of logic. Following Jan Lukasiewicz, Bocheński organically combined the classical syllogistic of Aristotle with the modern logical calculus. The comparative analysis of the logic of Theophrastus and Aristotle led to fundamental insights into modal logic and its history. He achieved lasting results in the presentation of syntactic categories."





157. **BOCHEŃSKI, Innocent Marie-Joseph** (1902-1995). *A History of Formal Logic. Translated and Edited by Ivo Thomas*. New York: Chelsea Publishing, 1970. ¶ Second edition, but a reprint. 8vo. xxii, 567 pp. Illus., extensive bibliog., index. Maroon cloth, gilt spine. FINE. S8483

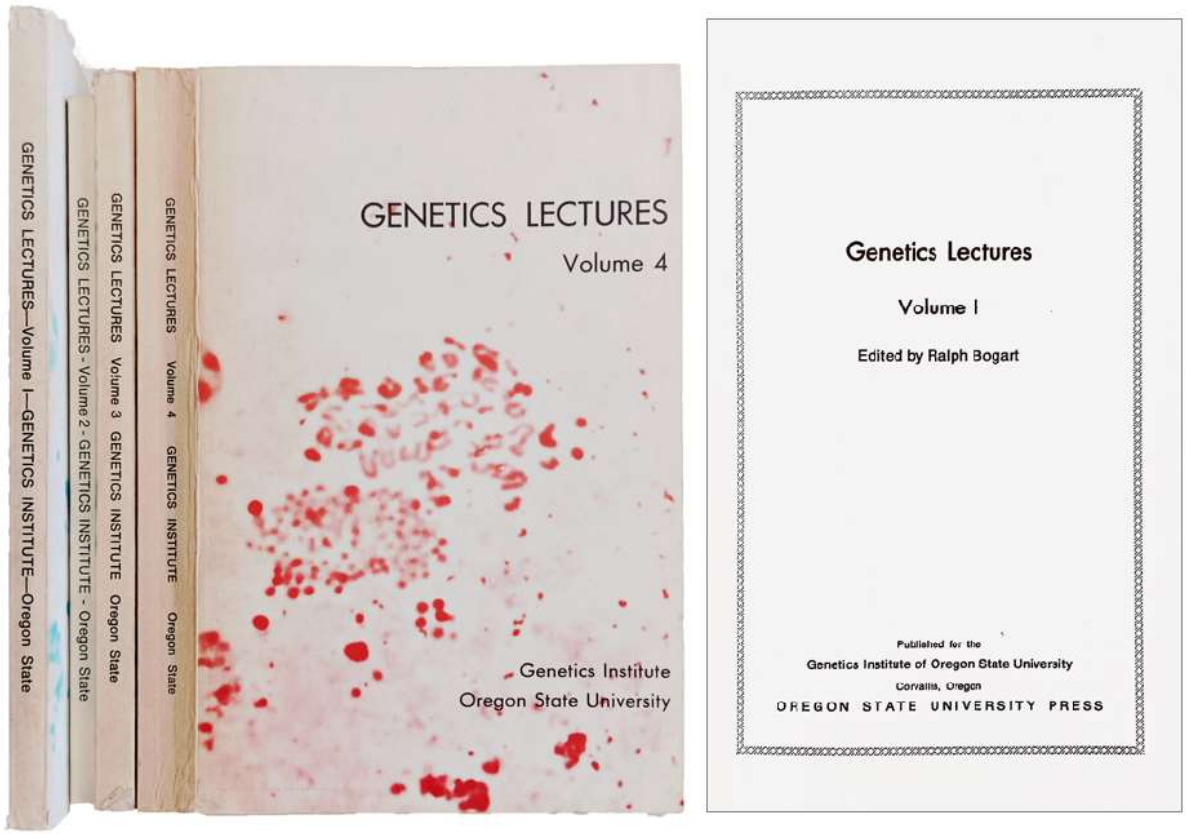
$ 40

Joseph Maria Bocheński's main work was first published in 1956. After a systematic introduction, it contains in its four main sections the problematic history of Greek, scholastic, mathematical and Indian logic, which is presented on the basis of original documents. The result is twofold: on the one hand, there is the insight that the history of logic is not only made up of earlier stages of our present-day science, but that within it several high-level, autonomously developing and essentially

different forms of formal logic can be distinguished. On the other hand, it becomes clear that the problems are essentially the same throughout this entire history. Thus the work, with its several hundred texts and their explanations, is also an easily readable textbook of logic that enables every learner to understand the basic doctrines, problems and theories of this science from its development and its various formations.

Bocheński was a Polish-Swiss philosopher and logician. "In addition to a number of works on questions of philosophy and the history of philosophy, Bocheński's work on logic is of particular importance. His historical research on logic, which he carried out over decades, culminated in the publication of a comprehensive textbook on the history of logic. Following Jan Łukasiewicz, Bocheński organically combined the classical syllogistic of Aristotle with the modern logical calculus. The comparative analysis of the logic of Theophrastus and Aristotle led to fundamental insights into modal logic and its history. He achieved lasting results in the presentation of syntactic categories."

CONTENTS: Introduction; Greek variety of logic; Scholastic variety of logic; Transitional period; Mathematical variety of logic; Indian variety of logic.



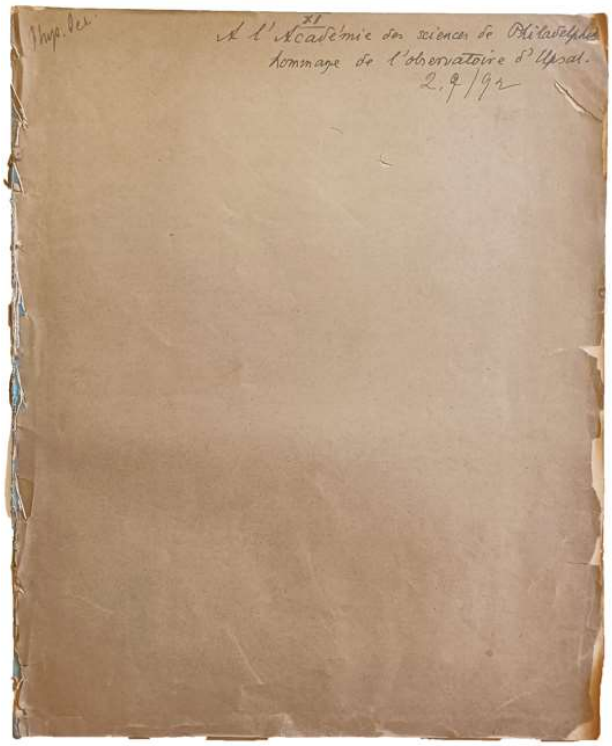
[158] BOGART

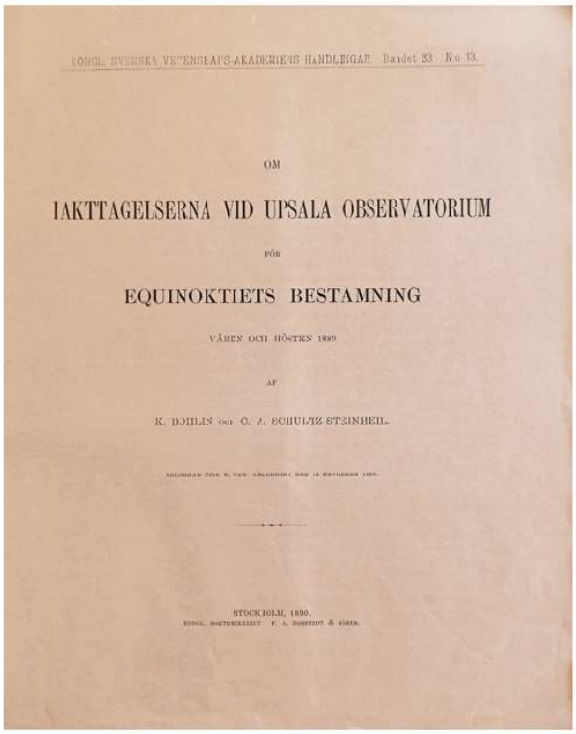
158. **BOGART, Ralph** (1908-1992). *Genetics Lectures. Volumes I-IV.* Corvallis: Oregon State University Press, 1969-1975. ¶ Four volumes. 8vo. 194; 126; 192; 298 pp. Articles, photos, figs.; half-title loose vol. IV. Pictorial wrappers. Very good. S8484

$ 30

Ralph Bogart directed an active genetics research program at Oregon State University, but, beyond that, he influenced research on a regional and national basis.

See: J. E. Oldfield, *Ralph Bogart 1908–1992: A brief biography.*



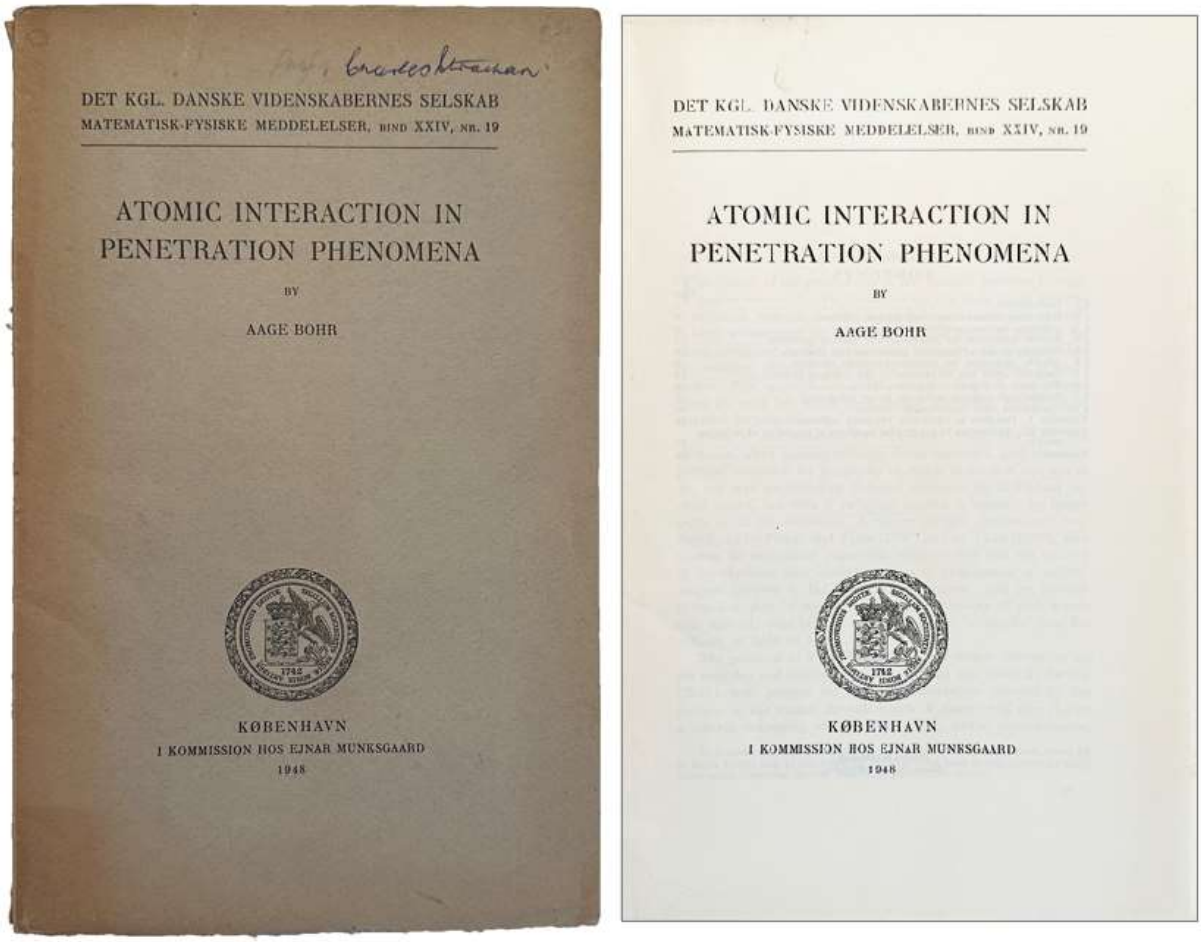


159. **BOHLIN, Karl** (1860-1939); **Carl Arvid SCHULTZ-STEINHEIL** (1863-1954). *"Om iakttagelserna vid Upsala Observatorium for equinoktiets bestämning våren och Hosten 1889."* Offprint from: *Kongliga Svenska Vetenskaps-Akademiens Hanlingar*, Vol. 23, No. 13, 1890. Stockholm: P. A. Norstedt & Soner, 1890. ¶ 287 x 235 mm. 4to. 58 pp. Tables; uniformly browned. Plain wrappers; heavily chipped. PRESENTATION COPY from the Observatory of Upsala to the Academy of Sciences at Philadelphia. AS IS. S5912

$ 12.95

On the Observations at the Upsala Observatory for Equinoctial determination in the Spring and Autumn of 1889. Karl Bohlin was a theoretical astronomer, known primarily for work on the orbits of asteroids and other three-body problems. On behalf of the General Staff, he carried out precision measurements in

Södermanland and lower Norrland in 1895 and in upper Norrland in 1896. He undertook a large number of study trips in Europe for scientific purposes. Schultz-Steinheil's scientific output was entirely within astronomy. Among other things, observations and calculations for the determination of the equinoctial (together with Karl Bohlin) as well as about comets and Jupiter's moons, description of a new method for determining Jupiter's radius and studies of interference problems are noted.



160. **BOHR, Aage Niels** (1922-2009). *Atomic Interaction in Penetration Phenomena*. Copenhagen: Munksgaard, 1948. ¶ Offprint. From: *Det Kgl. Danske Videnskabernes Selskab Matematisk-Fysiske Meddelelser*, Bind XXIV, Nr. 19. 8vo. 52 pp. Original printed wrappers; a tad wear to extremities. Ownership signature of Prof. Charles Strachan. Very good. S13217

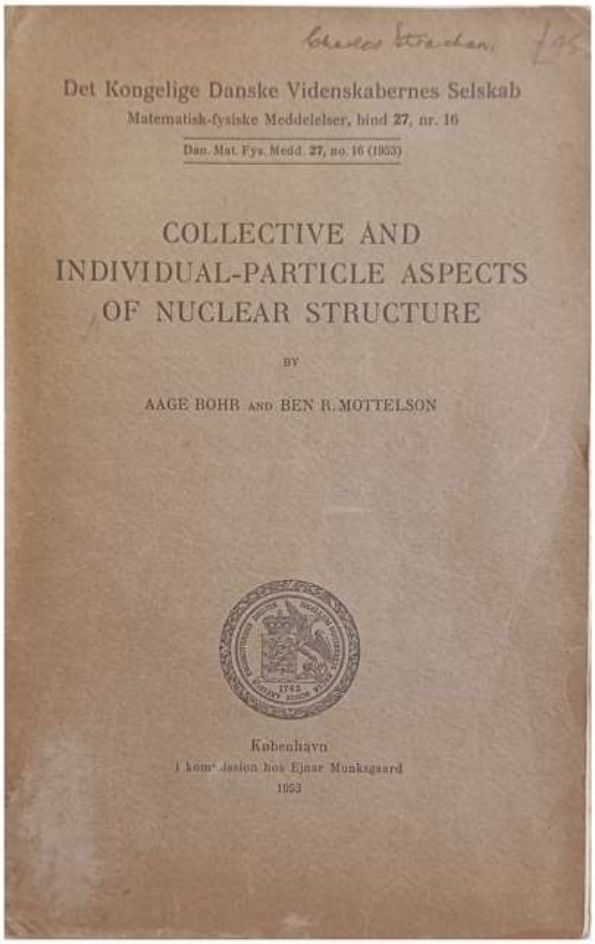
$ 50

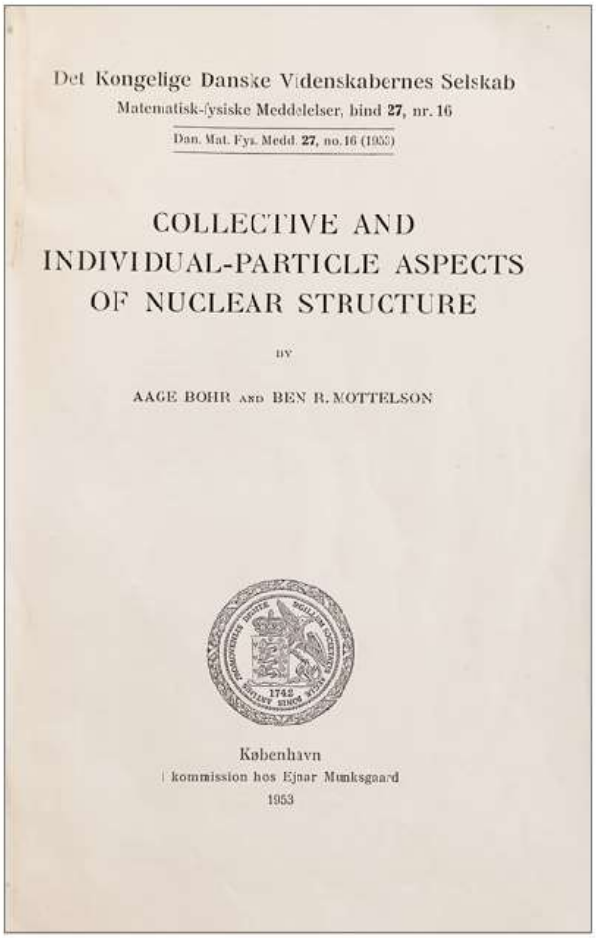
Aage Niels Bohr shared the 1975 Nobel Prize for Physics with Ben Roy Mottelson and Leo James Rainwater, "for the discovery of the connection between collective motion and particle motion in atomic nuclei and the development of the theory of the structure of the atomic nucleus based on this connection."

"According to modern physics, an atomic nucleus consists of nucleons - protons and neutrons. In earlier models the nucleus was depicted as being spherical, but this proved to be inaccurate. In 1950 James Rainwater postulated that the atomic nucleus can be distorted. The nucleons in the outer portions of the atomic nucleus move about in paths and interact with nucleons inside, causing the nucleus to be distorted. Independently of Rainwater, Aage Bohr arrived at the same theory and corroborated it through experiments in collaboration with Ben Mottelson in 1952 and 1953." :: Nobel Prize.

PROVENANCE: Charles Strachan (1907-1993), Scottish mathematician and physicist, Reader at the University of Aberdeen, he mentored Sir George Paget Thomson FRS (1892-1975), the son of J.J. Thomson, who earned the Nobel Prize for Physics in 1937 for his discovery of the wave properties of the electron by electron diffraction.

"Quantum ideas were being shaped into a mathematical theory which could be applied to a vast range of hitherto intractable problems. Charles Strachan was to be among the young mathematical physicists who seized on the opportunities thus offered. He duly completed his undergraduate work in Aberdeen with a First Class Honours degree. At that time it was standard practice in Scottish universities for the best graduates aiming at an academic career to read for a further undergraduate degree at Oxford or Cambridge. G P Thomson arranged for him to go to Thomson's former Cambridge College (Corpus Christi), where he undertook an accelerated tripos, attending courses by such great names in relativity and quantum theory as Eddington and Dirac. Charles Strachan achieved the distinction of becoming Junior Wrangler. He then embarked on research at Cambridge, first under R. H. Fowler and then under J. E. Lennard Jones, and was awarded a Cambridge PhD in 1935. Prominent among his pre-war researches were investigations, the earliest in collaboration with Lennard Jones, of the interaction of atoms and molecules with solid surfaces. These papers brought out some important quantum effects in the behaviour of systems of many atoms and presented mathematical procedures which made possible the application of quantum mechanics to the quantitative treatment of these effects. They represented significant early contributions not only to surface physics but more generally to aspects of solid state physics which are still the subject of extensive investigation. Part of this work was done at Aberdeen, where he held an assistantship and then a lectureship between 1933 and 1937. In 1937 he was invited by Professor Max Born to take up a temporary lectureship for one year in his Department in Edinburgh and he clearly decided that the opportunity of working with this very great theoretical physicist could not be missed." :: C. W. McCombie.





161. **BOHR, Aage Niels** (1922-2009); **Ben Roy MOTTELSON** (1926-2022). *Collective and Individual-Particle Aspects of Nuclear Structure*. Copenhagen: Ejnar Munksgaard, 1953. ¶ Offprint. From: Det Kongelige Danske Videnskabernes Selskab Matematisk-Fysiske Meddelelser, Bind 27, Nr. 16. 8vo. 174 pp. Original printed wrappers; joints repaired with kozo. Ownership signature of Prof. Charles Strachan. Very good. S13218

$ 45

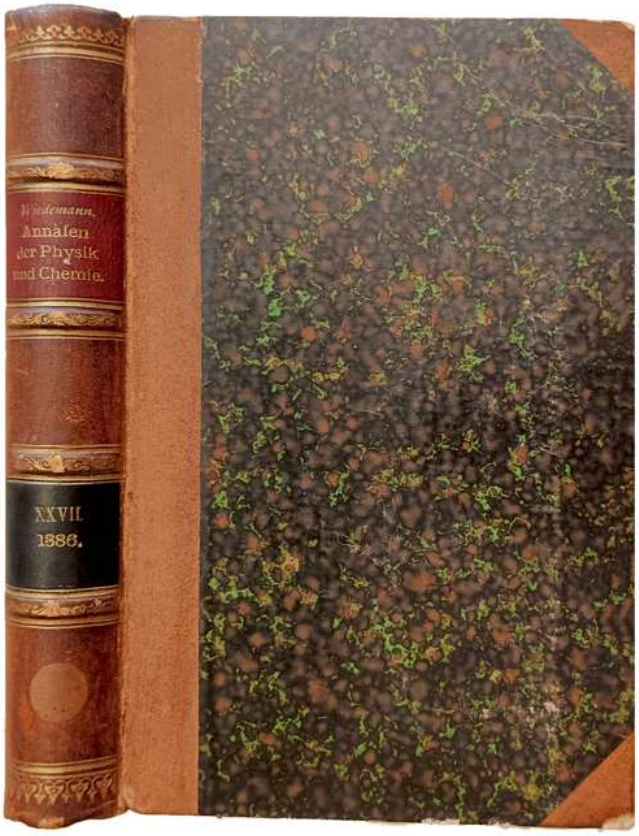
Aage Niels Bohr shared the 1975 Nobel Prize for Physics with Ben Roy Mottelson and Leo James Rainwater, "for the discovery of the connection between collective motion and particle motion in atomic nuclei and the development of the theory of the structure of the atomic nucleus based on this connection" :: [this paper].

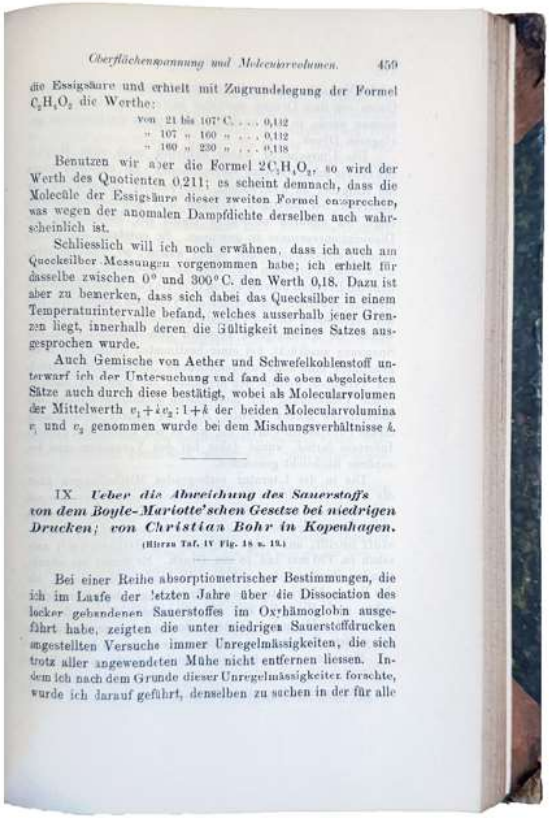
"On my return to Copenhagen in the autumn of 1950, I took up the problem of incorporating the coupling suggested by Rainwater into a consistent dynamical system describing the motion of a particle in a deformable core. Soon, I was joined by Ben Mottelson in pursuing the consequences of the interplay of individual-particle and collective motion for the great variety of nuclear phenomena that was then coming within the range of experimental studies" :: Bohr's Nobel Lecture. "According to modern physics, an atomic nucleus consists of nucleons - protons

and neutrons. In earlier models the nucleus was depicted as being spherical, but this proved to be inaccurate. In 1950 James Rainwater postulated that the atomic nucleus can be distorted. The nucleons in the outer portions of the atomic nucleus move about in paths and interact with nucleons inside, causing the nucleus to be distorted. Independently of Rainwater, Aage Bohr arrived at the same theory and corroborated it through experiments in collaboration with Ben Mottelson in 1952 and 1953." -- Nobel Prize.

PROVENANCE: Charles Strachan (1907-1993), Scottish mathematician and physicist, Reader at the University of Aberdeen, he mentored Sir George Paget Thomson FRS (1892-1975), the son of J.J. Thomson, who earned the Nobel Prize for Physics in 1937 for his discovery of the wave properties of the electron by electron diffraction.

"Quantum ideas were being shaped into a mathematical theory which could be applied to a vast range of hitherto intractable problems. Charles Strachan was to be among the young mathematical physicists who seized on the opportunities thus offered. He duly completed his undergraduate work in Aberdeen with a First Class Honours degree. At that time it was standard practice in Scottish universities for the best graduates aiming at an academic career to read for a further undergraduate degree at Oxford or Cambridge. G P Thomson arranged for him to go to Thomson's former Cambridge College (Corpus Christi), where he undertook an accelerated tripos, attending courses by such great names in relativity and quantum theory as Eddington and Dirac. Charles Strachan achieved the distinction of becoming Junior Wrangler. He then embarked on research at Cambridge, first under R H Fowler and then under J E Lennard Jones, and was awarded a Cambridge PhD in 1935. Prominent among his pre-war researches were investigations, the earliest in collaboration with Lennard Jones, of the interaction of atoms and molecules with solid surfaces. These papers brought out some important quantum effects in the behaviour of systems of many atoms and presented mathematical procedures which made possible the application of quantum mechanics to the quantitative treatment of these effects. They represented significant early contributions not only to surface physics but more generally to aspects of solid state physics which are still the subject of extensive investigation. Part of this work was done at Aberdeen, where he held an assistantship and then a lectureship between 1933 and 1937. In 1937 he was invited by Professor Max Born to take up a temporary lectureship for one year in his Department in Edinburgh and he clearly decided that the opportunity of working with this very great theoretical physicist could not be missed." -- C. W. McCombie.





Oberflächenspannung und Molecularvolumen. 459

die Essigsäure und erhielt mit Zugrundelegung der Formel $C_2H_4O_2$ die Werthe:

von 21 bis 107° C. . . . 0,132
„ 107 „ 160 „ . . . 0,132
„ 160 „ 230 „ . . . 0,118

Benutzen wir aber die Formel $2C_2H_4O_2$, so wird der Werth des Quotienten 0,211; es scheint demnach, dass die Molecüle der Essigsäure dieser zweiten Formel entsprechen, was wegen der anomalen Dampfdichte derselben auch wahrscheinlich ist.

Schliesslich will ich noch erwähnen, dass ich auch am Queckeilber Messungen vorgenommen habe; ich erhielt für dasselbe zwischen 0° und 300° C. den Werth 0,18. Dazu ist aber zu bemerken, dass sich dabei das Quecksilber in einem Temperaturintervalle befand, welches ausserhalb jener Grenzen liegt, innerhalb deren die Gültigkeit meines Satzes ausgesprochen wurde.

Auch Gemische von Aether und Schwefelkohlenstoff unterwarf ich der Untersuchung und fand die oben abgeleiteten Sätze auch durch diese bestätigt, wobei als Molecularvolumen der Mittelwerth $v_1 + kv_2 : 1+k$ der beiden Molecularvolumina v_1 und v_2 genommen wurde bei dem Mischungsverhältnisse k.

IX. *Ueber die Abweichung des Sauerstoffs von dem Boyle-Mariotte'schen Gesetze bei niedrigen Drucken; von Christian Bohr in Kopenhagen.*

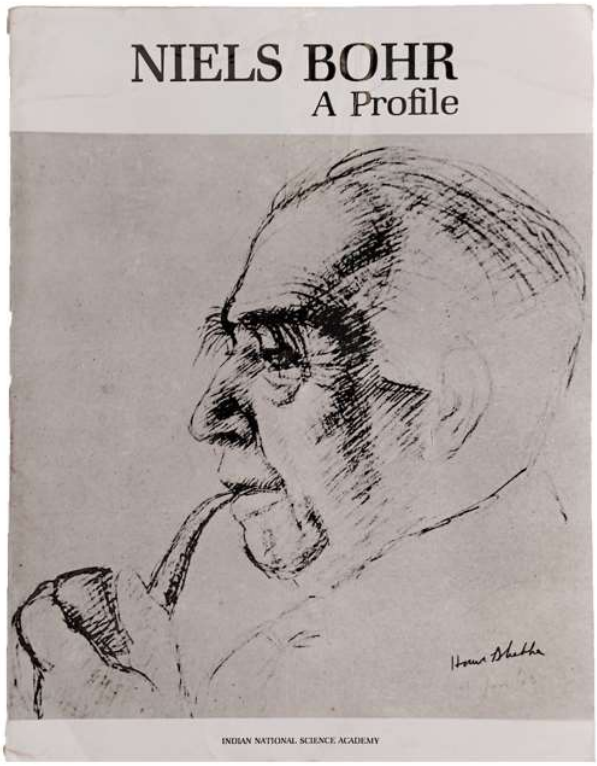
(Hierzu Taf. IV Fig. 18 u. 19.)

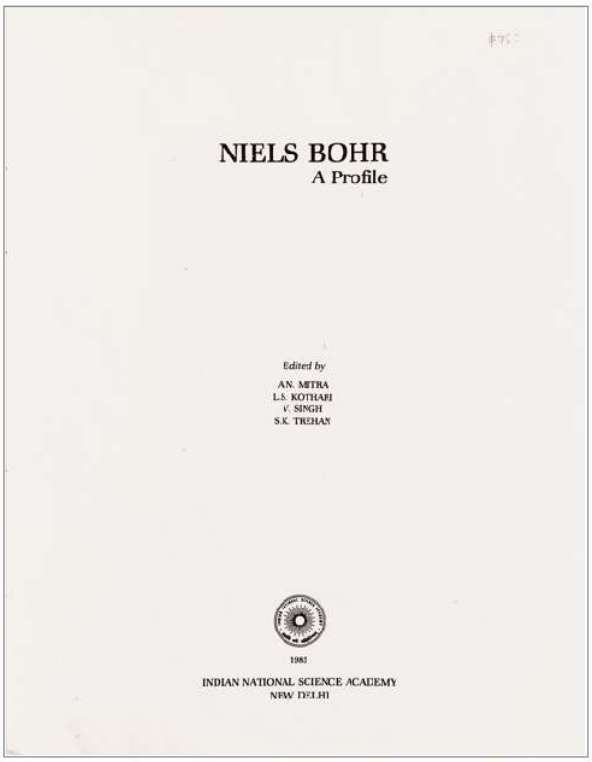
Bei einer Reihe absorptiometrischer Bestimmungen, die ich im Laufe der letzten Jahre über die Dissociation des locker gebundenen Sauerstoffes im Oxyhämoglobin ausgeführt habe, zeigten die unter niedrigen Sauerstoffdrucken angestellten Versuche immer Unregelmässigkeiten, die sich trotz aller angewendeten Mühe nicht entfernen liessen. Indem ich nach dem Grunde dieser Unregelmässigkeiten forschte, wurde ich darauf geführt, denselben zu suchen in der für alle

162. **BOHR, Christian** (1855-1911). *"Ueber die Abweichung des Sauerstoff's von dem Boyle-Mariotte'schen Gesetze bei niedrigen Drucken."* In: *Annalen der Physik und Chemie*, Neue Folge, Band XXVII, 1886. ¶ 224 x 150 mm. 8vo. Pages 459-479. [Entire volume: viii, 680 pp.] 3 tables, 2 figs. on 1 (of 5) folding lithographic plates. Quarter brown calf, calf corners, marbled boards, raised bands, red and black leather spine labels, gilt spine. Ex library blind-stamp of the Carnegie Institution of Washington, Solar Observatory. Fine. S5524

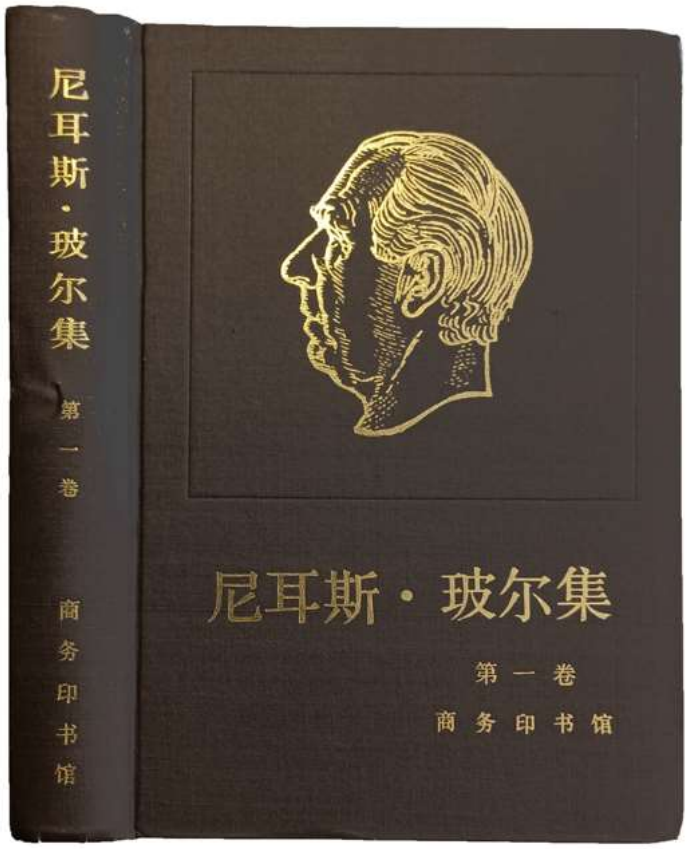
$ 175

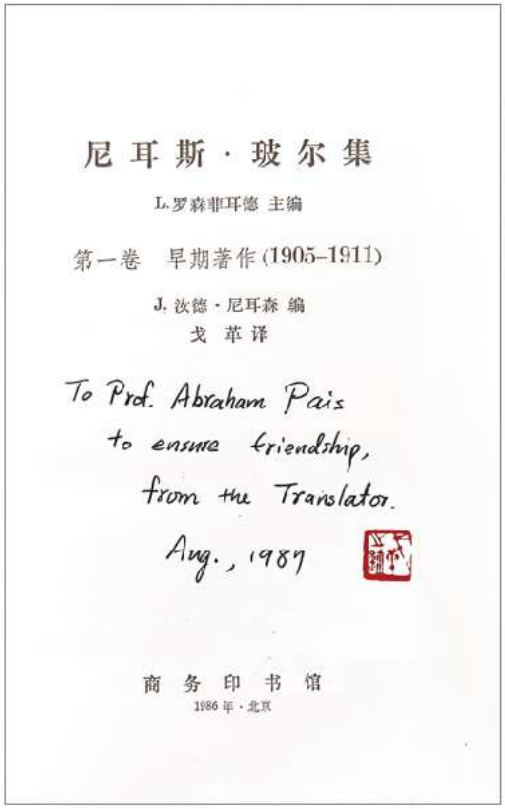
FIRST EDITION. On the Deviation from Boyle-Mariotte's Law of Oxygen at Low Pressures. In 1885 Christian Bohr was awarded a silver medal by the Royal Danish Academy of Sciences for this paper on the deviation from Boyle-Mariotte's law of oxygen at low pressures. Christian Bohr received the Ph.D. in medicine in 1880 on a study of suspended fat droplets in natural milk. Bohr became privatdocent in 1881 at the University of Copenhagen, lektor (associate professor) in 1886, and professor in 1890. Bohr was rector of the University from 1905-1906. Bohr was an excellent physicist with a good mathematical knowledge, who showed a high degree of originality. Bohr is principally remembered for two things. As a scientist, he is remembered for his discovery of the influence of carbon dioxide on the release of oxygen by hemoglobin (1904, Garrison and Morton 726). Christian Bohr was also the father of the celebrated twentieth century physicist, Niels Bohr. Pais, *Niels Bohr's times*, pp. 36-37.





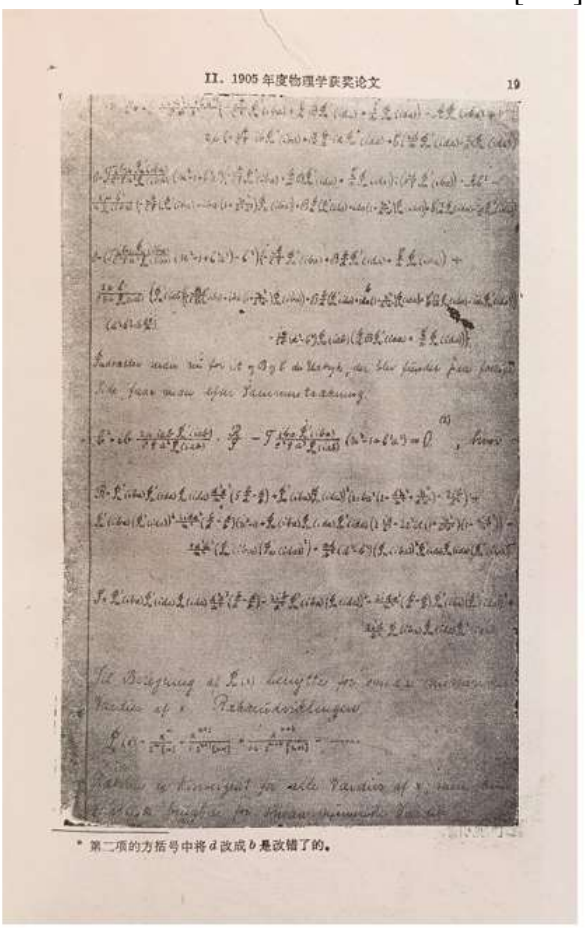
163. [**BOHR, Niels** (1885-1962)] **MITRA, A. N.**, et al, editors. *Niels Bohr; a profile.* New Delhi: Indian National Science Academy, 1985. ¶ 265 x 207 mm. 4to. [vi], 400 pp. Frontis. port., figs., tables. Pictorial wrappers; spine bumped, extremities a bit worn, else very good. S4842 $ 25





[164]

大学时期的哈若德·玻尔和尼耳斯·玻尔

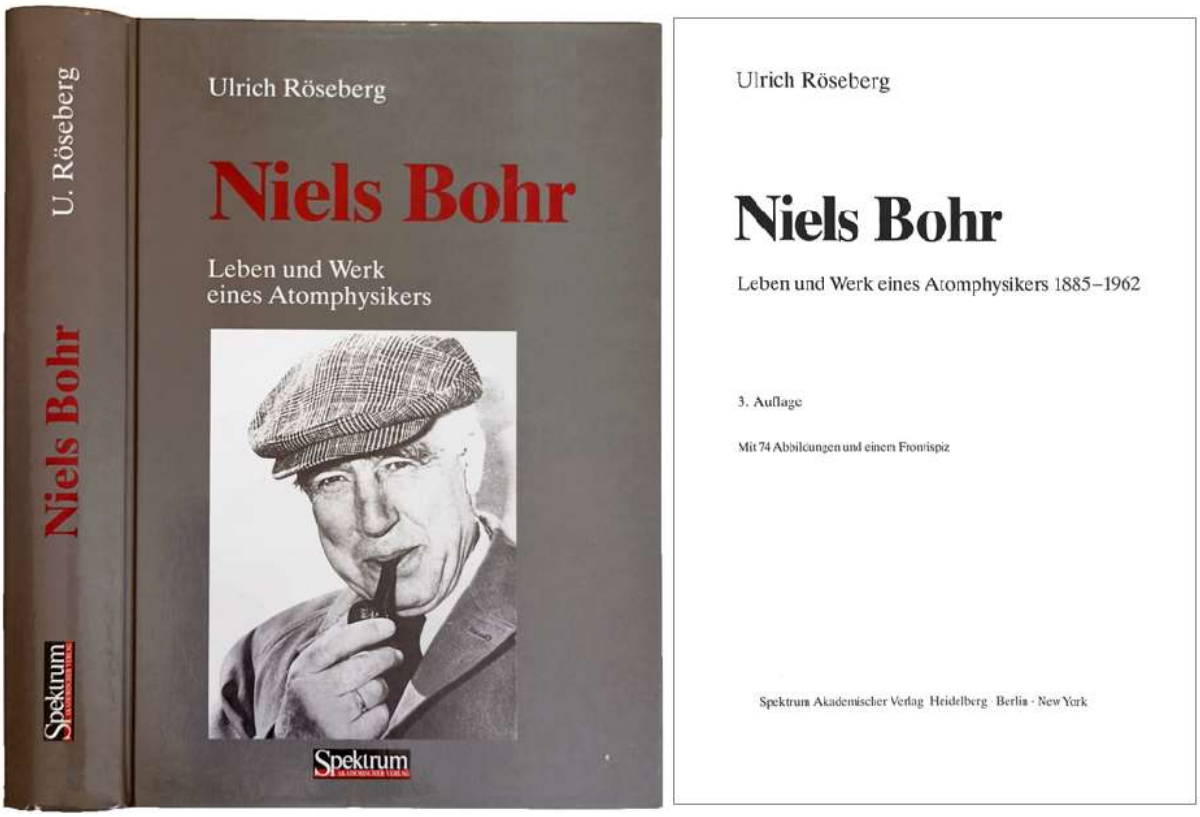


* 第二项的方括号中将 d 改成 b 是改错了的。

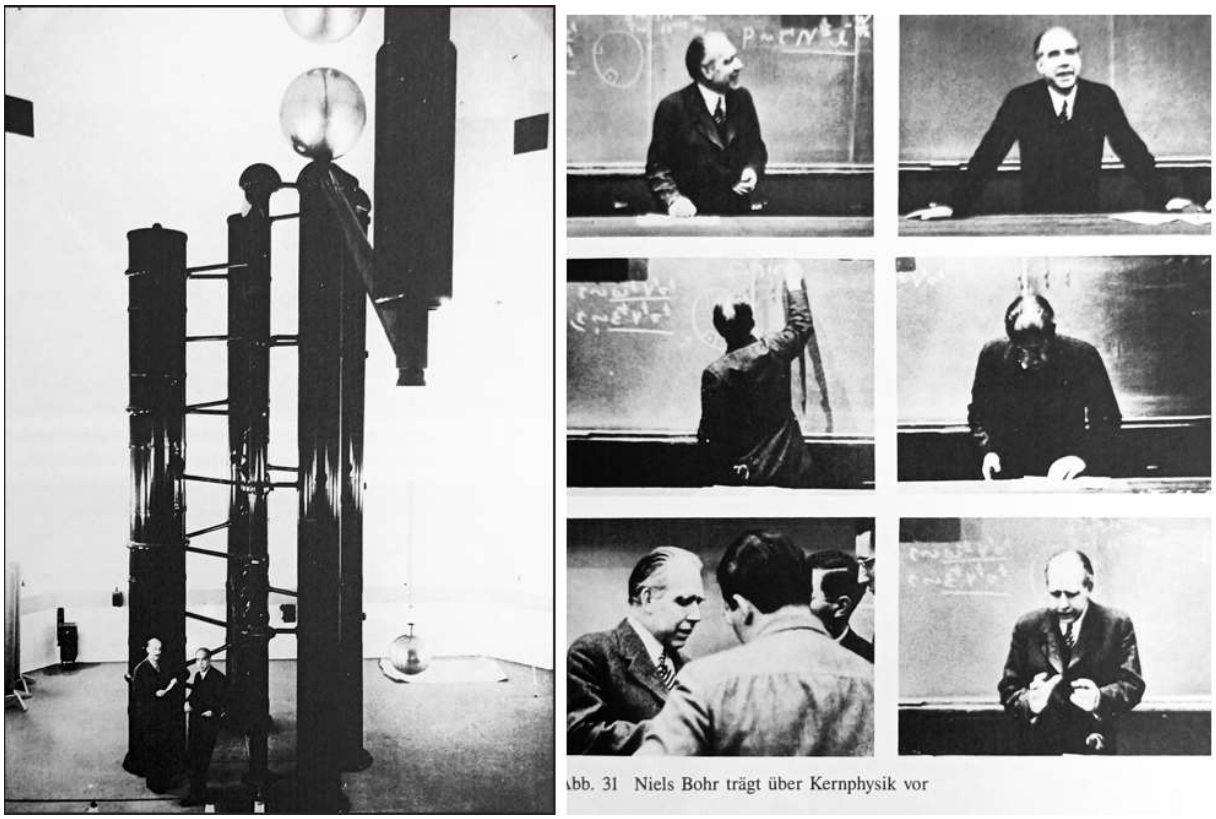
164. **BOHR, Neils Hendrik David** (1885-1962). [In Japanese]: *Collected works. General editor Leon Rosenfeld. Volume I: Early work, (1905-1911). Edited by J. Rud Nielsen*. Tokyo, 1986. ¶ Volume 1 (of 12). 210 x 146 mm. 8vo. [iv], 3, [1 blank], 475 pp. Frontis. port., figs., index. Blind- and gilt-stamped brown cloth. INSCRIBED BY THE TRANSLATOR to Abraham Pais on title. Fine. S4831

$ 25

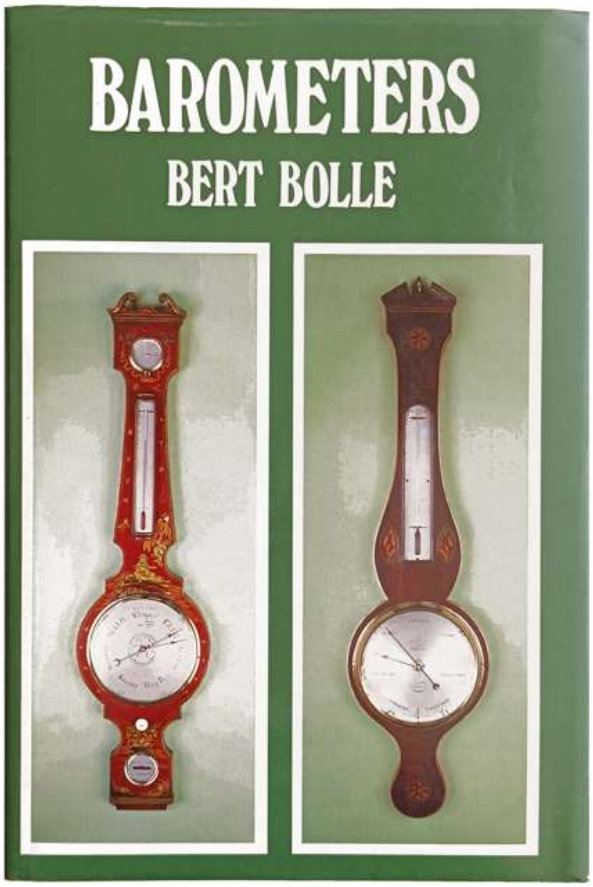
Japanese edition. The editor, Jens Rud Nielsen (1894-1979), born in Copenhagen, was an esteemed physicist at the University of Oklahoma. Leon Rosenfeld (1904-1974) was a close collaborator of the physicist Niels Bohr from 1930 until Bohr's passing.

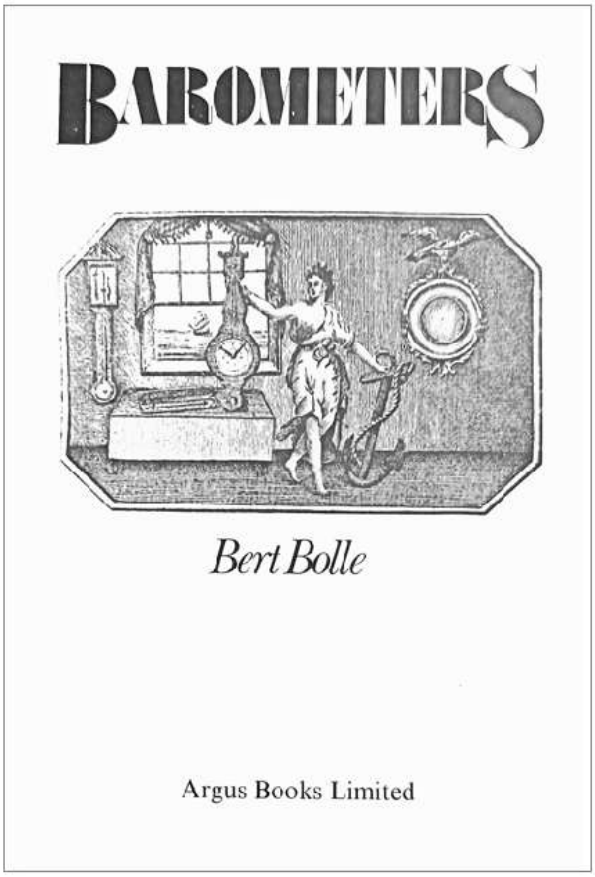


[165]

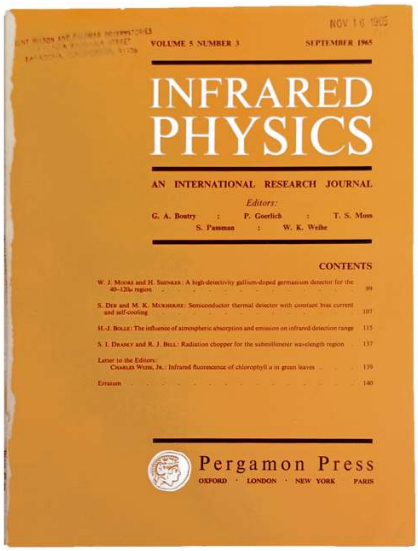


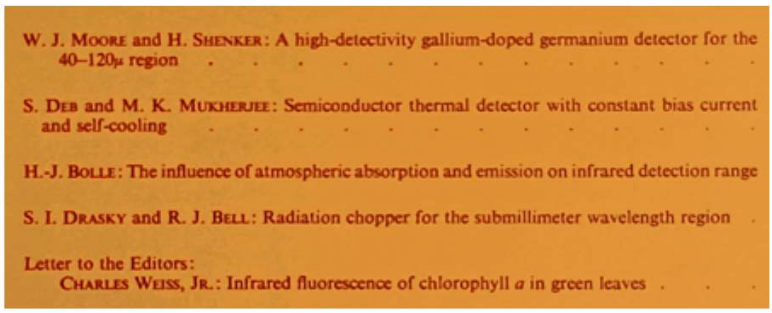
165. [**BOHR, Niels** (1885-1962)] **RÖSEBERG, Ulrich** (1943-1994). *Niels Bohr. Leben und Werk eines Atomphysikers 1885-1962*. Heidelberg, etc.: Spektrum Akademischer, 1992. ¶ THIRD EDITION. 246 x 169 mm. 8vo. 538 pp. Frontis. port., 74 figs., index. Pictorial boards. Fine. S4848 $ 30





166. **BOLLE, Bert**. *Barometers*. Bodmin, Cornwall: Argus Books, 1984. ¶ 8vo. 255, [1] pp. 290 figs. Black cloth, gilt spine, dust-jacket. Fine. S6895 $ 12.95





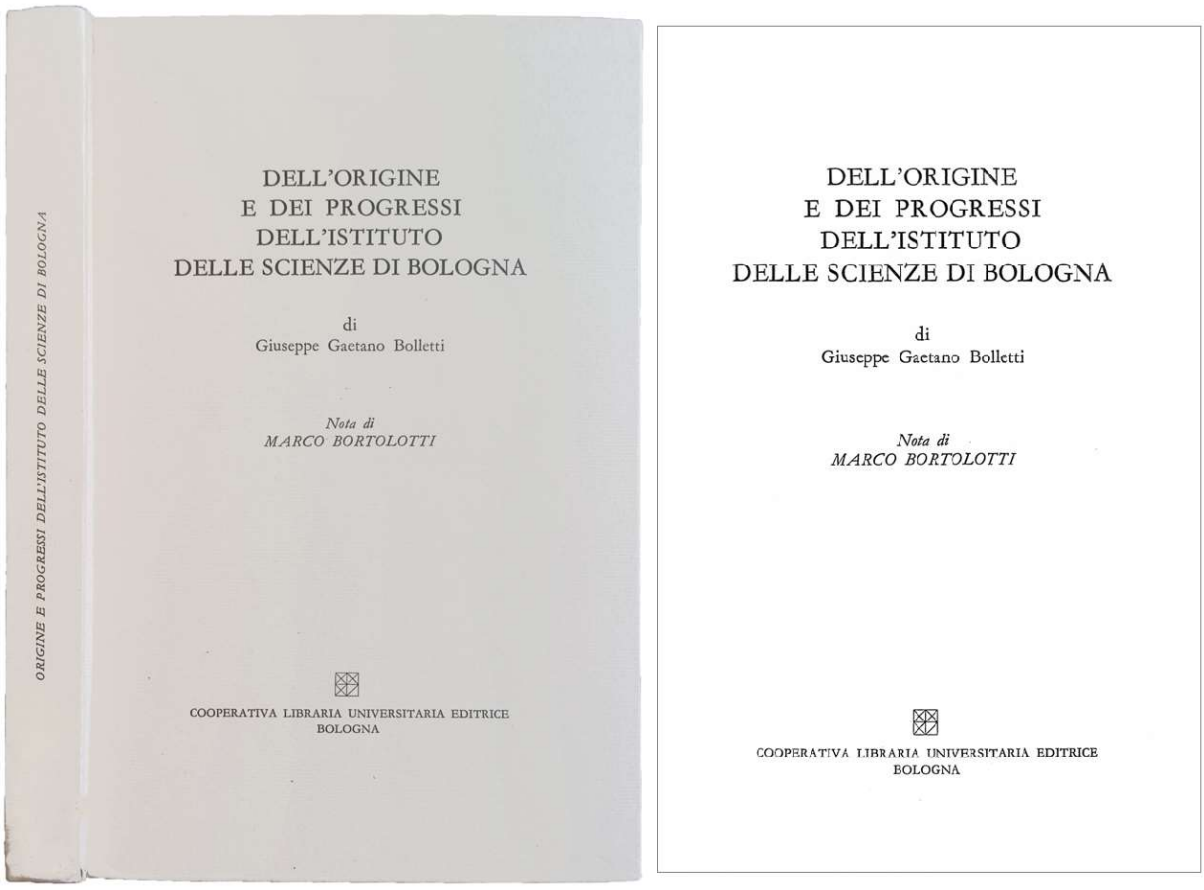
[167]

167. **BOLLE, H.-J.** *"The Influence of Atmospheric Absorption and Emission on Infrared Detection Range."* In: *Infrared Physics: An International Research Journal*, Vol. 5, No. 3, September 1965, pp. 115-135. Oxford, et al.: Pergamon Press, 1965. ¶ 8vo. 99-140 pp. Figs., tables. Printed wrappers; spine frayed. Library stamp on front cover. Good. S10102

$ 10

Summary [Bolle]: A graphical method is presented to determine the detection range for narrow infrared windows in dependence of atmospheric absorption and emission. The atmospheric radiation properties are deduced from theoretical and empirical data under consideration of the actual pressure, temperature and humidity distribution. Some examples are given . . .

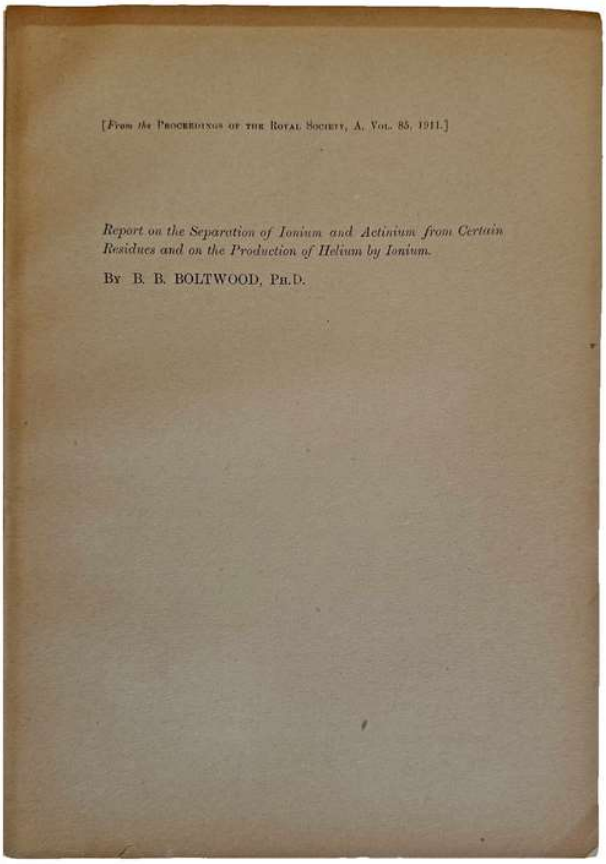
CONTENTS, 4 papers: [1] **W. J. MOORE** and **H. SHENKER**: A high-detectivity gallium-doped germanium detector for the 40-120μ, region. Summary: Gallium-doped germanium with low levels of compensating impurities has been found to be a fast, efficient detector of far infrared radiation. [2] **S. Deb** and **M. K. MUKHERJEE**: Semiconductor thermal detector with constant bias current and self-cooling. Summary: Behaviour of a single crystal semiconductor detector of thermal type, when the bias current is constant and large enough to make self-cooling a dominant heat losing channel, has been analysed taking end cooling into account. Universal curves for computation of responsivity are given. The maximum value of responsivity realizable from an ideal detector of the type is shown to be 1/ i, i being the bias current. Tentative estimate of NEP is made and the speed of response inferred from the expression for high frequency responsivity. [3] **H.-J. BOLLE**: The influence of atmospheric absorption and emission on infrared detection range. [4] **S. I. DRASKY** and **R. J. BELL**: Radiation chopper for the submillimeter wavelength region. Summary: A woven wire mesh application is described for strong discrimination against short wavelength radiation while submillimeter radiation is efficiently utilized. ¶ Letter to the Editors: **CHARLES WEISS, JR**.: Infrared fluorescence of chlorophyll *a* in green leaves.



168. **BOLLETTI, Giuseppe Gaetano** (1709-1769). *Dell'Origine e dei progressi dell'Istituto delle scienze di Bologna. Nota di Marco Bortolotti*. Bologna: Cooperativa libraria universitaria editrice, 1977. ¶ Facsimile. 8vo. xxxi, 126 pp. 4 leaves of folding plates. Printed boards. Fine. RH1369

$ 18.95

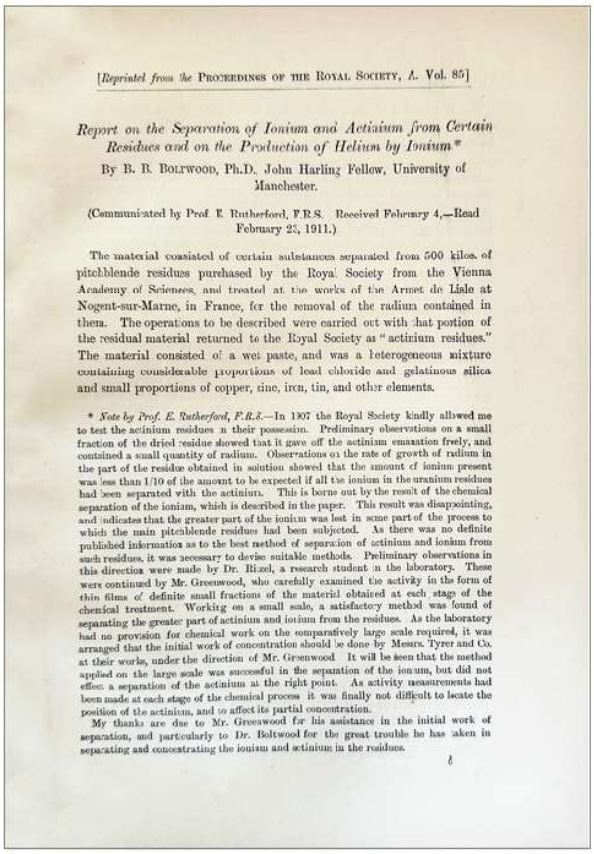
Of the Origin and Progress of the Institute of Sciences in Bologna. Originally printed in 1751, 1763. With notes by Marco Bortolotti.



[From the PROCEEDINGS OF THE ROYAL SOCIETY, A. VOL. 85, 1911.]

Report on the Separation of Ionium and Actinium from Certain Residues and on the Production of Helium by Ionium.

BY B. B. BOLTWOOD, PH.D.



[*Reprinted from the* PROCEEDINGS OF THE ROYAL SOCIETY, *A.* Vol. 85]

*Report on the Separation of Ionium and Actinium from Certain Residues and on the Production of Helium by Ionium.**

By B. B. BOLTWOOD, Ph.D., John Harling Fellow, University of Manchester.

(Communicated by Prof. E. Rutherford, F.R.S. Received February 4,—Read February 23, 1911.)

The material consisted of certain substances separated from 500 kilos. of pitchblende residues purchased by the Royal Society from the Vienna Academy of Sciences, and treated at the works of the Armet de Lisle at Nogent-sur-Marne, in France, for the removal of the radium contained in them. The operations to be described were carried out with that portion of the residual material returned to the Royal Society as "actinium residues." The material consisted of a wet paste, and was a heterogeneous mixture containing considerable proportions of lead chloride and gelatinous silica and small proportions of copper, zinc, iron, tin, and other elements.

* *Note by Prof. E. Rutherford, F.R.S.*—In 1907 the Royal Society kindly allowed me to test the actinium residues in their possession. Preliminary observations on a small fraction of the dried residue showed that it gave off the actinium emanation freely, and contained a small quantity of radium. Observations on the rate of growth of radium in the part of the residue obtained in solution showed that the amount of ionium present was less than 1/10 of the amount to be expected if all the ionium in the uranium residues had been separated with the actinium. This is borne out by the result of the chemical separation of the ionium, which is described in the paper. This result was disappointing, and indicates that the greater part of the ionium was lost in some part of the process to which the main pitchblende residues had been subjected. As there was no definite published information as to the best method of separation of actinium and ionium from such residues, it was necessary to devise suitable methods. Preliminary observations in this direction were made by Dr. Rizel, a research student in the laboratory. These were continued by Mr. Greenwood, who carefully examined the activity in the form of thin films of definite small fractions of the material obtained at each stage of the chemical treatment. Working on a small scale, a satisfactory method was found of separating the greater part of actinium and ionium from the residues. As the laboratory had no provision for chemical work on the comparatively large scale required, it was arranged that the initial work of concentration should be done by Messrs. Tyrer and Co. at their works, under the direction of Mr. Greenwood. It will be seen that the method applied on the large scale was successful in the separation of the ionium, but did not effect a separation of the actinium at the right point. As activity measurements had been made at each stage of the chemical process it was finally not difficult to locate the position of the actinium, and to affect its partial concentration.

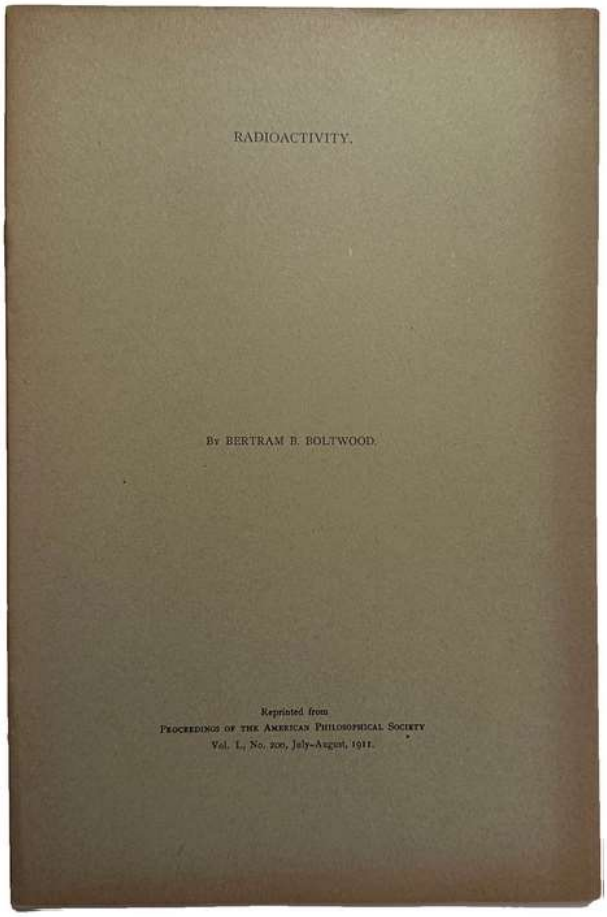
My thanks are due to Mr. Greenwood for his assistance in the initial work of separation, and particularly to Dr. Boltwood for the great trouble he has taken in separating and concentrating the ionium and actinium in the residues.

b

169. **BOLTWOOD, Bertram Borden** (1870-1927). *"Report on the Separation of Ionium and Actinium from Certain Residues and on the Production of Helium by Ionium."* Offprint from: *Proceedings of the Royal Society*, A, vol. 85, 1911. (London: Harrison and Sons, 1911). ¶ 8vo. 77-81 pp. Original printed wrappers. Fine. S7455

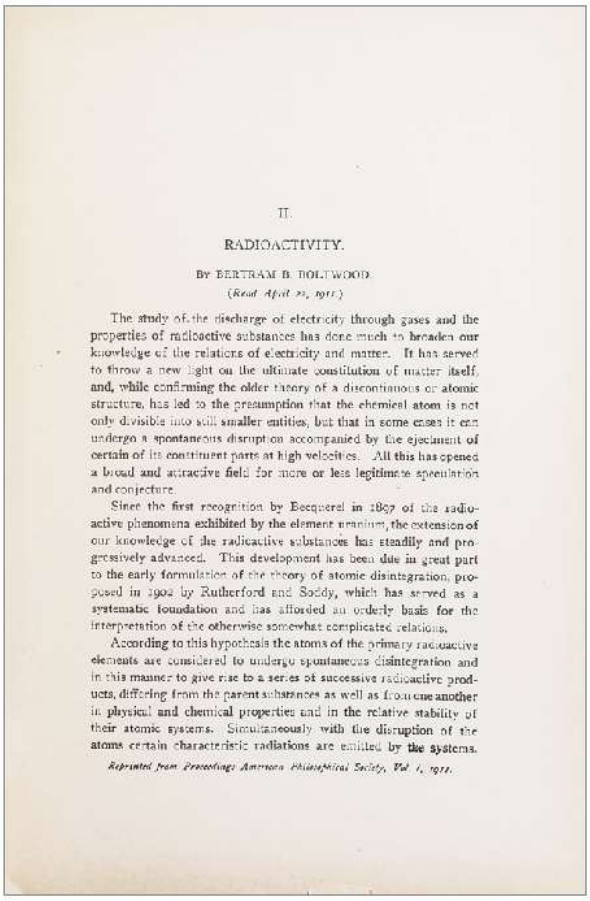
$ 18

Bertram Borden Boltwood was an American pioneer of radiochemistry. Boltwood attended Yale University, became a professor there and in 1910 was appointed chair of the first academic department of radiochemistry. He was the Discoverer of ionium and its genetic relation to uranium and radium.


RADIOACTIVITY.

By BERTRAM B. BOLTWOOD.

Reprinted from
PROCEEDINGS OF THE AMERICAN PHILOSOPHICAL SOCIETY
Vol. L, No. 200, July-August, 1911.


II.

RADIOACTIVITY.

By BERTRAM B. BOLTWOOD.

(*Read April 20, 1911.*)

The study of the discharge of electricity through gases and the properties of radioactive substances has done much to broaden our knowledge of the relations of electricity and matter. It has served to throw a new light on the ultimate constitution of matter itself, and, while confirming the older theory of a discontinuous or atomic structure, has led to the presumption that the chemical atom is not only divisible into still smaller entities, but that in some cases it can undergo a spontaneous disruption accompanied by the ejectment of certain of its constituent parts at high velocities. All this has opened a broad and attractive field for more or less legitimate speculation and conjecture.

Since the first recognition by Becquerel in 1897 of the radioactive phenomena exhibited by the element uranium, the extension of our knowledge of the radioactive substances has steadily and progressively advanced. This development has been due in great part to the early formulation of the theory of atomic disintegration, proposed in 1902 by Rutherford and Soddy, which has served as a systematic foundation and has afforded an orderly basis for the interpretation of the otherwise somewhat complicated relations.

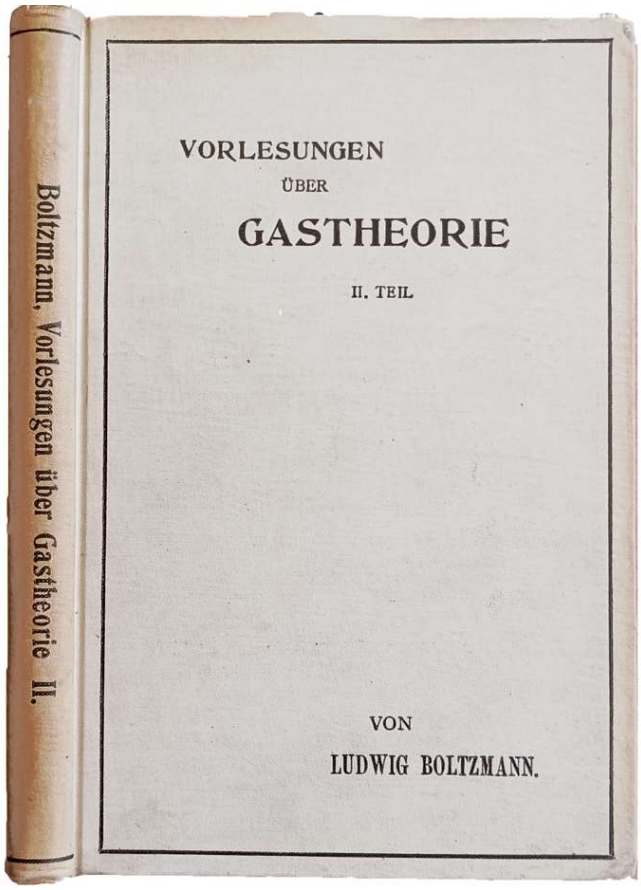
According to this hypothesis the atoms of the primary radioactive elements are considered to undergo spontaneous disintegration and in this manner to give rise to a series of successive radioactive products, differing from the parent substances as well as from one another in physical and chemical properties and in the relative stability of their atomic systems. Simultaneously with the disruption of the atoms certain characteristic radiations are emitted by the systems.

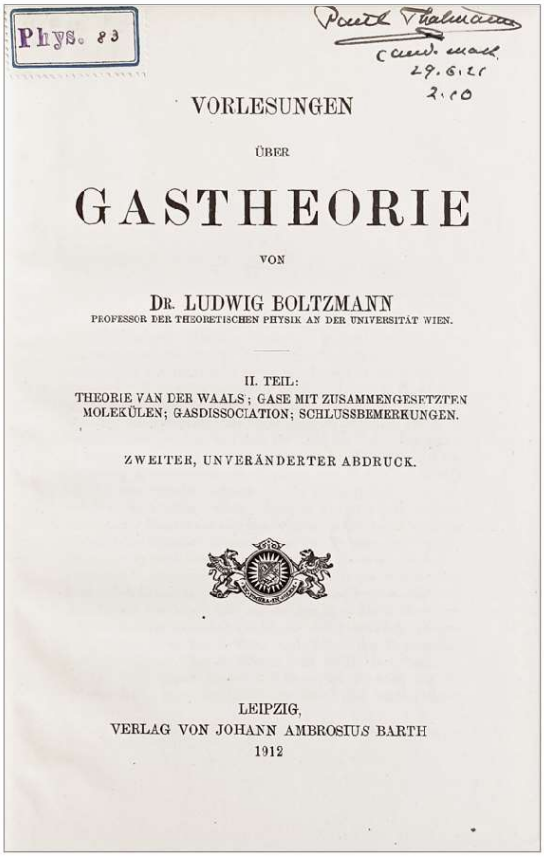
Reprinted from Proceedings American Philosophical Society, Vol. L, 1911.

170. **BOLTWOOD, Bertram Borden** (1870-1927). *"Radioactivity."* Offprint from: *Proceedings of the American Philosophical Society*, vol. L, no. 200. No place: American Philosophical Society, 1911. ¶ 8vo. 14 pp. Printed wrappers. Fine. SS7457

$ 20

Bertram Borden Boltwood was an American pioneer of radiochemistry. Boltwood attended Yale University, became a professor there and in 1910 was appointed chair of the first academic department of radiochemistry. He was the Discoverer of ionium and its genetic relation to uranium and radium. Boltwood was a colleague of Ernest Rutherford (1871-1937) and was associated with Yale University.

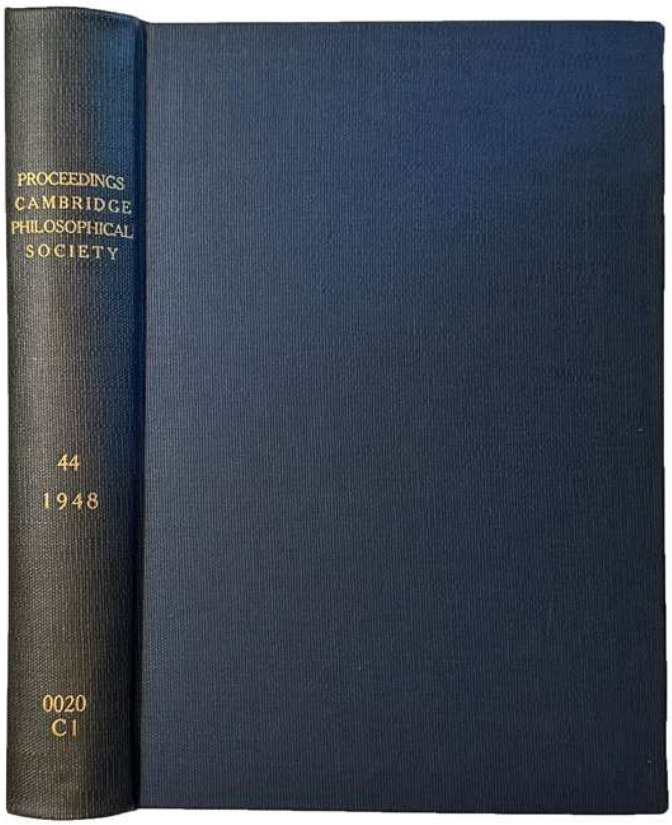


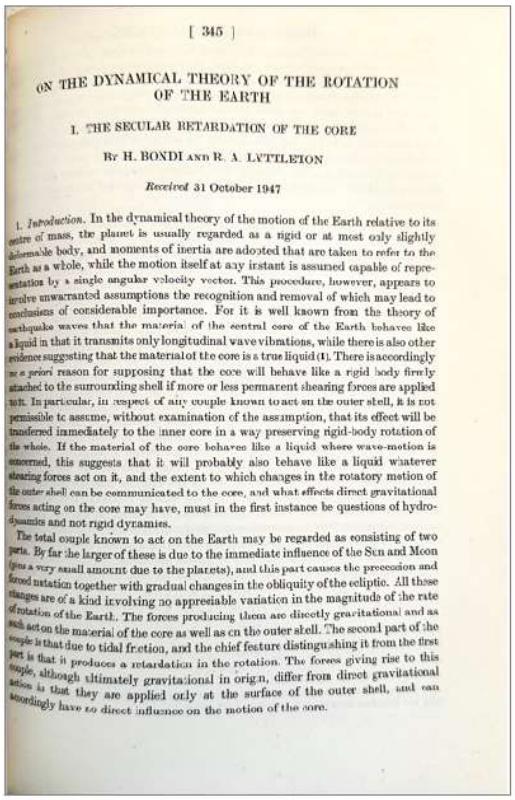


171. **BOLTZMANN, Ludwig** (1844-1906). *Vorlesungen über Gastheorie. II teil: Theorie van der Waals'; Gase mit zusammengesetzten Molekülen; Gasdissociation; Schlussbemerkungen*. Leipzig: Johann Ambrosius Barth, 1912. ¶ Second edition. Part II only. 8vo. x, 265 pp. Beige cloth stamped in black. Copy of Paul Thalmann, with his bookplate and title-page inscription; also his rubber-stamp, Bern. S11590

$ 25

Paul Thalmann was a German physics professor




[345]

ON THE DYNAMICAL THEORY OF THE ROTATION OF THE EARTH

I. THE SECULAR RETARDATION OF THE CORE

By H. BONDI and R. A. LYTTLETON

Received 31 October 1947

1. *Introduction.* In the dynamical theory of the motion of the Earth relative to its centre of mass, the planet is usually regarded as a rigid or at most only slightly deformable body, and moments of inertia are adopted that are taken to refer to the Earth as a whole, while the motion itself at any instant is assumed capable of representation by a single angular velocity vector. This procedure, however, appears to involve unwarranted assumptions the recognition and removal of which may lead to conclusions of considerable importance. For it is well known from the theory of earthquake waves that the material of the central core of the Earth behaves like a liquid in that it transmits only longitudinal wave vibrations, while there is also other evidence suggesting that the material of the core is a true liquid (1). There is accordingly no *a priori* reason for supposing that the core will behave like a rigid body firmly attached to the surrounding shell if more or less permanent shearing forces are applied to it. In particular, in respect of any couple known to act on the outer shell, it is not permissible to assume, without examination of the assumption, that its effect will be transferred immediately to the inner core in a way preserving rigid-body rotation of the whole. If the material of the core behaves like a liquid where wave-motion is concerned, this suggests that it will probably also behave like a liquid whatever shearing forces act on it, and the extent to which changes in the rotatory motion of the outer shell can be communicated to the core, and what effects direct gravitational forces acting on the core may have, must in the first instance be questions of hydrodynamics and not rigid dynamics.

The total couple known to act on the Earth may be regarded as consisting of two parts. By far the larger of these is due to the immediate influence of the Sun and Moon (plus a very small amount due to the planets), and this part causes the precession and forced nutation together with gradual changes in the obliquity of the ecliptic. All these changes are of a kind involving no appreciable variation in the magnitude of the rate of rotation of the Earth. The forces producing them are directly gravitational and as such act on the material of the core as well as on the outer shell. The second part of the couple is that due to tidal friction, and the chief feature distinguishing it from the first part is that it produces a retardation in the rotation. The forces giving rise to this couple, although ultimately gravitational in origin, differ from direct gravitational action in that they are applied only at the surface of the outer shell, and can accordingly have no direct influence on the motion of the core.

172. **BONDI, Hermann** (1919-2005); **Raymond Arthur LYTTLETON** (1911-1995). *On the dynamical theory of the rotation of the earth. I. The secular retardation of the core*. In: *Proceedings of the Cambridge Philosophical Society*, Vol. 44, 1948. Cambridge: University Press, 1948. ¶ 255 x 181 mm. Tall 8vo. Pages 345-359. [Entire volume: iv, 604, [2] pp.] Full navy buckram, gilt spine. Blind stamp of the Carnegie Institution of Washington, Mount Wilson Observatory. Fine. S3087

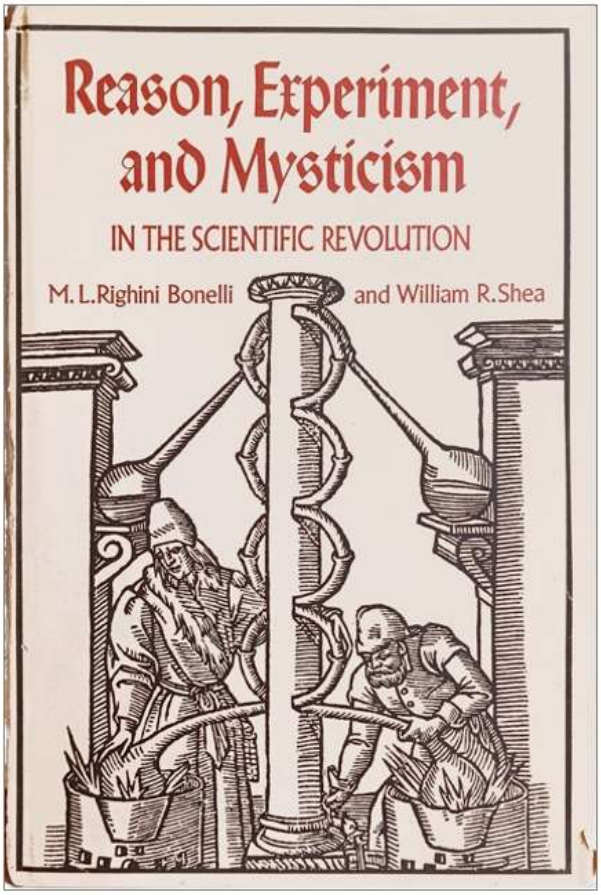
$ 100

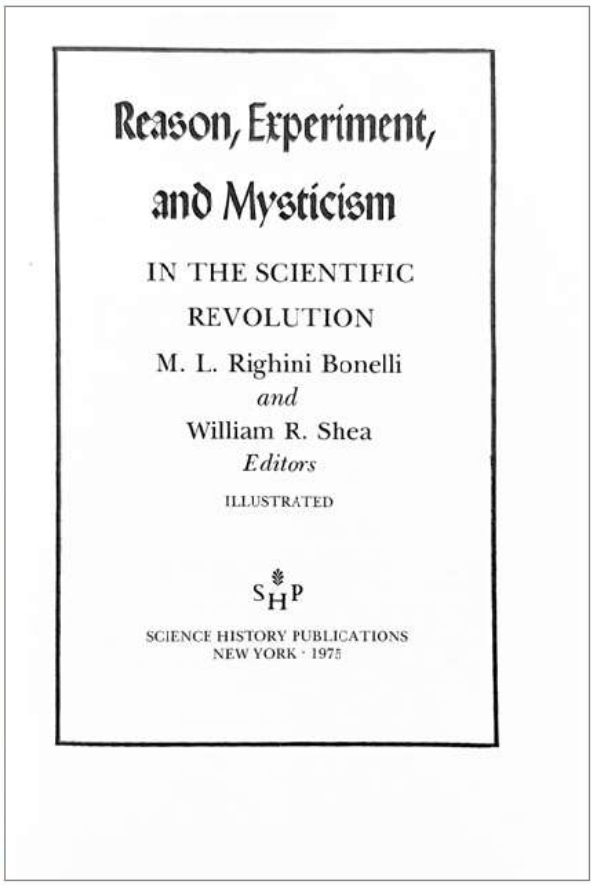
"In an earlier paper of the same general title (1) the possibility that the core of the Earth, in view of its supposed liquid nature, does not partake of the rigid-body motion of the outer shell was discussed with particular reference to the secular diminution of the angular velocity. In addition to this small rate of change of the magnitude of the angular velocity vector of the shell there occur changes in its direction consisting of the precession and nutation, but all the rates of change therein involved are small. The secular retardation takes place with extreme slowness, the rotations involve deviations of the axis with small angular amplitudes, while the precession, though of large angular amplitude, is of very long period compared with the rotation period of the Earth. Accordingly, it may be supposed that the effects of these various changes in the angular velocity can be considered separately in their relation to the motion within the core, and it is the object of this

paper to give an account of our investigation into what may be termed for brevity the precession problem. It should perhaps be stated at the outset that the work does not constitute a solution of the problem, which our studies have led us to believe is one of the utmost mathematical difficulty presenting features of an exceptional character in hydro-dynamic theory. After first obtaining the equations of steady motion applicable to the interior, and those applicable to the boundary layer, the solution of the latter equations has been obtained; but in respect of the former equations we have been able to carry the question of the interior motion only as far as showing that no motion representable everywhere by analytic functions and consistent with the boundary conditions is possible. The investigation strongly suggests that no steady-state motion of a permanent character is possible for the interior, though the precise nature of the motion that actually occurs poses a problem of special interest from a hydrodynamic standpoint, but it is one to which we are not able to arrive at any definite answer at present. Without making any progress with the problem thus produced, the paper nevertheless makes clear the inherent difficulties of the problem and also serves to emphasize the inadequacy of any simplified mode of attack assuming classical fluid and resembling, for example, Poincaré's method for the nutation problem adopted by Lamb. Thus despite its incompleteness it seemed worthwhile to publish some account of such progress with these highly interesting questions as we have been able to make." [Abrstract].

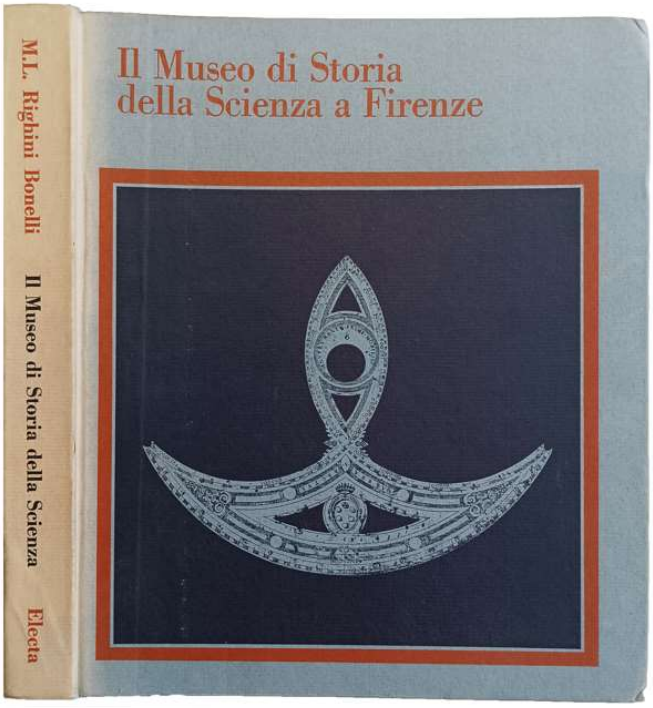
"Lyttleton's researches also took him into the realm of geophysics and planetary physics, in particular the structures of the terrestrial group of planets. He was the first to appreciate that the motion of the liquid core of the Earth must be considered on the fullest basis of hydrodynamical theory, and in collaboration with H. Bondi, he conducted extensive mathematical investigations on the effect of tidal friction and of precession on motions within the core." *McGraw-Hill modern men of science*, II, p. 337.

Sir Hermann Bondi was an Austrian-British mathematician and cosmologist.





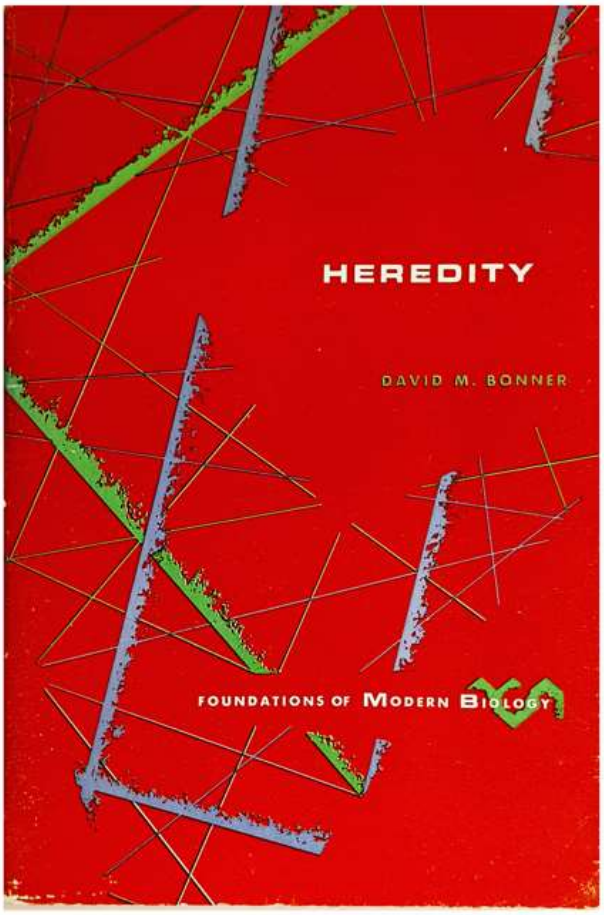
173. **BONELLI, Maria Luisa Righini** (1917-1981); **William René SHEA** (1937-) (editors). *Reason, Experiment, and Mysticism in the Scientific Revolution*. New York: Science History, 1975. ¶ 8vo. vi, 320 pp. Illus. Cloth, dust-jacket; jacket torn, else very good. Ownership signature of Roger Hahn, UCB. RH1370 $ 22

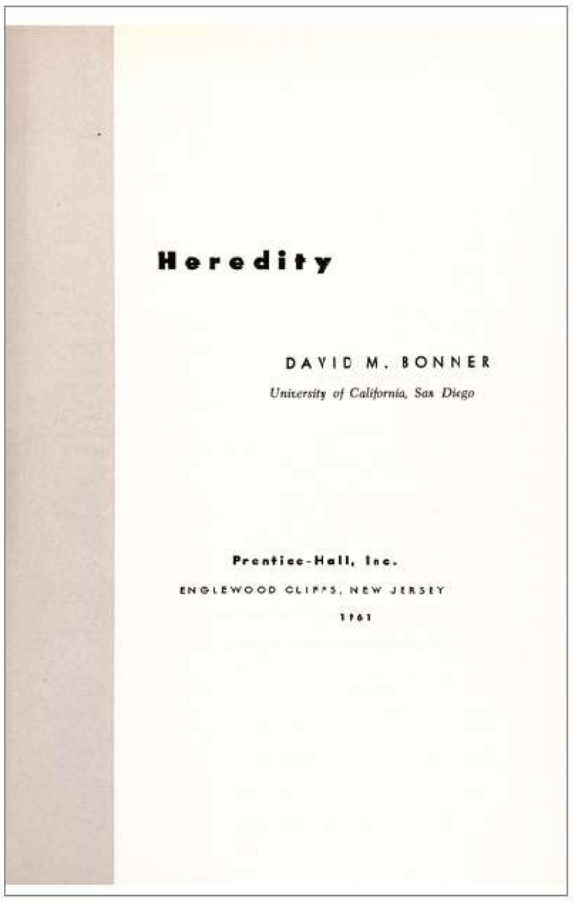


174. **BONELLI, Maria Luisa Righini** (1917-1981). *Il Museo di Storia della Scienza a Firenze*. Milan: Electa Editrice, 1968. ¶ Wide 8vo. 250, [1] pp. 10 in-text plates (I-II tipped-in), 143 photographs. Printed blue cloth; spine sunned, corners slightly bumped. Ownership signature. Very good. S11045

$ 25

In 1961, upon the death of Andrea Corsini, Maria Bonelli became director of the Museum of the History of Science, Florence. On 4 November 1966, the Palazzo Castellani, home to the Museum, was hit hard by the flooding of the Arno. The collections, whose reorganization had been completed just two years earlier, were seriously damaged by water, mud and diesel fuel. The director, who had an apartment on the ground floor of the building, found herself alone facing the emergency. To save at least the most important instruments, she ventured onto the cornice that connects the Palace to the Uffizi. Her courage was reported in the press of the time and became a symbol of the reaction of the Florentines in the face of disaster.





175. **BONNER, David M.** *Heredity*. New Jersey: Prentice-Hall, 1961. ¶ Second printing. 8vo. xiv, 112 pp. Photos, figs., index. Pictorial wrappers. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine. S7132 $ 4

N. H. HOROWITZ
DIVISION OF BIOLOGY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

Neurospora Lactase. I: Properties of Lactase Preparations from a Lactose Utilizing and a Lactose Non-utilizing Strain

Otto E. Landman and David M. Bonner

From the Osborn Botanical Laboratory, Yale University, New Haven, Connecticut

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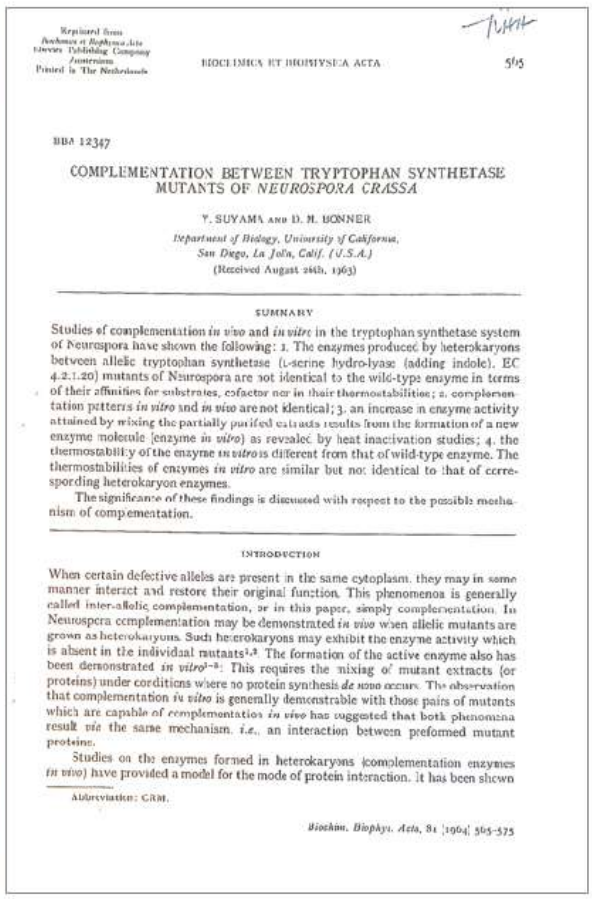
Vol. 41, No. 2, December, 1952
Printed in U.S.A.



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BIOCHIMICA ET BIOPHYSICA ACTA 565

BBA 12347

COMPLEMENTATION BETWEEN TRYPTOPHAN SYNTHETASE MUTANTS OF *NEUROSPORA CRASSA*

Y. SUYAMA AND D. M. BONNER

Department of Biology, University of California, San Diego, La Jolla, Calif. (U.S.A.)

(Received August 26th, 1963)

SUMMARY

Studies of complementation *in vivo* and *in vitro* in the tryptophan synthetase system of Neurospora have shown the following: 1. The enzymes produced by heterokaryons between allelic tryptophan synthetase (L-serine hydro-lyase (adding indole), EC 4.2.1.20) mutants of Neurospora are not identical to the wild-type enzyme in terms of their affinities for substrates, cofactor nor in their thermostabilities; 2. complementation patterns *in vitro* and *in vivo* are not identical; 3. an increase in enzyme activity attained by mixing the partially purified extracts results from the formation of a new enzyme molecule (enzyme *in vitro*) as revealed by heat inactivation studies; 4. the thermostability of the enzyme *in vitro* is different from that of wild-type enzyme. The thermostabilities of enzymes *in vitro* are similar but not identical to that of corresponding heterokaryon enzymes.

The significance of these findings is discussed with respect to the possible mechanism of complementation.

INTRODUCTION

When certain defective alleles are present in the same cytoplasm, they may in some manner interact and restore their original function. This phenomenon is generally called inter-allelic complementation, or in this paper, simply complementation. In Neurospora complementation may be demonstrated *in vivo* when allelic mutants are grown as heterokaryons. Such heterokaryons may exhibit the enzyme activity which is absent in the individual mutants[1,2]. The formation of the active enzyme also has been demonstrated *in vitro*[3-5]. This requires the mixing of mutant extracts (or proteins) under conditions where no protein synthesis *de novo* occurs. The observation that complementation *in vitro* is generally demonstrable with those pairs of mutants which are capable of complementation *in vivo* has suggested that both phenomena result *via* the same mechanism, *i.e.*, an interaction between preformed mutant proteins.

Studies on the enzymes formed in heterokaryons (complementation enzymes *in vivo*) have provided a model for the mode of protein interaction. It has been shown

Abbreviation: CRM.

Biochim. Biophys. Acta, 81 [1964] 565–575

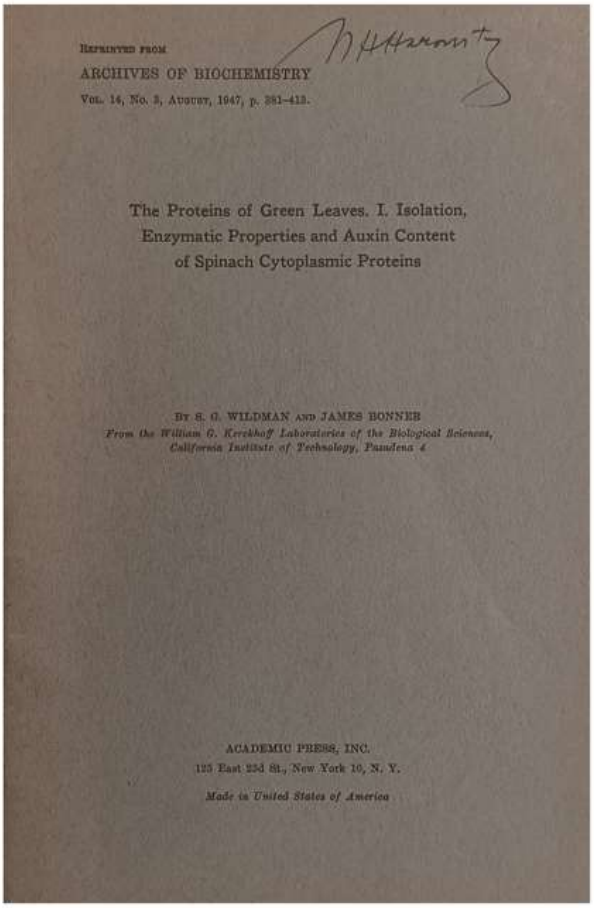
176. **BONNER, David M**. [Group of 2 offprints]: **BONNER; Otto E. LANDMAN**. *"Neurospora Lactase. I: Properties of Lactase Preparations from a Lactose Utilizing and a Lactose Non-Utilizing Strain."* Offprint from: *Archives of Biochemistry and Biophysics*, vol. 41, no. 2, 1952. ¶ 8vo. 253-265 pp. Figs. Printed wrappers. Ownership rubber stamp of Norman Horowitz. FINE.

WITH: **BONNER**, & **Y. SUYAMA**. *"Complementation Between Tryptophan Synthetase Mutants of Neurospora Crassa."* Offprint from: *Biochimica et Biophysica Acta*, vol. 81, 1964. ¶ 8vo. 565-575 pp. Self-wraps. Ownership signature of Horowitz. S8218

$ 30

Bonner was a pioneer geneticist, who, like Norman Horowitz, was a colleague of such figures as George W. Beadle and E. L. Tatum.

PROVENANCE: These were the personal copies of Norman Horowitz (1915-2005), who was a geneticist at Caltech who achieved national fame as the scientist who devised experiments to determine whether life might exist on Mars.



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ARCHIVES OF BIOCHEMISTRY
Vol. 14, No. 3, August, 1947, p. 381–413.

The Proteins of Green Leaves. I. Isolation, Enzymatic Properties and Auxin Content of Spinach Cytoplasmic Proteins

By S. G. Wildman and James Bonner
From the William G. Kerckhoff Laboratories of the Biological Sciences, California Institute of Technology, Pasadena 4

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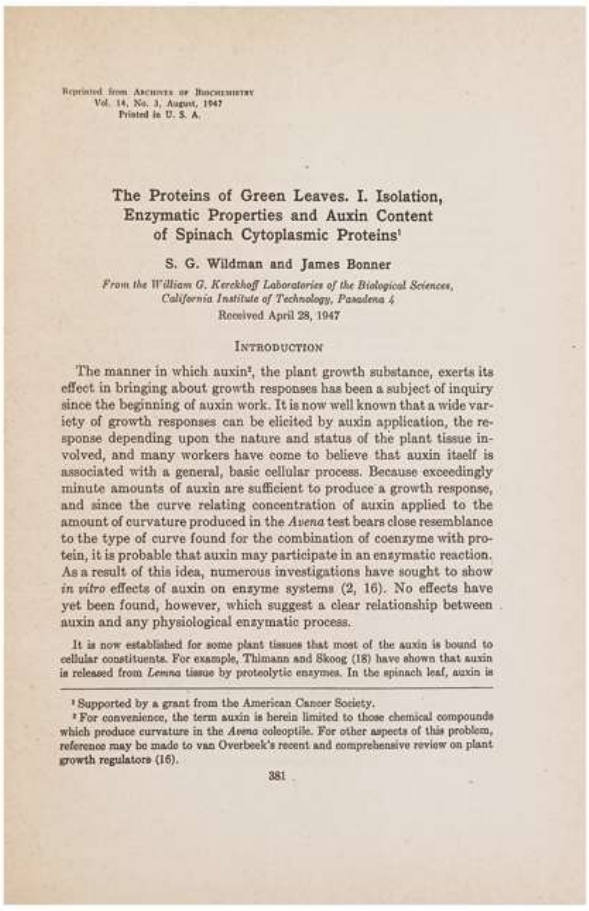
Made in United States of America



Reprinted from Archives of Biochemistry
Vol. 14, No. 3, August, 1947
Printed in U. S. A.

The Proteins of Green Leaves. I. Isolation, Enzymatic Properties and Auxin Content of Spinach Cytoplasmic Proteins[1]

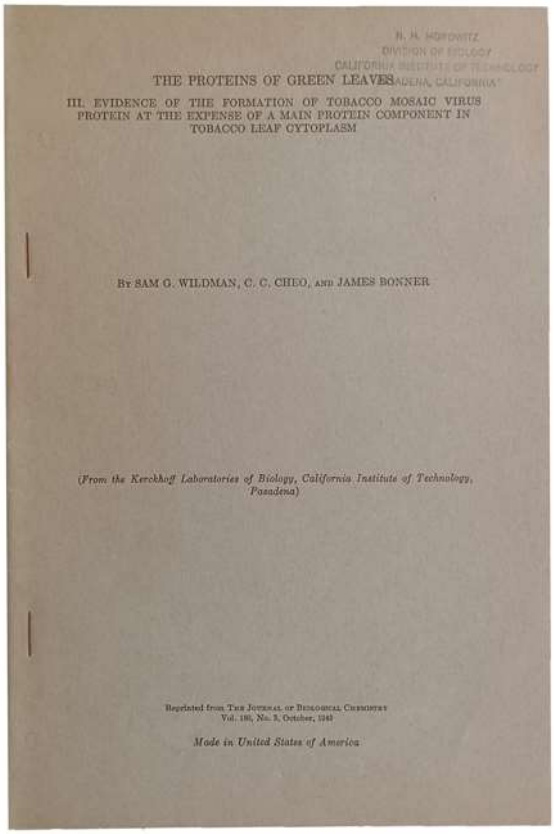
S. G. Wildman and James Bonner
From the William G. Kerckhoff Laboratories of the Biological Sciences, California Institute of Technology, Pasadena 4
Received April 28, 1947

Introduction

The manner in which auxin[2], the plant growth substance, exerts its effect in bringing about growth responses has been a subject of inquiry since the beginning of auxin work. It is now well known that a wide variety of growth responses can be elicited by auxin application, the response depending upon the nature and status of the plant tissue involved, and many workers have come to believe that auxin itself is associated with a general, basic cellular process. Because exceedingly minute amounts of auxin are sufficient to produce a growth response, and since the curve relating concentration of auxin applied to the amount of curvature produced in the *Avena* test bears close resemblance to the type of curve found for the combination of coenzyme with protein, it is probable that auxin may participate in an enzymatic reaction. As a result of this idea, numerous investigations have sought to show *in vitro* effects of auxin on enzyme systems (2, 16). No effects have yet been found, however, which suggest a clear relationship between auxin and any physiological enzymatic process.

It is now established for some plant tissues that most of the auxin is bound to cellular constituents. For example, Thimann and Skoog (18) have shown that auxin is released from *Lemna* tissue by proteolytic enzymes. In the spinach leaf, auxin is

[1] Supported by a grant from the American Cancer Society.
[2] For convenience, the term auxin is herein limited to those chemical compounds which produce curvature in the *Avena* coleoptile. For other aspects of this problem, reference may be made to van Overbeek's recent and comprehensive review on plant growth regulators (16).



THE PROTEINS OF GREEN LEAVES

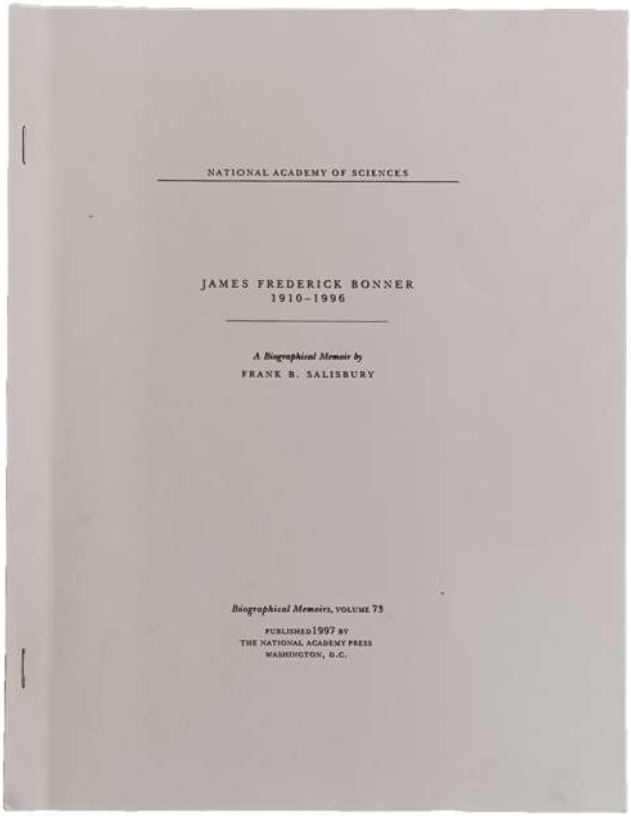
III. EVIDENCE OF THE FORMATION OF TOBACCO MOSAIC VIRUS PROTEIN AT THE EXPENSE OF A MAIN PROTEIN COMPONENT IN TOBACCO LEAF CYTOPLASM

By Sam G. Wildman, C. C. Chiu, and James Bonner

(From the Kerckhoff Laboratories of Biology, California Institute of Technology, Pasadena)

Reprinted from The Journal of Biological Chemistry
Vol. 180, No. 3, October, 1949

Made in United States of America



NATIONAL ACADEMY OF SCIENCES

JAMES FREDERICK BONNER
1910–1996

A Biographical Memoir by
FRANK B. SALISBURY

Biographical Memoirs, VOLUME 75

PUBLISHED 1997 BY
THE NATIONAL ACADEMY PRESS
WASHINGTON, D.C.

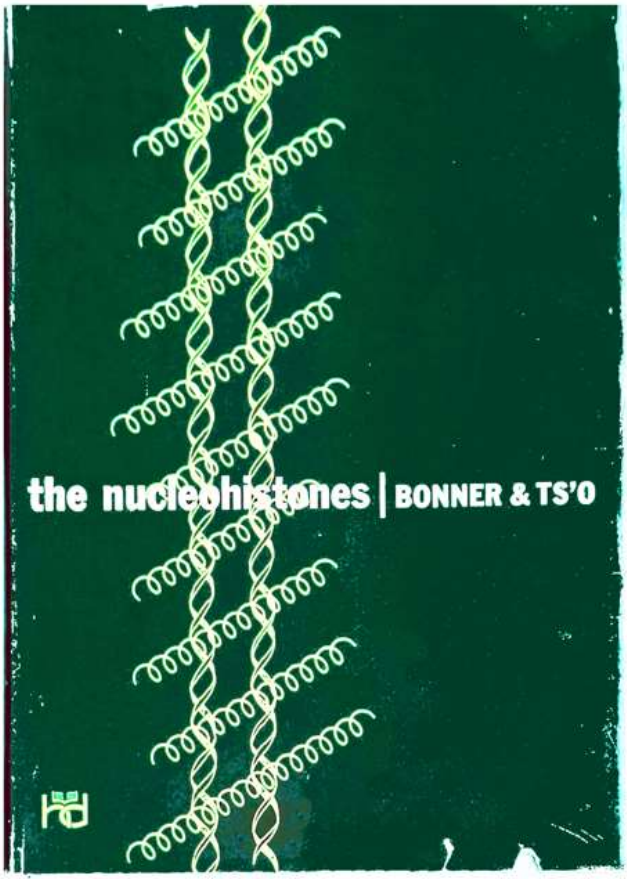
177. **BONNER, James Frederick** (1910-1996); **Samuel Goodnow WILDMAN** (1912-2004). Group of 3 offprints. Includes: **BONNER & WILDMAN**. *"The Proteins of Green Leaves. I. Isolation, Enzymatic Properties and Auxin Content of Spinach Cytoplasmic Proteins."* Offprint from: *Archives of Biochemistry*, vol. 14, no. 3, 1947. New York: Academic Press, 1947. ¶ 8vo. 381-413 pp. Figs., tables. Printed wrappers. Ownership signature of Norman Horowitz. Fine.

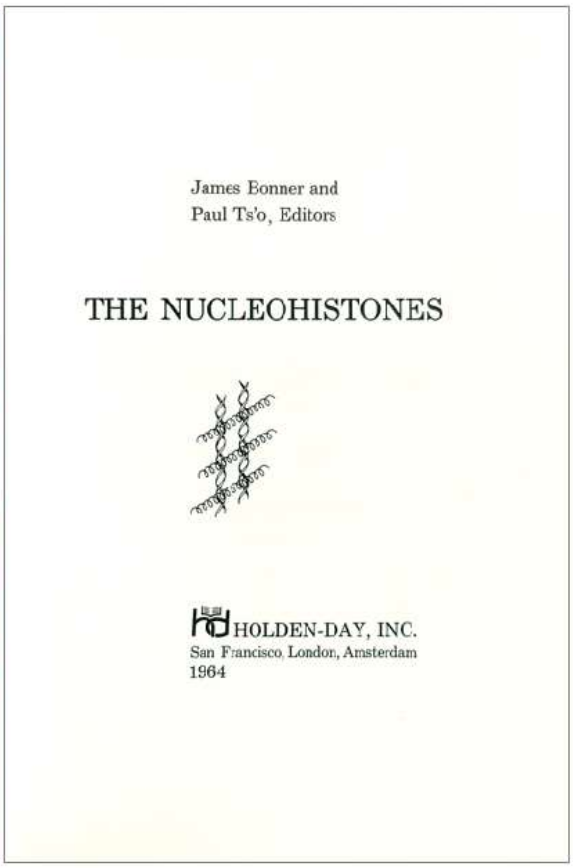
WITH: **BONNER**, **WILDMAN**, & **C. C. CHEO**. *"The Proteins of Green Leaves. III. Evidence of the Formation of Tobacco Mosaic Virus Protein at the Expense of a Main Protein Component in Tobacco Leaf Cytoplasm."* Offprint from: *Journal of Biological Chemistry*, vol. 180, no. 3, 1949. ¶ 8vo. 985-1001 pp. Figs., tables. Printed wrappers. Ownership rubber stamp of Horowitz, California Institute of Technology. Fine.

WITH: **Frank B. SALISBURY**, *"James Frederick Bonner, September 1, 1910—September 13, 1996,"* National Academies of Sciences, *Engineering, and Medicine.* V. 73, 1998. ¶ *Biographical Memoirs*: Volume 73. Washington, DC: The National Academies Press. S7373

$ 20

"After the end of the Second World War, Samuel G. Wildman arrived as a postdoctoral fellow. With Sam, James made a new start with what would today be called cell biology, the isolation of "chloroplasts, mitochondria, cytoplasm, and lots of enzymes!" They ground spinach leaves in a colloid mill, centrifuged the product at 20,000gn and found that the supernatant contained the soluble leaf proteins. Furthermore, over half of the soluble leaf proteins consisted of a single component of molecular mass ca. 500,000, which they called fraction I. Sam found this fraction in many other leaves besides spinach. It was later shown by John Littleton of Palmerston North, New Zealand, a former postdoctoral fellow of James, that fraction I was the main protein in the stroma or fluid part of chloroplasts. He, Paul Ts'o, and others went on to show that fraction I is ribulose-1,5-bisphosphate carboxylase/oxidase, which is now often referred to as rubisco. Rubisco is the enzyme that fixes CO2 in photosynthesis. It is the most abundant protein in the world, and Sam Wildman continued to study it until he retired." See: James Frederick Bonner, September 1, 1910—September 13, 1996. National Academies of Sciences, Engineering, and Medicine. Biographical Memoirs: Volume 73, 1998. Washington, DC: The National Academies Press.





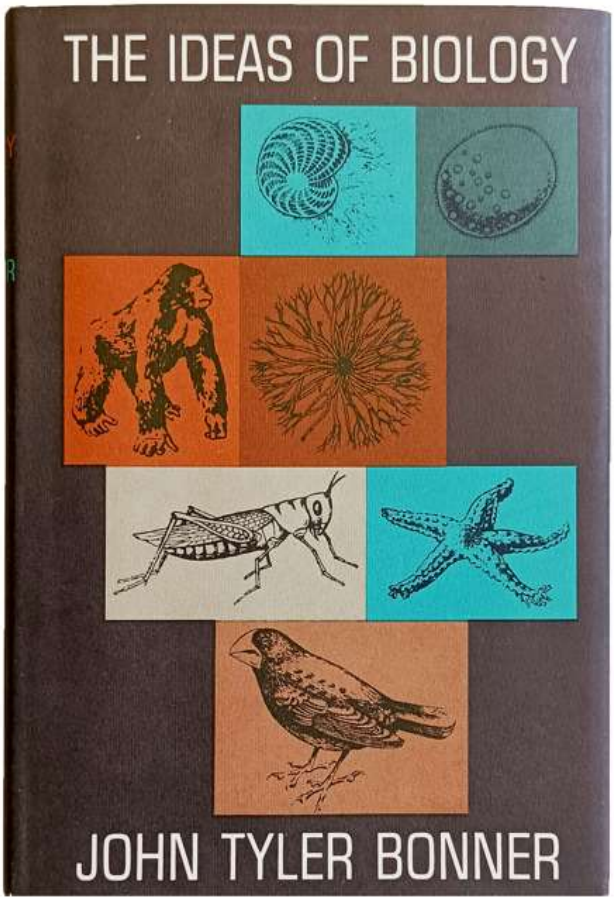
178. **BONNER, James Frederick** (1910-1996); **Paul O.P. TS'O** (eds.). *The Nucleohistones*. San Francisco: Holden-Day, 1964. ¶ FIRST EDITION. Tall 8vo. xvii, 398 pp. Articles, photos, figs., index. Blue cloth, dust jacket; jacket extremities slightly rubbed, else fine. Ownership rubber stamp & signature of Norman Horowitz, California Institute of Technology. S7650

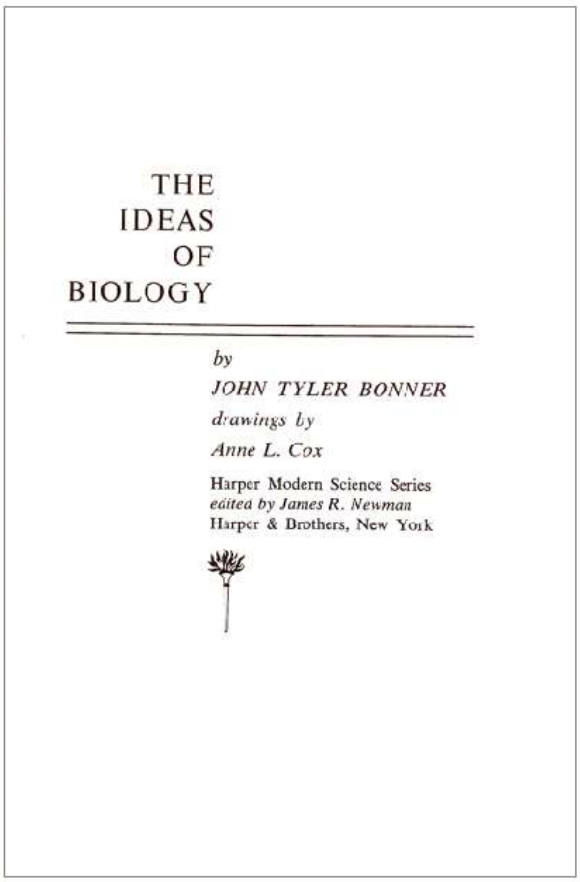
$ 12

"In the dawn of molecular biology in the 1960s, his interest turned to gene expression, in particular the regulation of production of RNA from genes. Experiments in his laboratory in collaboration with his postdoctoral fellow Ru Chih C. Huang showed that histone, a protein associated with the genes, shuts off gene activity. If the histone fraction is extracted from isolated chromatin, more RNA is made whereas if histone is added back, the transcription of RNA is greatly decreased. In the course of these experiments, Huang and Bonner discovered DNA-dependent RNA polymerase, but Bonner noted in a biographical article that several other groups discovered the enzyme simultaneously." "Beginning about 1956 (at the urging of a former graduate student and by then postdoctoral fellow, Paul O. P. Ts'o), but with a significant acceleration in 1961, James became interested in protein synthesis, microsomal/chromosomal proteins, histones and chromatin (including non-histone chromosomal proteins) and molecular biology in general (including 3 papers on the molecular biology of memory!), nucleic acids,

and the genome. This work encompassed about 190 publications with about 112 coauthors. James made numerous contributions in this area, far too many to discuss in limited space."

"Paul O.P. Ts'o, who took his Ph.D. with James and by 1956 was a postdoctoral fellow, convinced James that they should study the most fundamental problem of biology—how chromosomes control cellular metabolism." Frank B. Salisbury, "James Frederick Bonner, September 1, 1910—September 13, 1996," National Academies of Sciences, *Engineering, and Medicine*. V. 73, 1998. *Biographical Memoirs*: Volume 73. Washington, DC: The National Academies Press.




THE
IDEAS
OF
BIOLOGY

by
JOHN TYLER BONNER
drawings by
Anne L. Cox

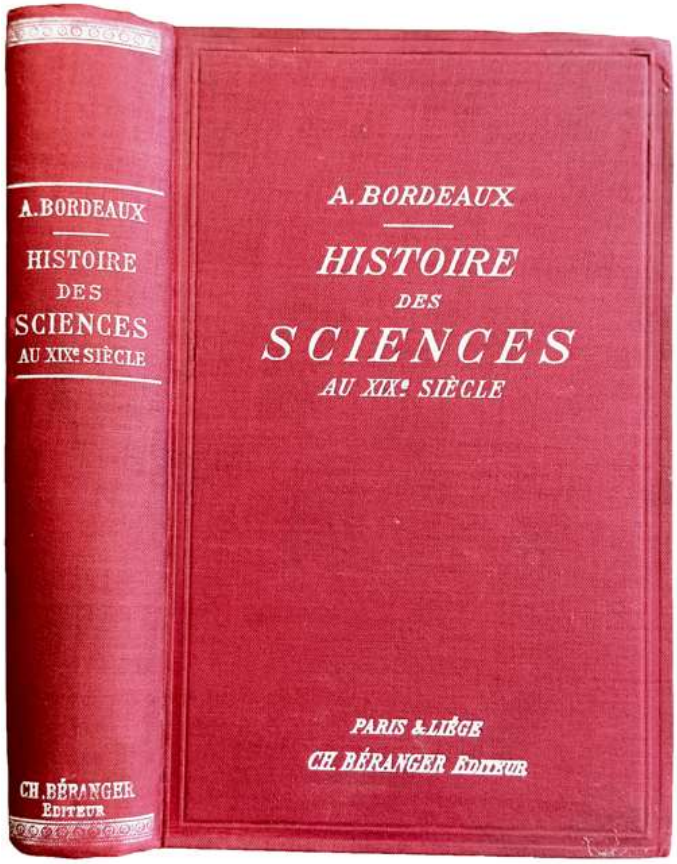
Harper Modern Science Series
edited by James R. Newman
Harper & Brothers, New York

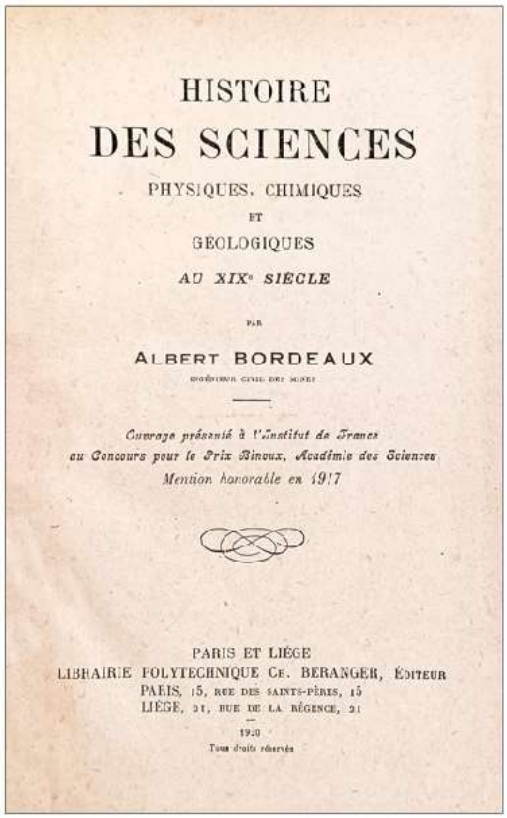
179. **BONNER, John Tyler** (1920-2029). *The ideas of biology. Drawings by Anne L. Cox*. New York: Harper & Bros., 1962. ¶ Series: *Harper Modern Science Series*. FIRST EDITION. 8vo. xi, 180 pp. 24 figs., bibliog., index. Gray cloth, dust-jacket. Fine. S1220

$ 15

John Tyler Bonner was an American biologist who was a professor in the Department of Ecology and Evolutionary Biology at Princeton University. "He was a pioneer in the use of cellular slime molds to understand evolution and

development over a career of 40 years and was one of the world's leading experts on cellular slime moulds. His work is highly readable and unusually clearly written and his contributions have made many complicated ideas of biology accessible to a wide audience." [Wikip.].

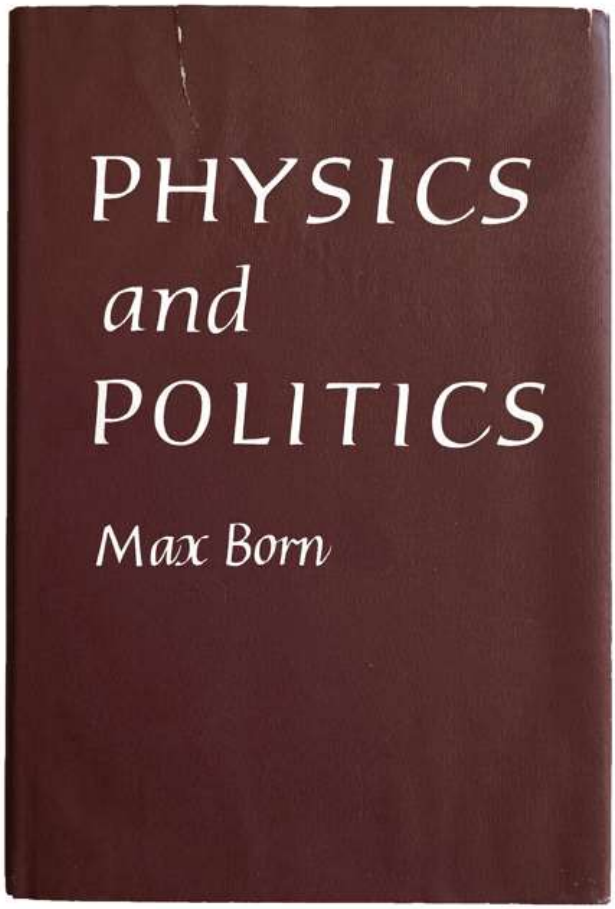


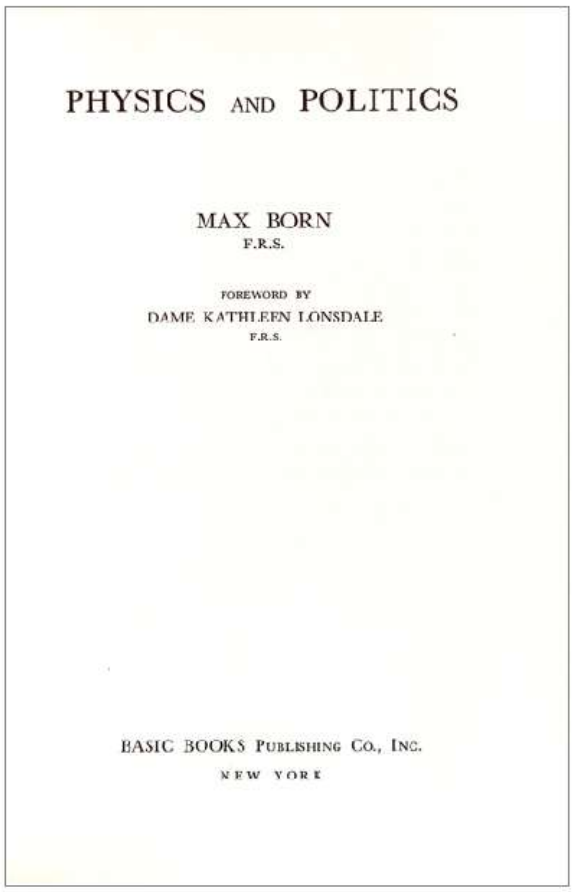


180. **BORDEAUX, Albert** (1865-1937). *Histoire des sciences physiques, chimiques et géologiques au XIXe siècle*. Paris & Leige : Librairie Polytechnique Ch. Beranger, 1920. ¶ 219 x 140 mm. 8vo. [ii], 661 pp. Red white-stamped cloth; lightly rubbed, corners bumped. Very good. S0880

$ 15

History of the physical, chemical and geological sciences in the 19th century.



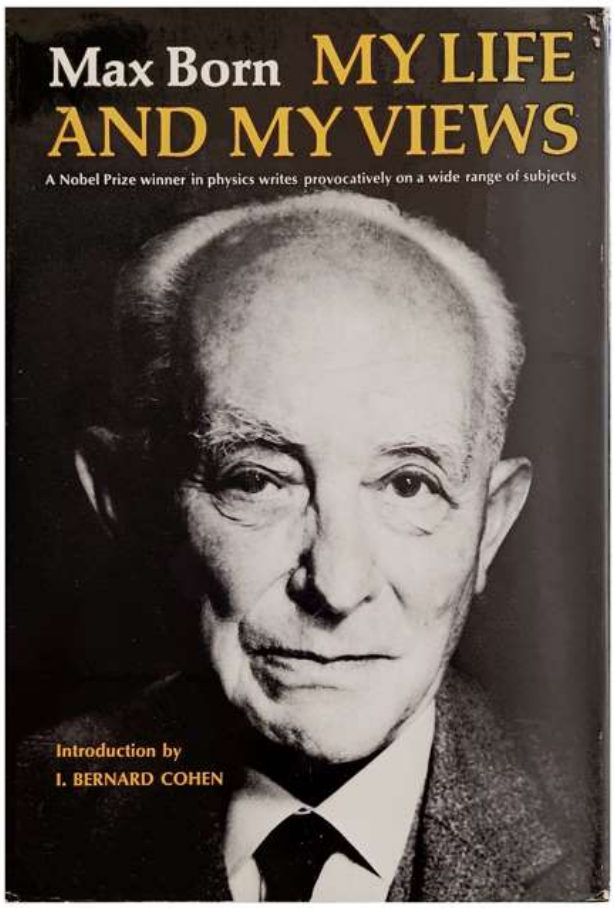

PHYSICS AND POLITICS

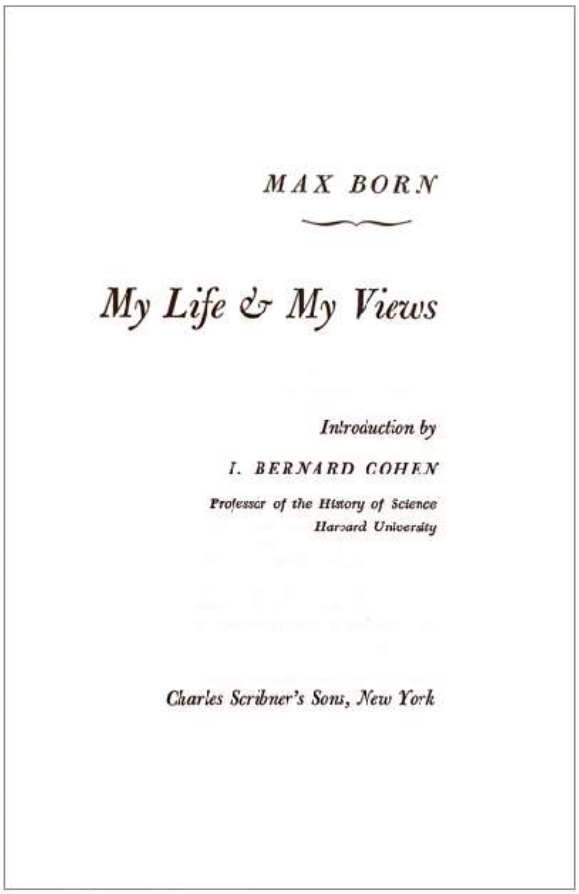
MAX BORN
F.R.S.

FOREWORD BY
DAME KATHLEEN LONSDALE
F.R.S.

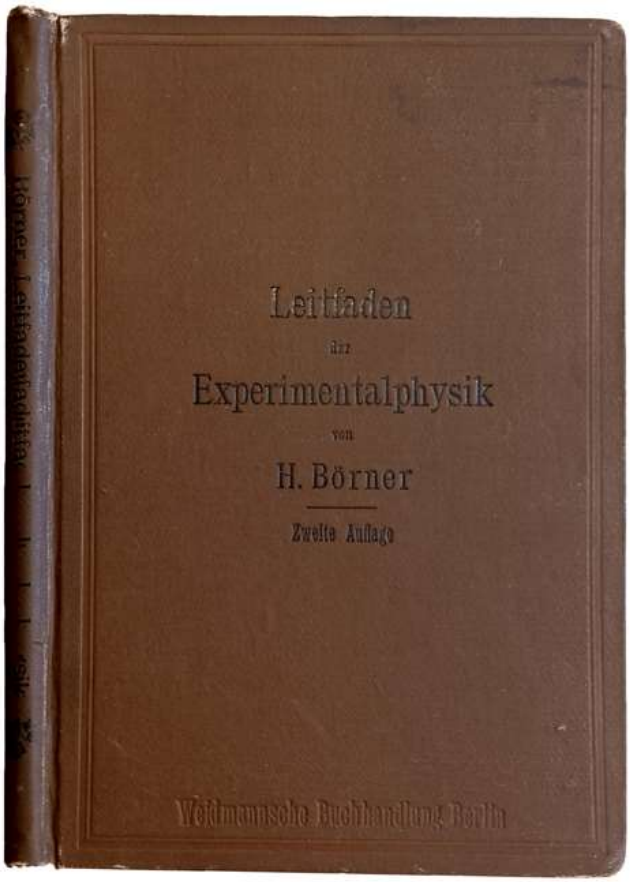
BASIC BOOKS PUBLISHING CO., INC.
NEW YORK

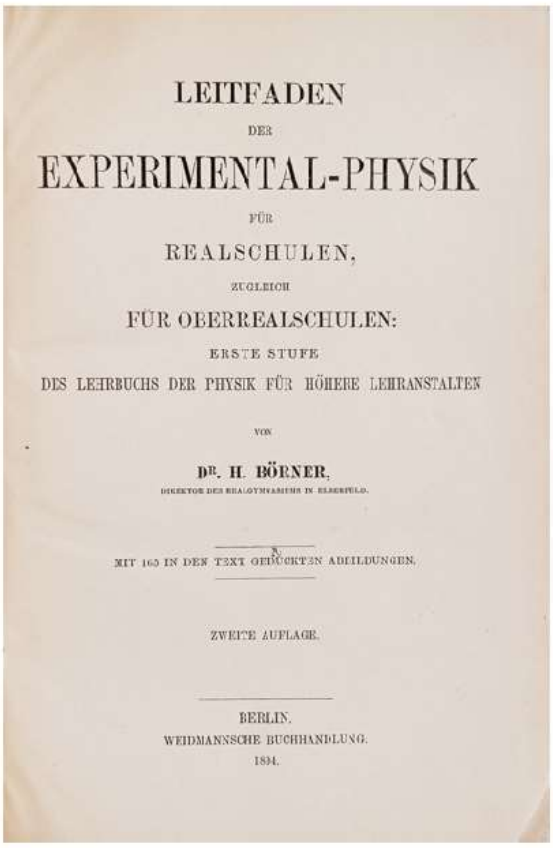
181. **BORN, Max** (1882-1970). *Physics and politics. Foreword by Dame Kathleen Lonsdale*. New York: Basic Books, 1962. ¶ 215 x 145 mm. 8vo. vii, 86 pp. Index. White cloth, dust-jacket; jacket torn, front cover soiled, else very good. S3639 $ 15





182. **BORN, Max** (1882-1970). *My life & my views. Introduction by I. Bernard Cohen.* New York: Charles Scribner's Sons, 1968. ¶ FIRST EDITION. 215 x 148 mm. 8vo. vi, 216 pp. Index. Black cloth, gilt spine, dust-jacket. Very good. S4626 $ 15

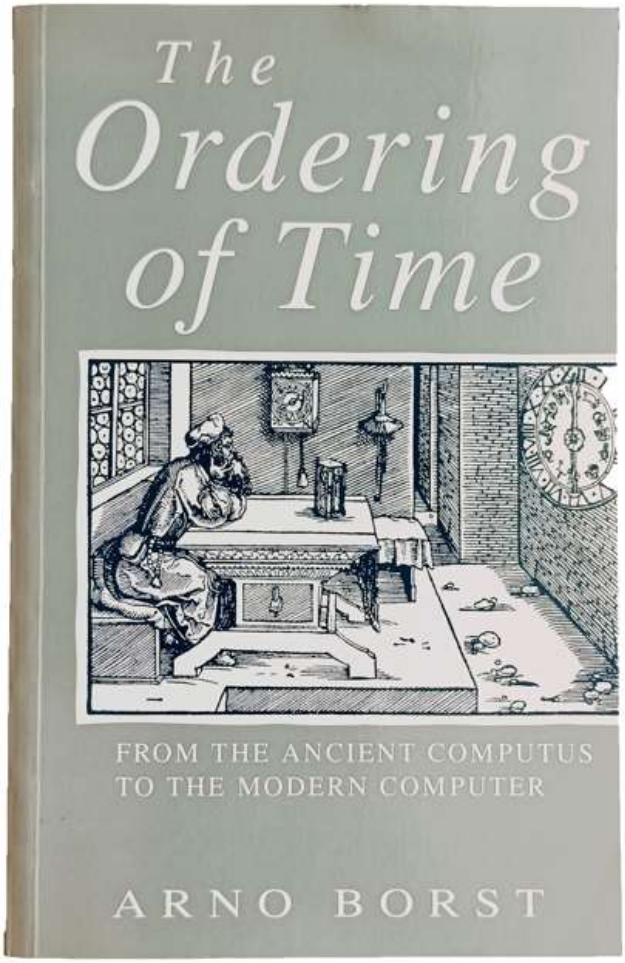


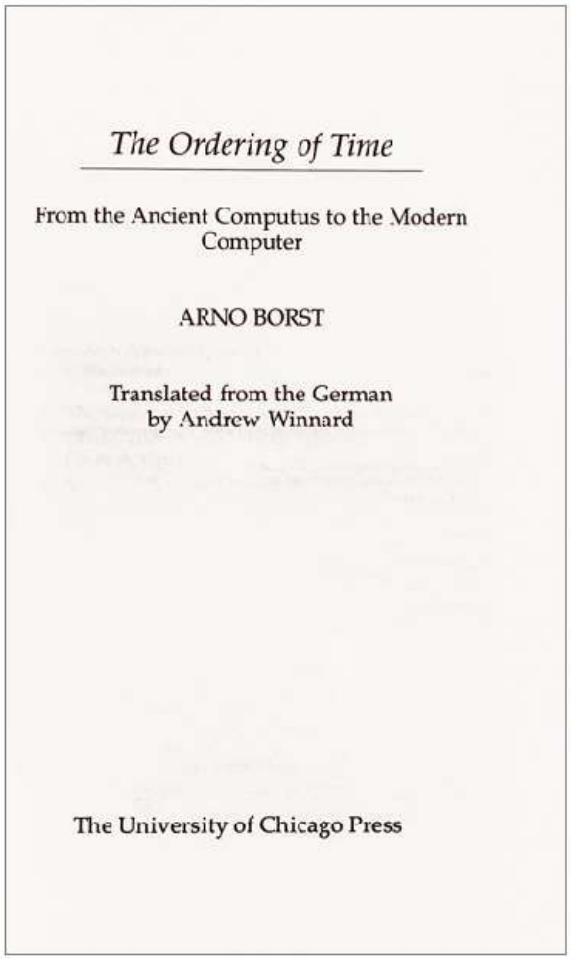


183. **BORNER, Heinrich** (1846-1916). *Leitfaden der Experimental-Physik für Realschulen, zugleich für Oberrealschulen: erste Stufe des Lehrbuchs der Physik für höhere Lehranstalten*. Berlin: Weidmannsche Buchhandlung, 1894. ¶ SECOND EDITION. 230 x 157 mm. 8vo. x, 170 pp. 165 figs., index. Original blind- and black-stamped brown cloth; lightly rubbed. Very good. S3641

$ 25

Guide to experimental physics for secondary schools and also for upper secondary schools: first level of the physics textbook for higher education institutions.





184. **BORST, Arno** (1925-2007). *The Ordering of Time from the ancient computers to the modern computer. Translated from the German by Andrew Winnard*. Chicago: University of Chicago Press, (1993). ¶ 8vo. ix, 168 pp. 25 illus., index. Printed wrappers. Fine. S11592

$ 15

Arno Borst was Emeritus Professor of Medieval History at the University of Konstanz in Germany. "The focus of Borst's research was on medieval history, but less on the classic fields of political, legal and constitutional history, but rather on the area of everyday life, mentality, ideas, science and social history."

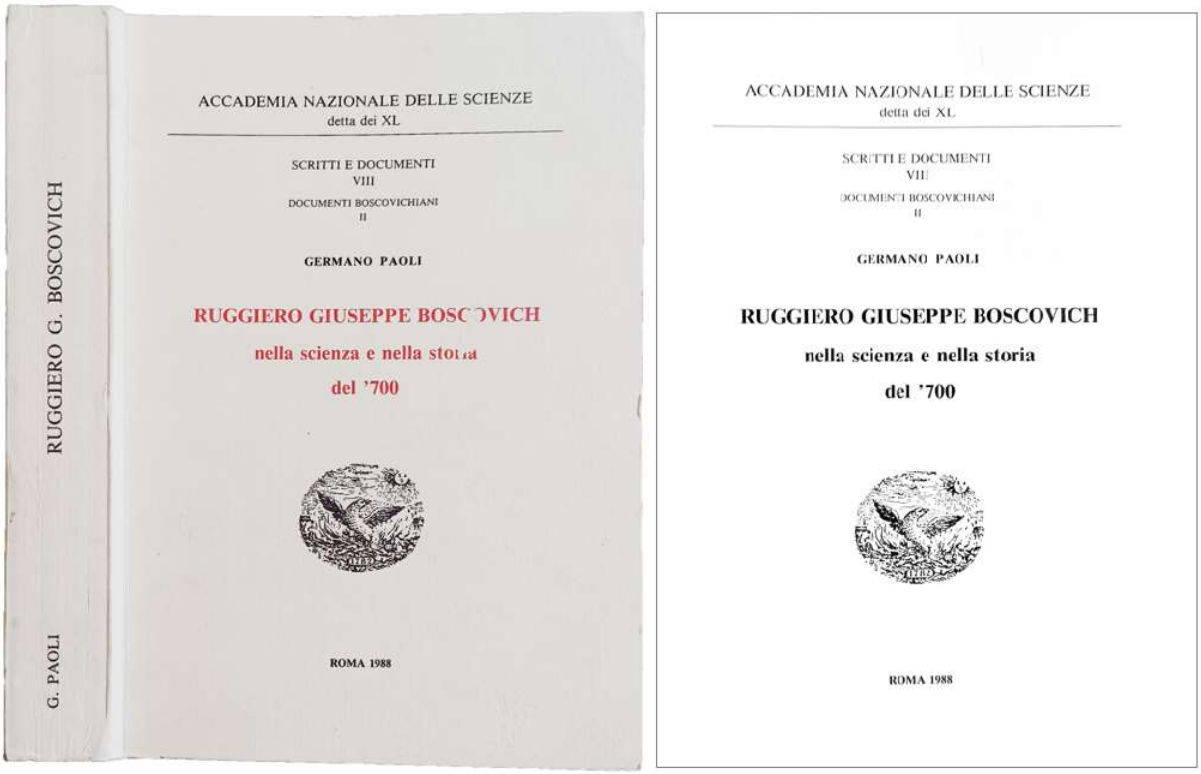
185. **BOSCOVICH, Roger Joseph** (1711-1787); **Edoardo PROVERBIO**; **Gian Tommaso Scarascia MUGNOZZA**. *Catalogo delle opere a stampa di Ruggiero Giuseppe Boscovich (1711-1787).* Rome: Accademia Nazionale delle Scienze detta dei XL, 2007. ¶ Series: *Scritti e documenti, Documenti Boscovichiani*, VIII. 8vo. 157 pp. Printed wrappers. Fine. Rare. From the library of Roger Hahn. RH1595

$ 25

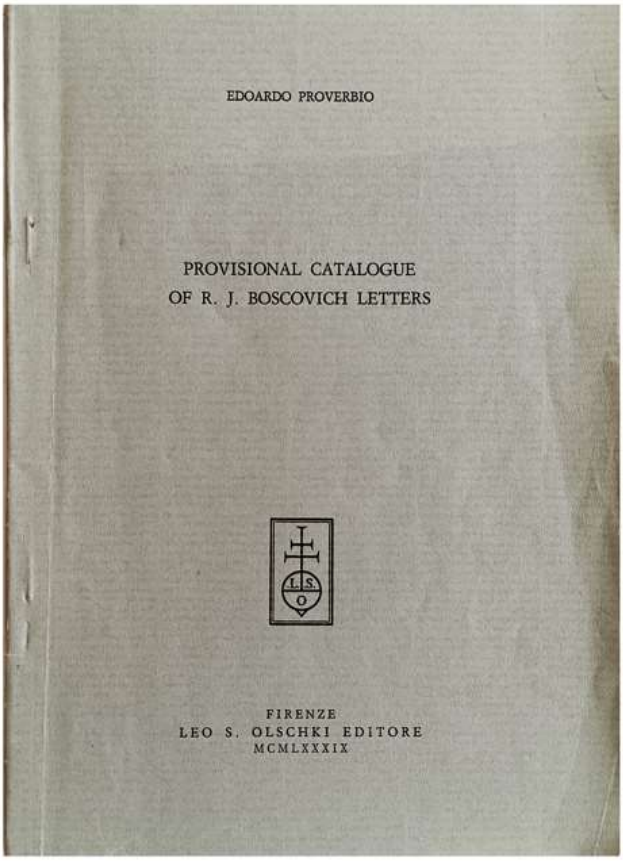
Catalogue of the printed works of Ruggiero Giuseppe Boscovich (1711-1787). Includes a topical catalogue of his works on Astronomy, Philosophy and natural philosophy, Mathematics and geometry, Mechanics: statics and dynamics, Geodesy and meteorology, Hydraulics, hydrography and hydrodynamics, Physics, Optics, etc., Miscellaneous works.

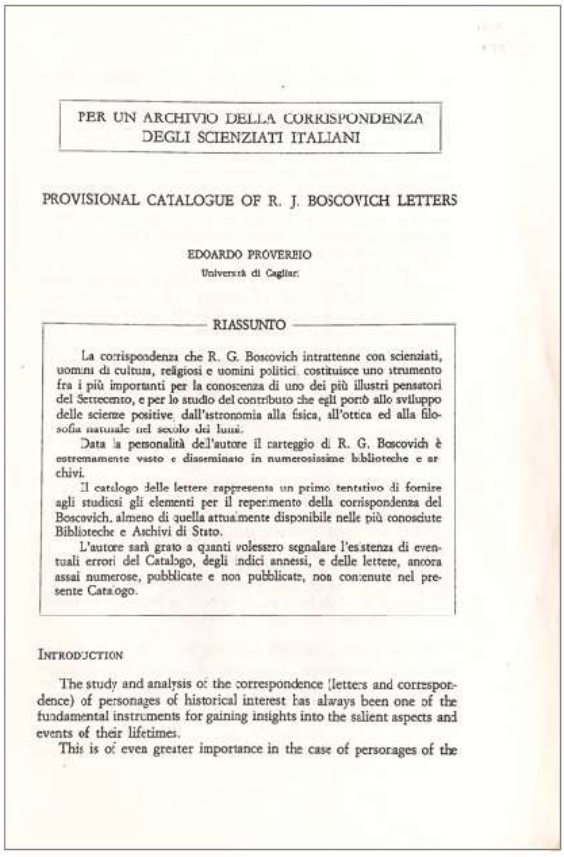
Contents: Indice: Prefazione: G.T. Scarascia Mugnozza. Introduzione. Appendice A: Elenco delle opere a stampa redatto da Ruggiero G. Boscovich nella lettera a Giovan Stefano Conti del 23 maggio 1761. Appendice B: Elenco dei singoli opuscoli contenuti nei cinque tomi dell'Opera pertinentia ad opticam et astronomiam. Pt. 1. Catalogo delle opere a stampa di Ruggiero Giuseppe Boscovich in ordine alfabetico. Pt. 2. Catalogo delle opere a stampa di Ruggiero Giuseppe Boscovich in ordine cronologico. Pt. 3. Catalogo delle opere a stampa di Ruggiero

Giuseppe Boscovich suddivise per materia: 1. Astronomia 2. Filosofia e filosofia naturale 3. Matematica e geometria 4. Meccanica: statica e dinamica 5. Geodesia e meteorologia 6. Idraulica, idrografia e idrodinamica 7. Fisica 8. Ottica 9. Poemi, elegie, epigrammi, carmina, ecloghe, lettere 10. Opere di varia natura.

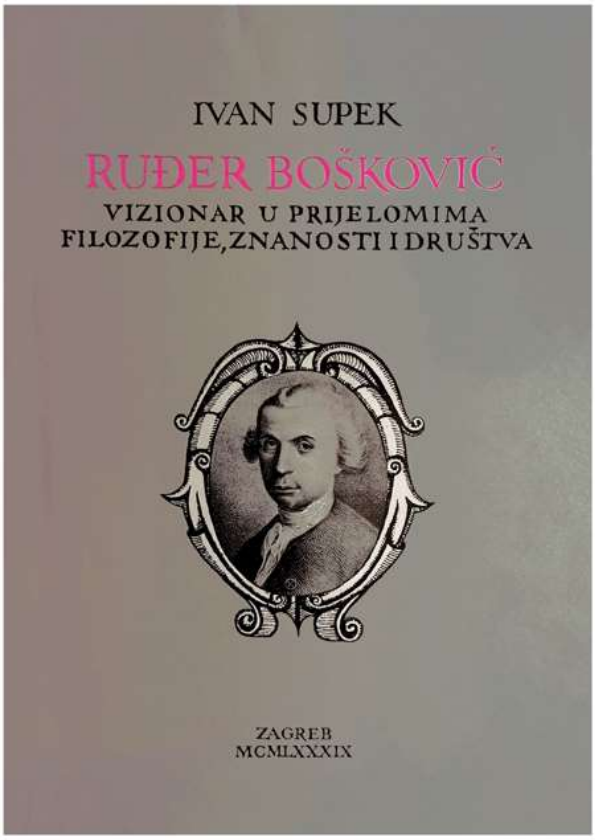


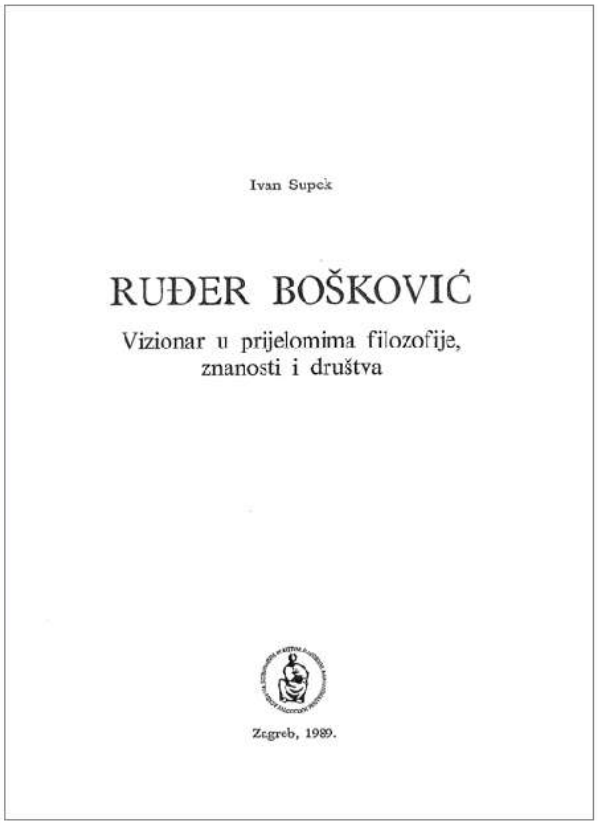
186. [**BOSCOVICH, Roger Joseph** (1711-1787)] **Germano PAOLI**. *Ruggiero Giuseppe Boscovich nella scienza e nella storia del '700*. Rome: Accademia nazionale delle scienze detta dei XL, 1988. ¶ Series: *Scritti e documenti, Documenti Boscovichiani*, 2. 8vo. xx, 597 pp. Illus., index. Printed wrappers. Fine. REVIEW COPY. Rare. From the library of Roger Hahn. RH1596 $ 20





187. **BOSCOVICH, Roger Joseph** (1711-1787); **PROVERDIO, Edoardo**. *Provisional Catalogue of R.J. Boscovich Letters*. Firenze: Leo S. Olschki, 1989. ¶ Offprint from Annali di Storia della Scienza, Anno IV, fasc. 1, 1989. 8vo. pp. (93)-159. Green printed wrappers. Very good. Together with a typed letter signed from the author to Roger Hahn (who was very invested in the history of Boscovich's letters). RARE. RH1330 $ 25



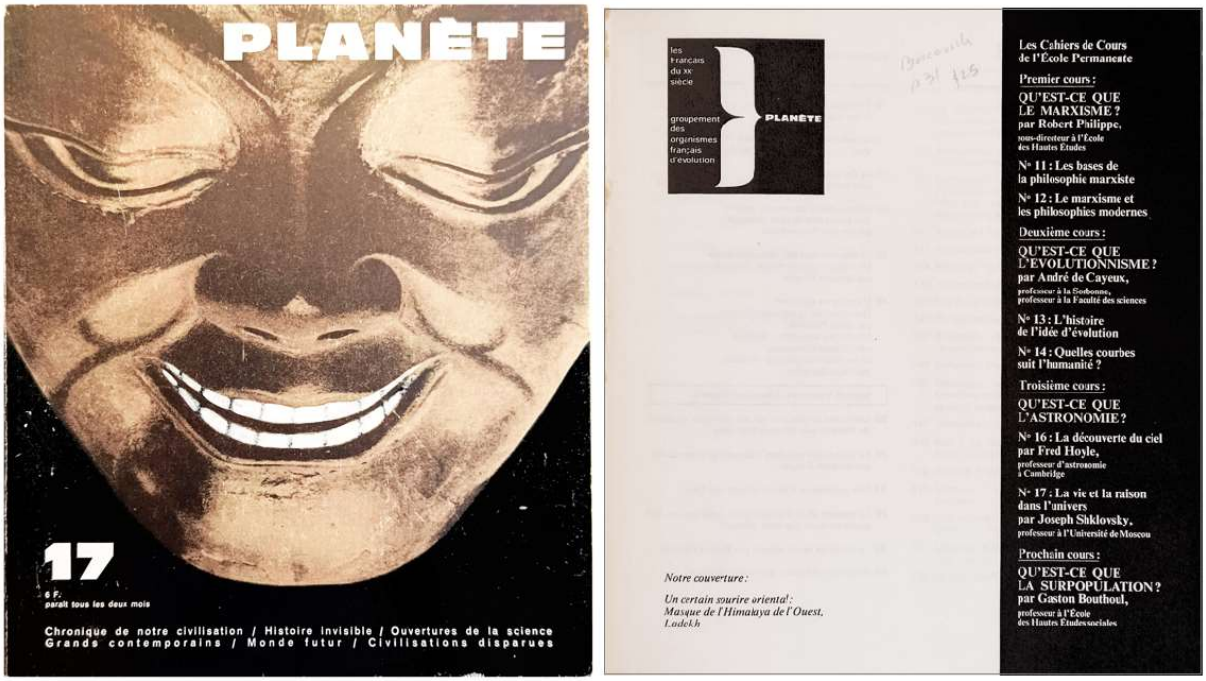


188. [**BOSCOVICH, Roger Joseph** (1711-1787)] **SUPEK, Ivan** (1915-2007). *Ruder Boskovic, Vizionar u prijelomima filozofije, znanosti I drustva.* Zagreb: Jugoslavenska akademija znanosti i umjetnosti, 1989. ¶ Series: *Posebno izdanje Razreda za matematicke, fizicke, kemijske i tehnicke znanosti.* Language: Serbo-Croatian. 8vo. 207, [1] pp. Index. Printed boards, dust-jacket. RARE. From the library of Roger Hahn. RH1331

$ 45

'Ruder Boskovic, Visionary in the fields of philosophy, science and society.'

"In March 1941 [Supek] was arrested by the Gestapo for being involved in antifascist activity and held in prison for many months. His professors, Heisenberg, Hund and von Weizsacker intervened to release him from prison. Immediately after being released, instead of returning to Leipzig, he went back to Independent State of Croatia and joined the communist antifascist movement. He would not return to physics research again, focusing on his philosophical and literary work." – Wikip.

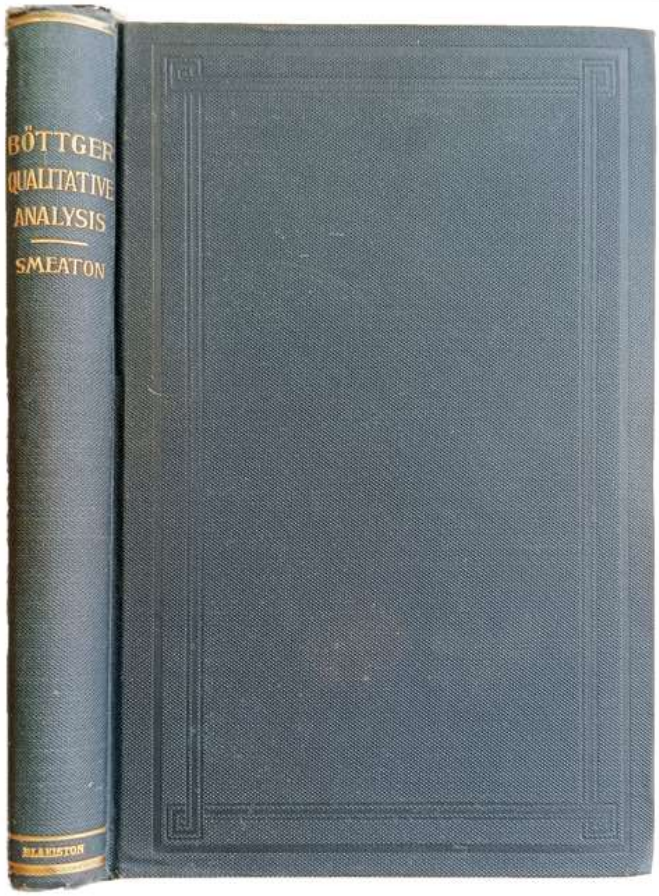


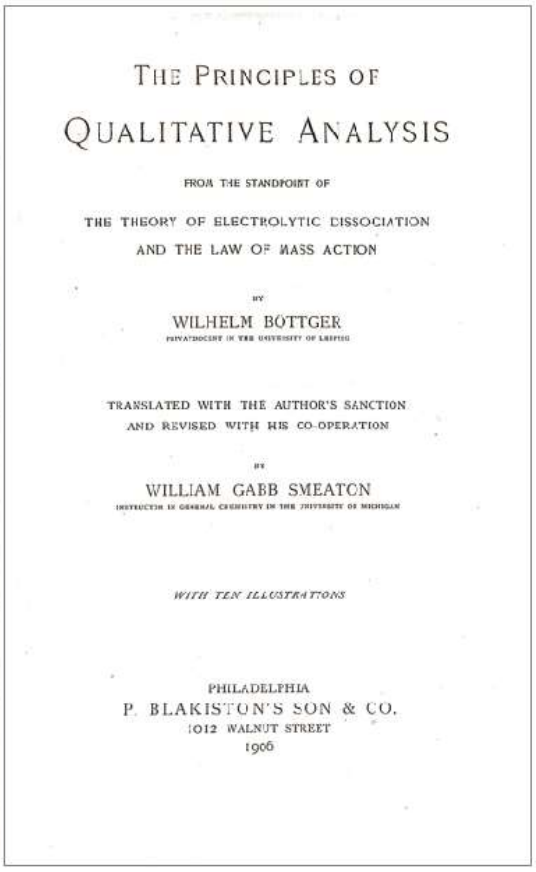
189. [**BOSCOVICH, Roger Joseph** (1711-1787)] **PAUWELS, Louis ; Jacques BERGIER** (1912-1978). *"Un mutant au XVIIIe siècle: Roger Boscovich."* *Planète: La Première Revue de Bibliothèque; 17*. Paris: Retz, July/August 1964. ¶ 8vo. 159 pp. Illus. Printed wrappers. Very good. From the library of Roger Hahn. RH1031

$ 15

Within this journal is a paper by Jacques Bergier on Boscovich, "Un mutant au XVIIIe siècle: Roger Boscovich."

"In 1954 Bergier met Louis Pauwels, a writer and editor, in Paris. They would later collaborate on the book *Le Matin des Magiciens*, which was published in France in 1960. This book takes the reader on a neo-surrealistic tour of modern European history focusing on the purported influence of the occult and secret societies on politics. It also attempts to connect alchemy with nuclear physics, hinting that early alchemists understood more about the actual function of atoms than they are credited . . . Pauwels and Bergier collaborated on two later books of essays, *Impossible Possibilities* and *The Eternal Man*. They also co-produced a journal called *Planète* which explored esoteric ideas. Bergier was interested in the possibilities of extraterrestrial life and explored reported sightings of UFOs. In 1970 he published *Les extra-terrestres dans l'Histoire* (The extraterrestrials in history)."




THE PRINCIPLES OF

QUALITATIVE ANALYSIS

FROM THE STANDPOINT OF

THE THEORY OF ELECTROLYTIC DISSOCIATION

AND THE LAW OF MASS ACTION

BY

WILHELM BÖTTGER

PRIVATDOCENT IN THE UNIVERSITY OF LEIPZIG

TRANSLATED WITH THE AUTHOR'S SANCTION

AND REVISED WITH HIS CO-OPERATION

BY

WILLIAM GABB SMEATON

INSTRUCTOR IN GENERAL CHEMISTRY IN THE UNIVERSITY OF MICHIGAN

WITH TEN ILLUSTRATIONS

PHILADELPHIA

P. BLAKISTON'S SON & CO.

1012 WALNUT STREET

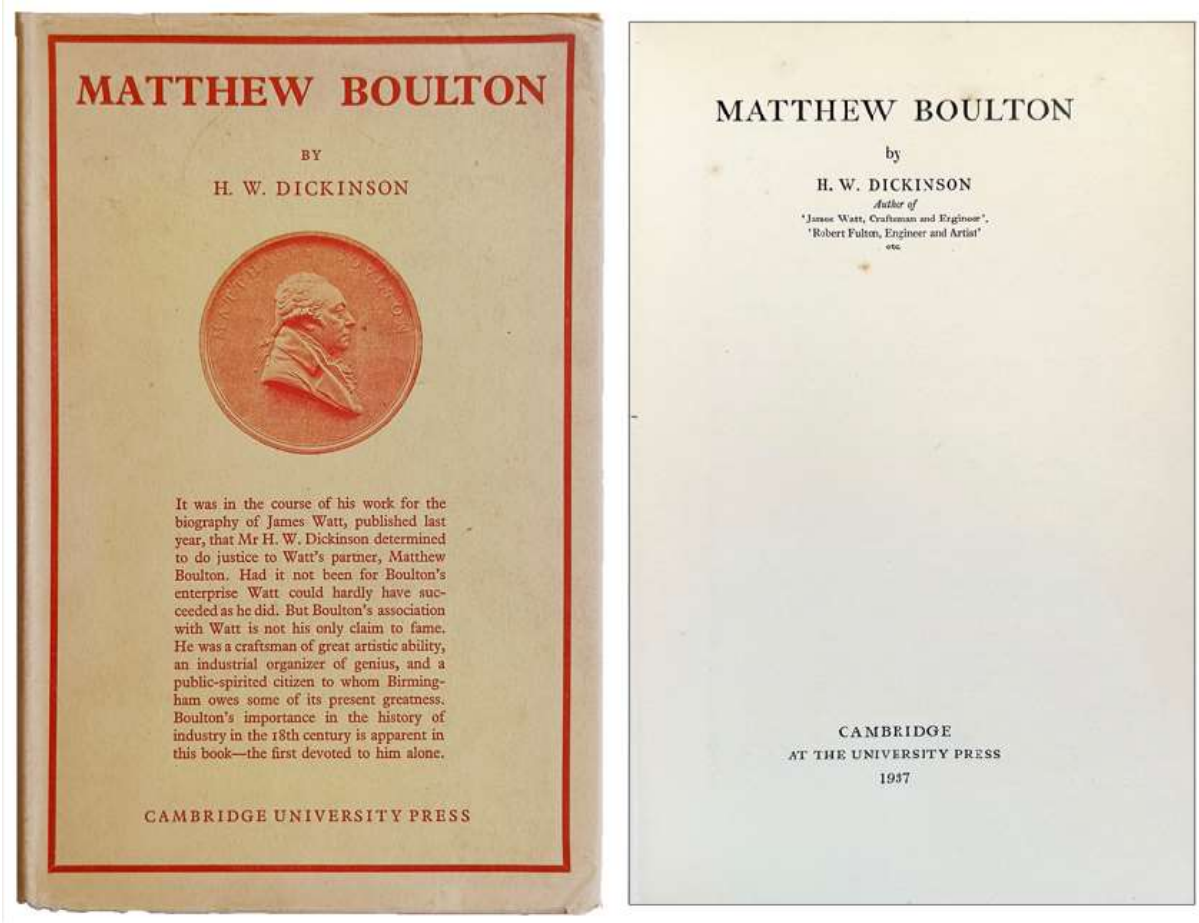
1906

190. **BÖTTGER, Wilhem [Carl]** (1871-1949). *The Principles of Qualitative Analysis from the standpoint of the theory of electrolytic dissociation and the law of mass action. Translated with the author's sanction and revised with his co-operation by William Gabb Smeaton*. Philadelphia: P. Blakiston's Son, 1906. ¶ FIRST ENGLISH EDITION. 242 x 165 mm. 8vo. xvi, 300 pp. Folding color frontis. plate of spectra, 10 figs., 3 tables, index. Original blind- and gilt-stamped green cloth. Fine. S0884

$ 50

Ther German chemist Carl Wilhelm Böttger completed practical training as a pharmacist in Chemnitz, Berlin and Switzerland and then studied pharmacy from 1893 and chemistry from 1895 in Leipzig, where he received his doctorate in 1897. He then worked as an assistant to Otto Wallach in Göttingen and then until 1937 as an assistant and later head of department at the Physical and Chemical Institute under Wilhelm Ostwald and Max Le Blanc in Leipzig. In 1903 he qualified as a professor in analytical and physical chemistry and then went to Boston to the Institute of Technology in 1904/05 as a research associate. In 1910 he became an extraordinary professor in Leipzig and in 1922 a full professor of analytical chemistry. In 1938 he became emeritus. In 1932 Böttger was elected a member of the Leopoldina Academy of Learned People.

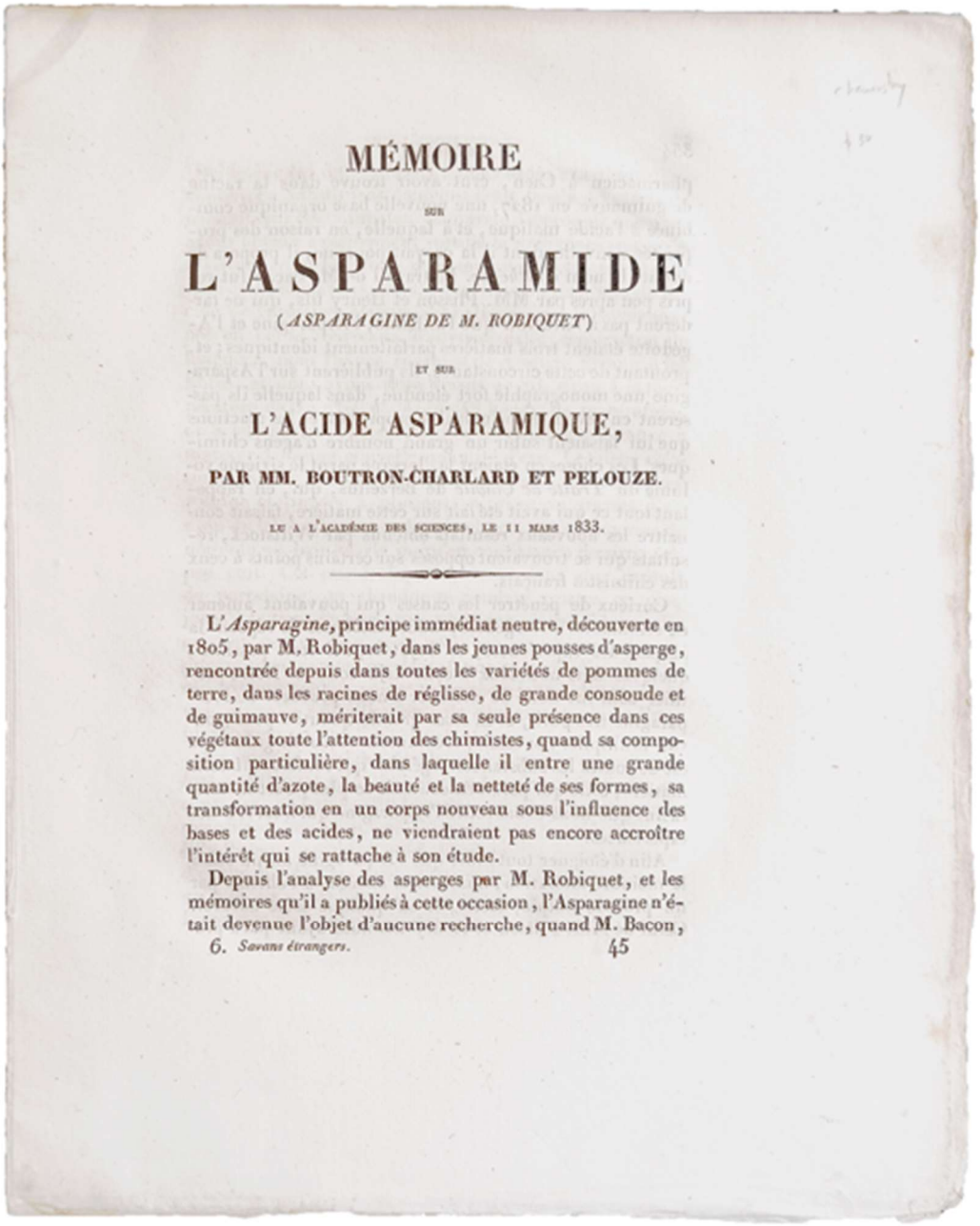
William Gabb Smeaton (1874–1959), the translator, American chemist and professor at the University of Michigan. "William Gabb Smeaton (Toronto '98) was called from the Physical-Chemical Institute at Leipzig in 1902 to develop a lecture course for engineering students [at the University of Michigan]. This separate division of general chemistry was merged with the regular department in 1905. Smeaton had charge of the course until 1919, when he took over the teaching duties of William Jay Hale (Miami '97, Ph.D. Harvard '02), Associate Professor of General Chemistry." University of Michigan, Chemistry, 'Early Years. Development and Growth of the Chemical Laboratory'



191. [**BOULTON, Matthew** (1728-1809)] **DICKINSON, H. W.** *Matthew Boulton.* Cambridge: Cambridge University Press, 1937. ¶ First edition. 8vo. xiv, 218 pp. Frontis., 14 plates, illus., index, errata slip; first & last few leaves lightly foxed. Cloth, dust-jacket; jacket extremities rubbed. Very good. S8488 $ 20

"This work gives deserved recognition to the achievements of the engineer and businessman Matthew Boulton. Boulton's importance has generally been overshadowed by that of his partner James Watt, but he was a significant figure in his own right, particularly in relation to the Soho Foundry and his production of

coins and medals. He belonged to a network of highly significant men of the period, including Josiah Wedgwood, Erasmus Darwin and Benjamin Franklin, and was a founding member of the Lunar Society of Birmingham. An engineer by profession, H. W. Dickinson researched widely, and published highly readable works on the history of the steam engine, Watt, and Trevithick, also reissued in this series. He succeeds in producing a work which appeals to the scientist, the historian and the general reader, without feeling obliged to over-simplify the technical details."



MÉMOIRE

SUR

L'ASPARAMIDE

(*ASPARAGINE DE M. ROBIQUET*)

ET SUR

L'ACIDE ASPARAMIQUE,

PAR MM. BOUTRON-CHARLARD ET PELOUZE.

LU A L'ACADÉMIE DES SCIENCES, LE 11 MARS 1833.

L'*Asparagine*, principe immédiat neutre, découverte en 1805, par M. Robiquet, dans les jeunes pousses d'asperge, rencontrée depuis dans toutes les variétés de pommes de terre, dans les racines de réglisse, de grande consoude et de guimauve, mériterait par sa seule présence dans ces végétaux toute l'attention des chimistes, quand sa composition particulière, dans laquelle il entre une grande quantité d'azote, la beauté et la netteté de ses formes, sa transformation en un corps nouveau sous l'influence des bases et des acides, ne viendraient pas encore accroître l'intérêt qui se rattache à son étude.

Depuis l'analyse des asperges par M. Robiquet, et les mémoires qu'il a publiés à cette occasion, l'Asparagine n'était devenue l'objet d'aucune recherche, quand M. Bacon,

6. *Savans étrangers.* 45

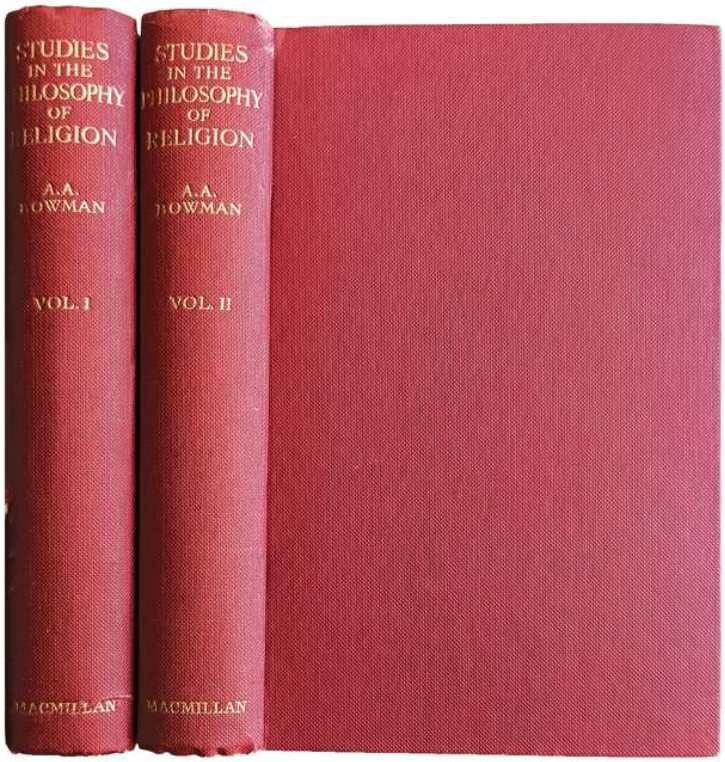
[192] Boutron-Charlard

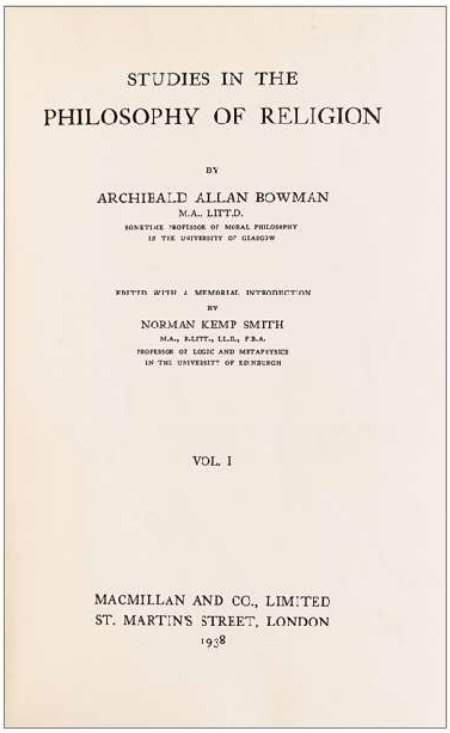
192. **BOUTRON-CHARLARD, Antoine François** (1796-1879) ; **Théophile-Jules PELOUZE** (1807-1867). *Mémoire sur l'asparamide (asparagines de M. Robiquet) et sur l'acide asparamique.* Extract. Paris: Journal de Chimie Medicale, de Pharmacie et de Toxicology, 1833. ¶ 4to. pp. (353)-367. Unopened. Self-wraps. Fine. S9876

$ 30

"In his first steps as a researcher, he guided the chemist Théophile-Jules Pelouze (who, like him, learned his trade with Pierre Robiquet, the great analytical chemist), whom he associated in 1830 with his study on asparamide and asparamic acid (published in 1833)." [Wikip.]

The authors remark on researching white mustard seed and its acidic characteristics. Henry & Garot found the acid to be rather unique and called it Sulpho-sinapic acid. From the: *Journal de Chimie Medicale, de Pharmacie et de Toxicology*. See also: *Journal of Philadelphia College of Pharmacy*, 1833, vol. IV, p. 218.




STUDIES IN THE
PHILOSOPHY OF RELIGION

BY

ARCHIBALD ALLAN BOWMAN
M.A., LITT.D.
SOMETIME PROFESSOR OF MORAL PHILOSOPHY
IN THE UNIVERSITY OF GLASGOW

EDITED WITH A MEMORIAL INTRODUCTION
BY
NORMAN KEMP SMITH
M.A., D.LITT., LL.D., F.B.A.
PROFESSOR OF LOGIC AND METAPHYSICS
IN THE UNIVERSITY OF EDINBURGH

VOL. I

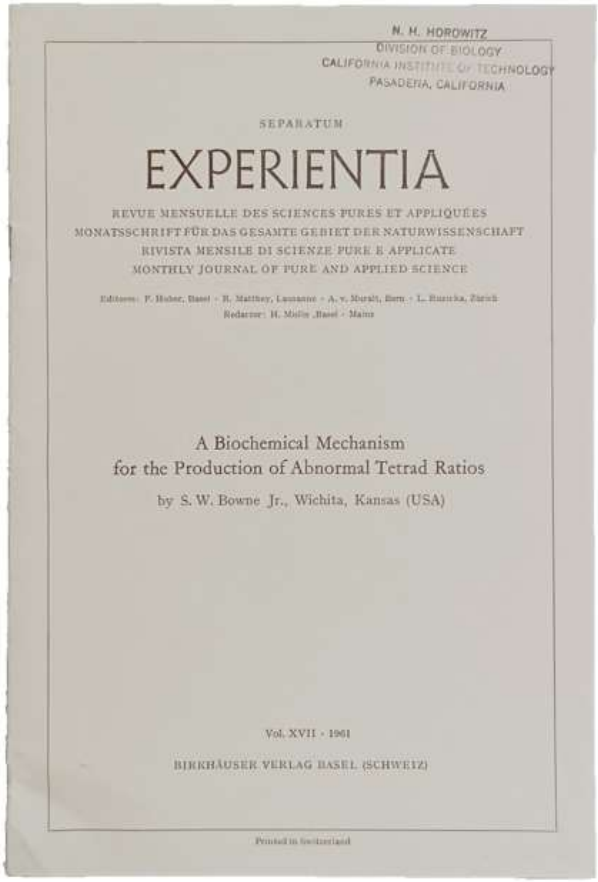
MACMILLAN AND CO., LIMITED
ST. MARTINS STREET, LONDON
1938

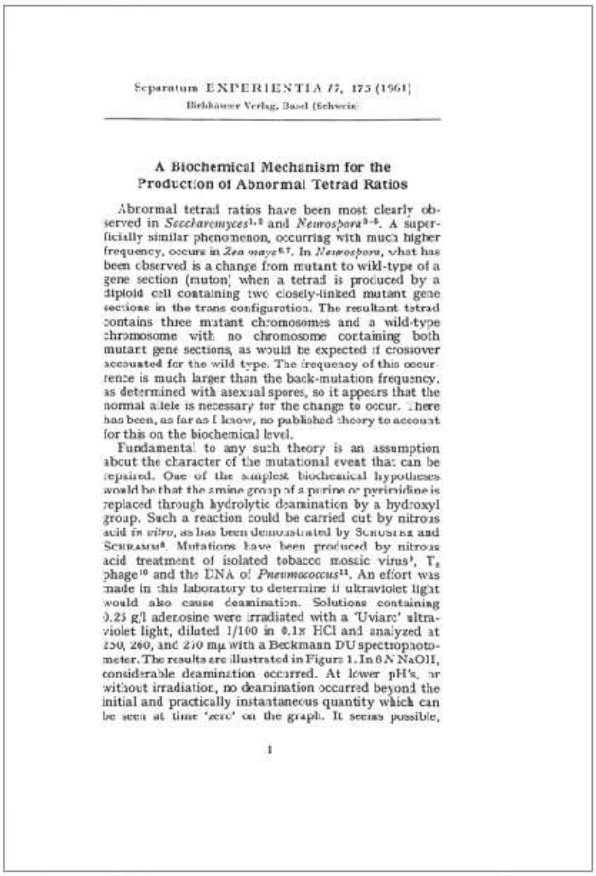
193. **BOWMAN, Archibald Allan** (1883-1936). *Studies in the Philosophy of Religion. Edited with a memorial introduction by Norman Kemp Smith.* London: Macmillan, 1938. ¶ 2 volumes. 8vo. xlviii, 422, [1]; xiii, 437 pp. Index. Red gilt-stamped cloth. Unusually fine set. S11932

$ 50

Bowman was a Scottish philosopher. "After his death, Kemp Smith saw to publication his two volume Studies in the Philosophy of Religion. The work was

one on which he had labored for many years, and though never completed in its final form, revealed a remarkable familiarity with the anthropology of religion (to which the first volume was devoted) and an independently minded and constructively imaginative approach to traditional questions in the philosophy of religion (to which the second volume was devoted)." – International Association for Scottish Philosophy.

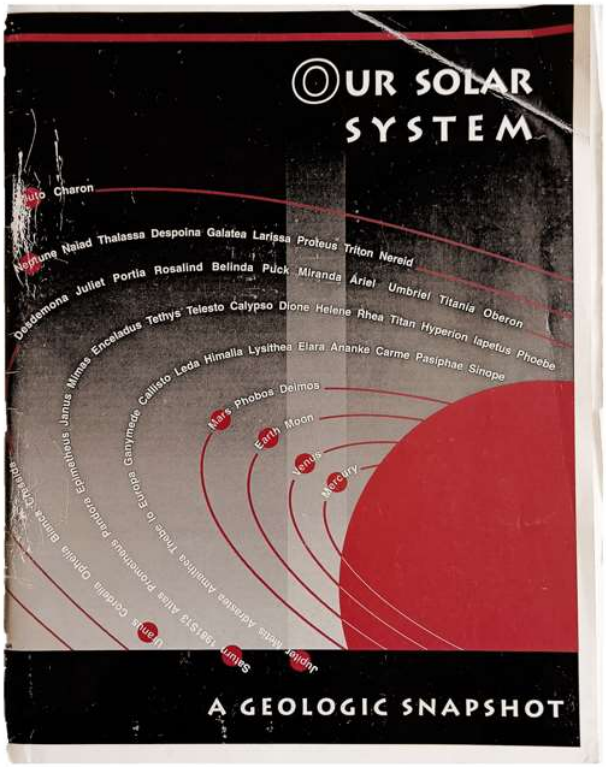


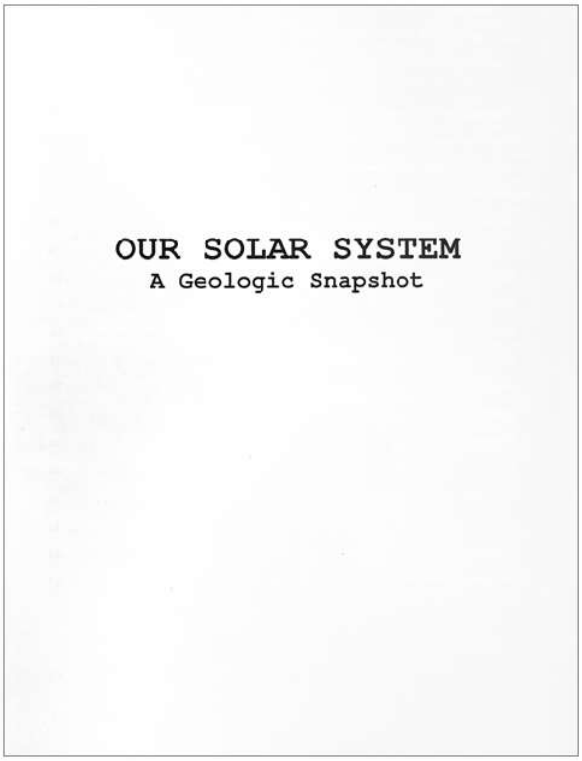


194. **BOWNE, Jr., S. W.** *"A Biochemical Mechanism for the Production of Abnormal Tetrad Ratios."* Offprint from: *Separatum Experientia*, 17, 175, 1961. ¶ 8vo. 5 pp. Figs. Printed wrappers. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine. S7118

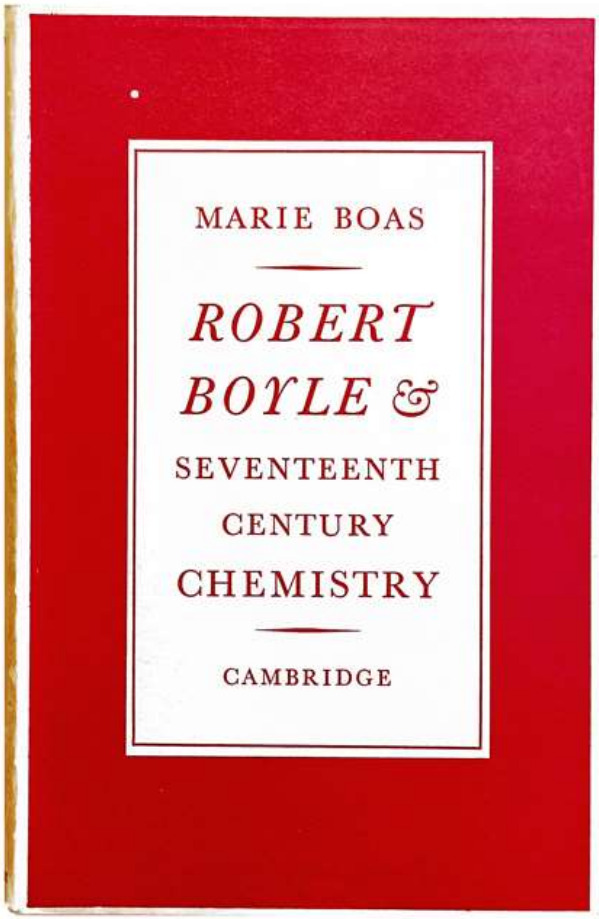
$ 10

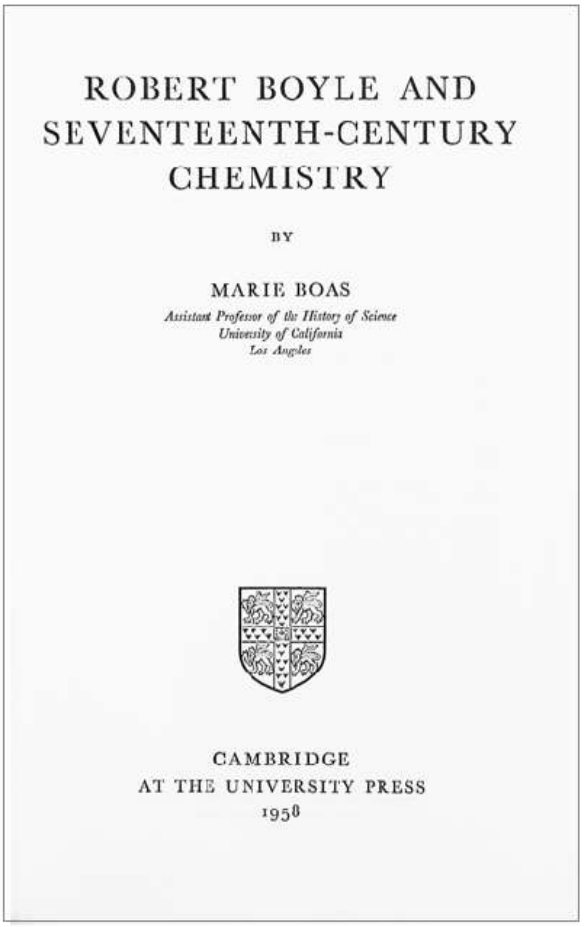
Hydrolytic deamination of the purine bases is a possible explanation for the observed mutation. This can be achieved in vitro by HNO2 or by ultraviolet light in the presence of alkali. The resulting hydroxy-purine bases can be reanimated by ammonia in the presence of amino-purine bases. A theory to explain the observed phenomenon is proposed and genetic consequences are discussed.





195. **BOYCE, Joseph M.**; **Ted MAXWELL**. *Our solar system; a geologic snapshot.* Washington, D.C.: National Aeronautics and Space Administration, 1992. ¶ Series: NP, 157. 4to. iii, 48 pp. Figs., glossary, 4 NASA photographs (3 color) laid in. Pictorial wrappers; top cover scratched. Very good. S5837 $ 8

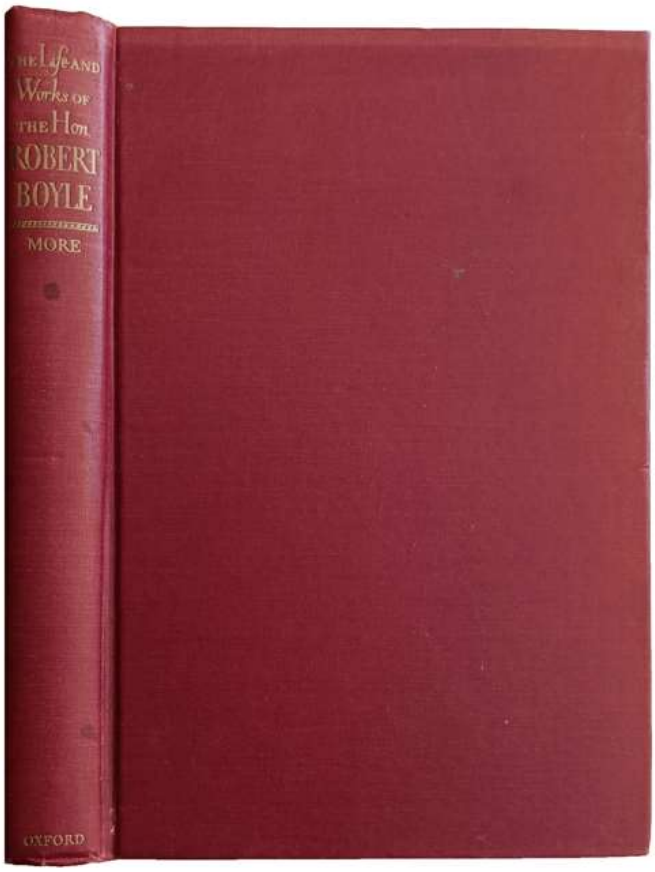


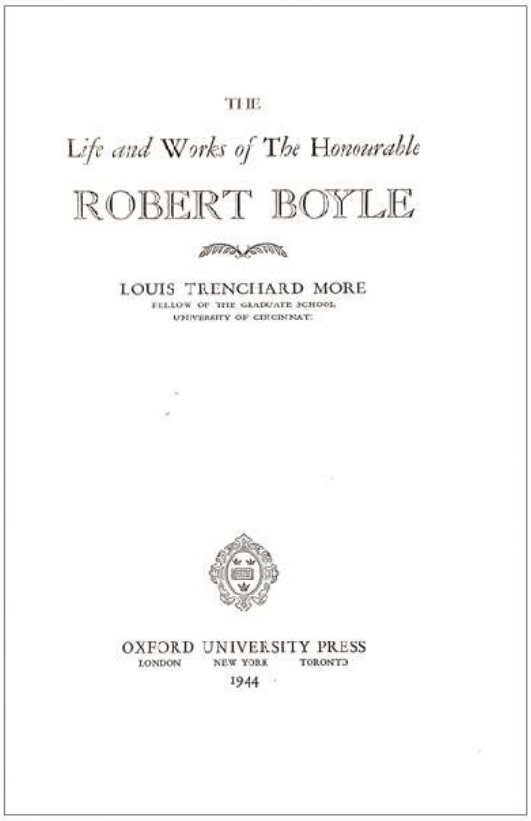


196. [**BOYLE, Robert** (1627-1691)] **BOAS, Marie** (1919-2009). *Robert Boyle and Seventeenth-Century Chemistry.* Cambridge: University Press, 1958. ¶ 8vo. vii, 239 pp. Index. Gilt-stamped red cloth, dust jacket; rubbed. Scarce in jacket. Very good. RH1246

$ 30

Marie Boas Hall was elected a Fellow of the American Academy of Arts and Sciences in 1955. She won the George Sarton Medal, the most prestigious award of the History of Science Society, together with her husband Alfred Rupert Hall in 1981.




THE

Life and Works of The Honourable

ROBERT BOYLE

LOUIS TRENCHARD MORE

FELLOW OF THE GRADUATE SCHOOL
UNIVERSITY OF CINCINNATI

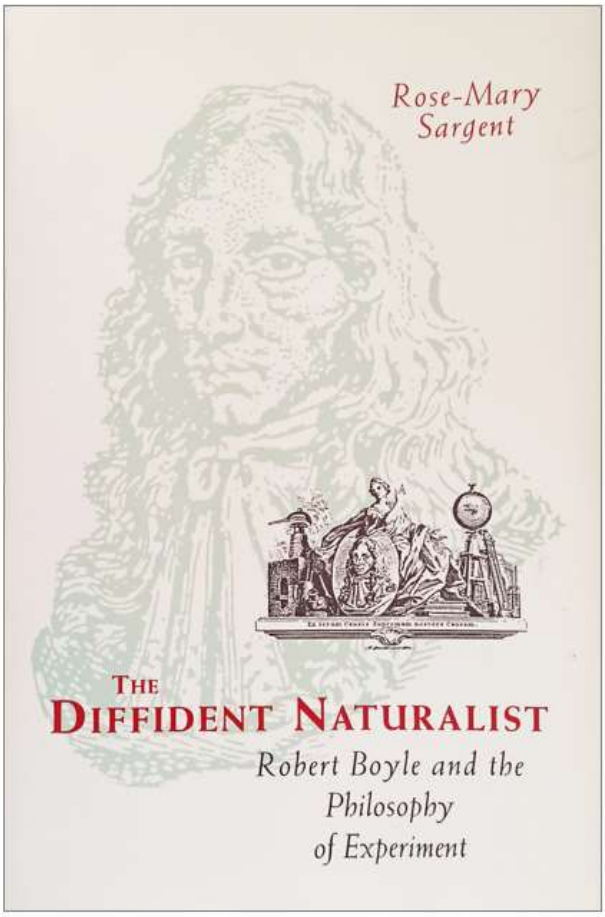
OXFORD UNIVERSITY PRESS

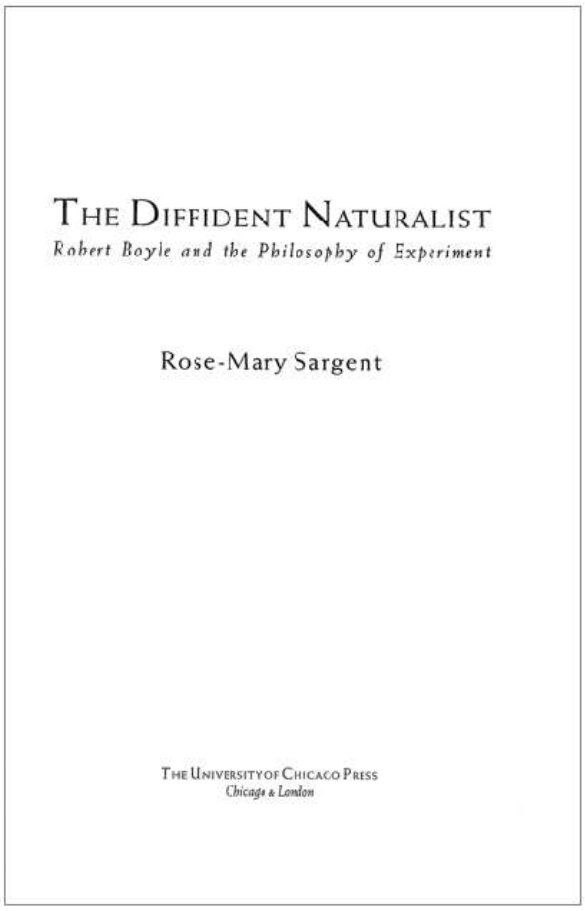
LONDON NEW YORK TORONTO

1944

197. [**BOYLE, Robert** (1627-1691)] **MORE, Louis Trenchard** (1870-1944). *The Life and Works of The Honourable Robert Boyle.* London, New York & Toronto: Oxford University Press, 1944. ¶ 8vo. xii, 313 pp. Frontis., index. Red cloth, gilt-stamped spine title. Ownership ink stamps. Very good. S9603 $ 10

Louis Trenchard More was an instructor in physics at Johns Hopkins University.





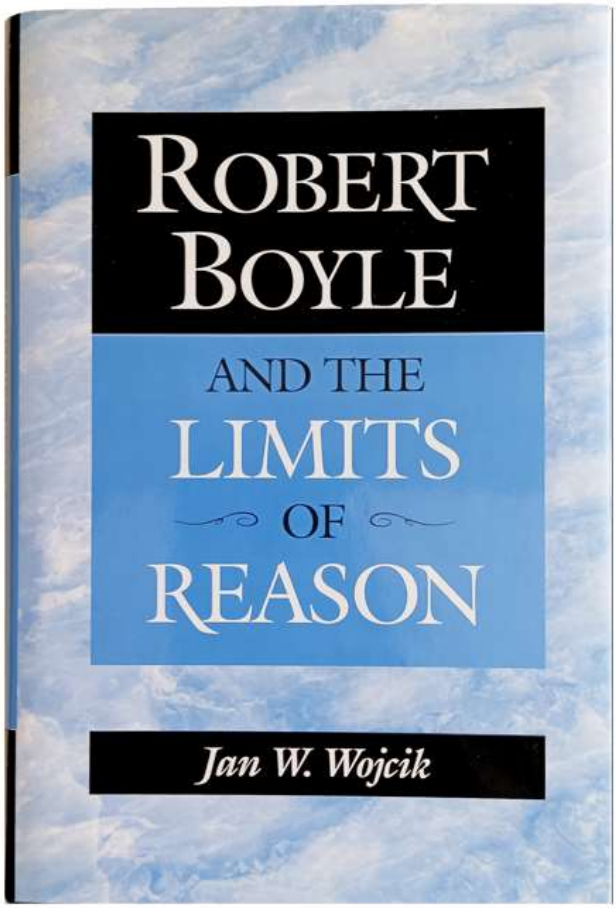
198. [**BOYLE, Robert** (1627-1691)] **SARGENT, Rose-Mary**. *The diffident naturalist. Robert Boyle and the philosophy of experiment*. Chicago & London: University of Chicago Press, 1995. ¶ 8vo. xi, 355 pp. Printed wrappers. Fine. S10689

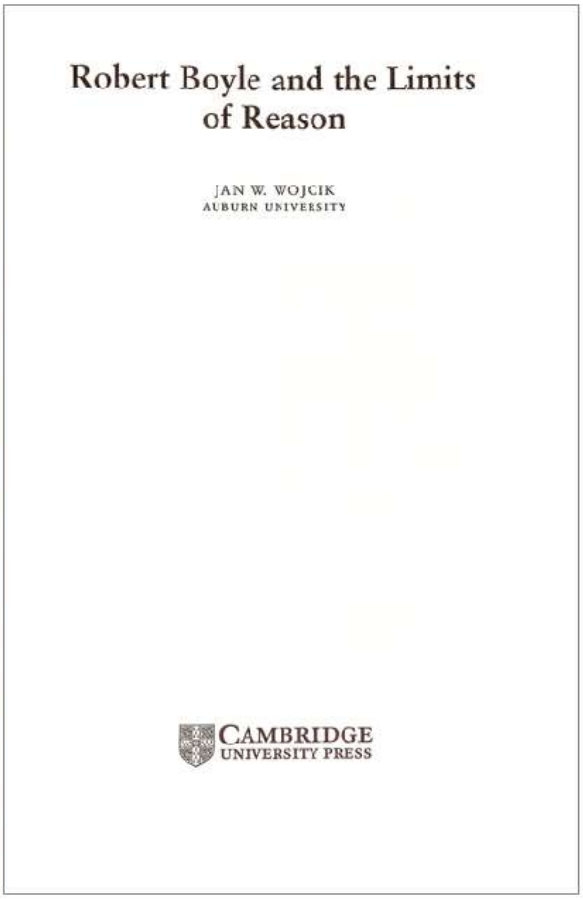
$ 22

In a provocative reassessment of one of the quintessential figures of early modern science, Rose-Mary Sargent explores Robert Boyle's philosophy of experiment, a central aspect of his life and work that became a model for mid- to late seventeenth-century natural philosophers and for many who followed them.

Sargent examines the philosophical, legal, experimental, and religious traditions—among them English common law, alchemy, medicine, and Christianity—that played a part in shaping Boyle's experimental thought and practice. The roots of his philosophy in his early life and education, in his religious ideals, and in the work of his predecessors—particularly Bacon, Descartes, and Galileo—are fully explored, as are the possible influences of his social and intellectual circle. Drawing on the full range of Boyle's published works, as well as on his unpublished notebooks and manuscripts, Sargent shows how these diverse influences were transformed and

incorporated into Boyle's views on and practice of experiment. Rose-Mary Sargent is assistant professor of philosophy at Merrimack College.

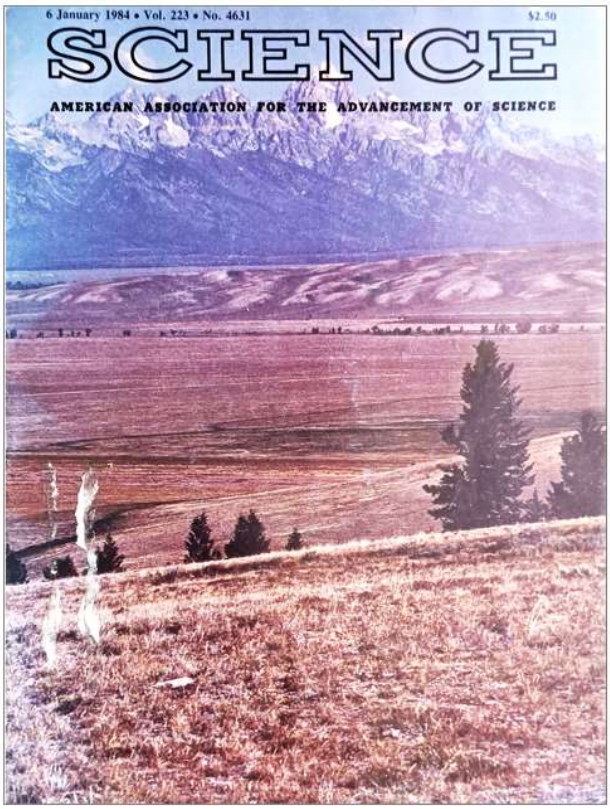




199. [**BOYLE, Robert** (1627-1691)] **WOJCIK, Jan W.** (1944-2006). *Robert Boyle and the Limits of Reason*. Cambridge: Cambridge University Press, (1997). ¶ 8vo. xvi, 243 pp. Navy cloth, gilt-stamped spine title, dust jacket. Ownership signature on ffep. Fine. S10687

$ 32

Jan Wojcik's published work on Robert Boyle have made a lasting contribution to the history of philosophy and the history of science. Based on fine historical scholarship and sophisticated philosophical analysis, *Robert Boyle and the Limits of Reason* (Cambridge University Press, 1997) demonstrates the relationships among Boyle's theology, philosophy, and natural philosophy. It is a fine model of contextualized history of philosophy. [Obituary, Margaret J. Osler, *Journal of the History of Philosophy*, Volume 44, Number 4, October 2006].



Carbon Compounds in Interplaretary Dust: Evidence for Formation by Heterogeneous Catalysis

Abstract. *Associations of carbonaceous material with iron-nickel alloy, carbides, and oxides were identified by analytical electron microscopy in ten unmelted chondritic porous micrometeorites from the earth's stratosphere. These associations which may be interpreted in terms of reactions between a carbon-containing gas and catalytically active dust grains, suggest that some of the carbon in the chondritic porous subset of interplanetary dust was emplaced through heterogeneous catalysis.*

Chondritic meteorites contain up to 4 percent carbon, mostly in reduced form as organic compounds and elemental carbon, and to a lesser extent in oxidized form as carbonates (*1*). The nature and origin of these phases are subjects of considerable interest because they are clues to the evolution of carbon during and possibly before formation of the solar system. New insight into the origin of carbon in meteoritic materials is provided by the study of micrometeorites, unmelted interplanetary dust particles (typically < 50 μm) that are routinely collected in the stratosphere. It is thought that a significant fraction of micrometeorites are of cometary origin since comets are major contributors of dust to the interplanetary medium (*2*). We report here the results of a study of micrometeorites that are termed chondritic porous (CP); the particles are carbon-rich (> 2 percent by weight) aggregates with chondritic (solar) elemental composition (*3*). We consider them to be a type of chondrite that has not been found as a conventional-size meteorite, probably because the material is too fragile to survive atmospheric entry in sizes larger than dust. In addition to their porosity, CP micrometeorites differ from carbon-rich carbonaceous chondrites in that the major silicate phases appear to be anhydrous, as determined by electron diffraction and infrared studies (*4*).

Using analytical electron microscopy (*5*), we examined carbon-bearing phases in ten CP micrometeorites. Our imaging techniques (in conjunction with electron diffraction) were bright-field, dark-field, and high-resolution lattice fringe imaging. Where possible, collateral chemical information was provided by x-ray energy-dispersive spectrometry (EDS) and energy-loss spectroscopy (ELS). As observed previously (*6*), much of the carbon appeared to be amorphous in the form of mantles, filaments, discrete grains, and matrix material in heterogeneous mineral aggregates. Although most of it was not detectably crystalline (*7*), we observed minor amounts of poorly crystalline graphitic carbon in some of the micrometeorites (Fig. 1, A and B). The amorphous material evidently was not elemental carbon, since ELS indicated minor amounts of nitrogen and oxygen along with the carbon. (It was not possible to determine the extent to which the nitrogen and oxygen measurements were influenced by contamination.) The material could also be unstable under electron irradiation, suggesting that it contained organic compounds or other volatile phases. In typical micrometeorites the carbonaceous material represented only a minor fraction of the particle, although in some micrometeorites discrete grains of low-atomic-number material may have occupied a major fraction of the particle volume.

Carbon was also a constituent of the iron-nickel grains (4 to 8 percent nickel) that usually accounted for < 1 percent of the mass of the micrometeorites examined. Almost all the iron-nickel grains studied contained significant amounts of interstitial carbon. These grains ranged in size from 0.05 to 1.0 μm and were usually embedded in carbon or "chondritic" material. For these reasons, selected area electron diffraction (SAED) identifications reported here are generally based on the successful indexing of a single zone axis pattern and on the verification of inconsistency between that pattern and patterns possible with a range of alternate candidate structures. Figure 1, A and D, shows hexagonal (cementite) carbide; Fig. 1C shows an SAED pattern (for an orthorhombic carbide) that exhibits superlattice reflections, suggesting an ordered arrangement of interstitial carbon in the iron-nickel carbide crystal lattice (*8*). In micrometeorite CP 22 we identified cohenite, an iron-nickel carbide with yet another orthorhombic structure (*8*). Other grains had cubic structures: for example, the SAED pattern shown in Fig. 1D (a grain from particle CP 22) corresponds to the body-centered cubic iron-nickel alloy (kamacite). We also characterized an iron-nickel grain in particle SP 61) with face-centered cubic (FCC) iron structure. Because FCC alloy (< 13 percent nickel by weight) is not stable at room temperature, we interpret this latter structure in terms of the FCC carbide (austenite), which has a similar crystal structure and is more stable than the alloy (*9*). At least three of the carbides have been observed by others: Christoffersen and Buseck (*10*) reported hexagonal (cementite) carbide in one micrometeorite, and Fraundorf (*11*) observed both orthorhombic cohenite and an iron-nickel grain with FCC austenite structure. Finally, bright-field and dark-field imaging experiments and

Fig. 1. (A and B) Electron micrographs of a hexagonal iron-nickel carbide grain (from micrometeorite Oz) embedded in a carbonaceous matrix. (A) Bright-field image (substrate is carbon support film). (B) High-resolution lattice fringe image of the grain-matrix interface. The carbide grain (defined by 2.1-Å (01 1) fringes) is rimmed by ~ 25 Å of graphitic carbon (defined by 3.4-Å (002) fringes), which merges into the bulk of the amorphous matrix (upper right). (C) A [110] SAED pattern from an orthorhombic cohenite carbide (host Oz). The predominantly strong supercell reflections (indexed) and weaker subcell reflections arise as a result of an ordered arrangement of interstitial carbon atoms in the carbide crystal lattice. (D) A [100] SAED pattern from an iron-nickel alloy (kamacite) grain. The superimposed ring pattern is due to Fe_3O_4 (magnetite) decorating the alloy grain.

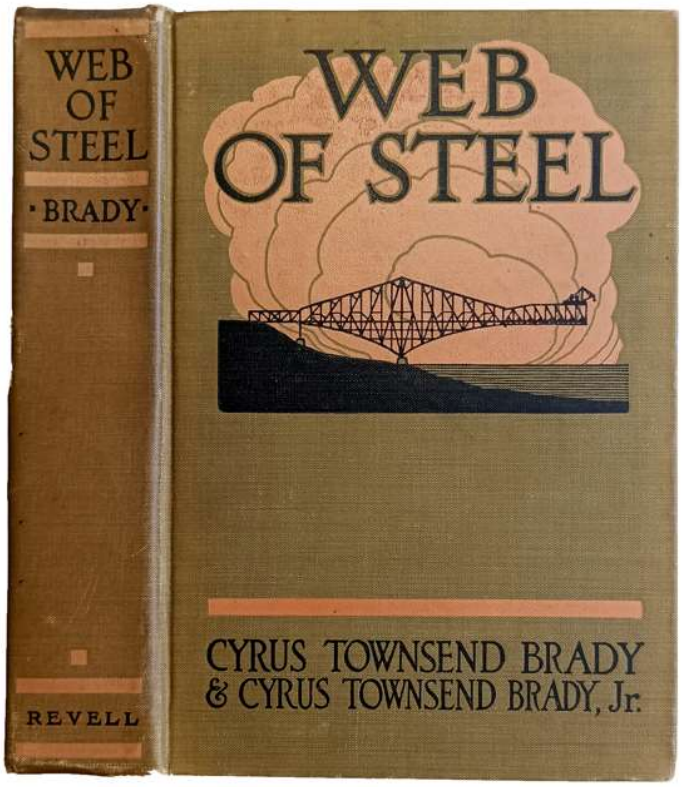
1 August 1983; accepted 27 October 1983

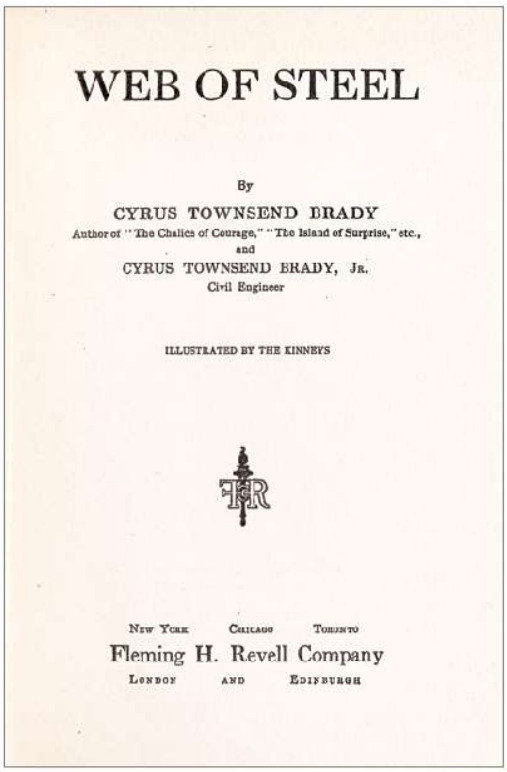
20. We thank J. Aston, T. M. Bisson, M. L. T. Bukovinski, A. R. McMahon and the reviewers for their helpful comments and D. Hess for his assistance with the experiments. Supported by the National Science Foundation. R.J. is an A. P. Sloan Foundation Fellow.

200. **BRADLEY, J. P.; Donld E. BROWNLEE** (1943-)**; Phillip FRAUNDORF**. *"Carbon compounds in interplanetary dust: evidence for formation by heterogeneous catalysts."* In: *Science*, Vol. 223, 6 January 1984. Washington, D.C.: American Association for the Advancement of Science, 1984. ¶ 4to. Pages 56-57. [Entire issue: 98 pp.] 2 figs. Pictorial wrappers. Very good. S6917

$ 12.95

FIRST EDITION. Reports finding carbonaceous material in association with iron-nickel alloy, carbides, and oxides in interplanetary dust particles. The carbides and oxides are typical of the Fischer-Tropsch reaction. "Associations of carbonaceous material with iron-nickel alloy, carbides, and oxides were identified by analytical electron microscopy in ten unmelted chondritic porous micrometeorites from the earth's stratosphere. These associations, which may be interpreted in terms of reactions between a carbon-containing gas and catalytically active dust grains, suggest that some of the carbon in the chondritic porous subset of interplanetary dust was emplaced through heterogeneous catalysis."



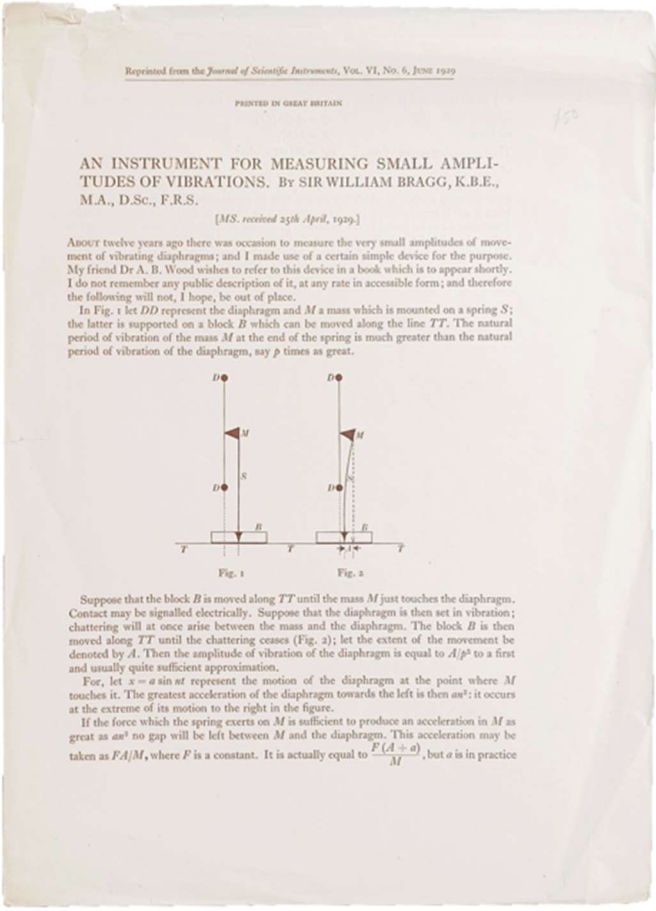


201. **BRADY, Cyrus Townsend** (1861-1920); **Cyrus Townsend BRADY, Jr.** *Web of steel. Illustrated by the Kinneys*. New York, Chicago, Toronto, London & Edinburgh: Fleming H. Revell Co., 1916. ¶ 8vo. 336 pp. Frontis. Original olive cloth, orange- and black-stamped cover and spine titles. Very good. S9776

$ 10

A novel centered on a fictional life and the railroad industry.

□ Smith, Geoffrey D., *American Fiction 1901-1925, a bibliography*, (1997), B-904.



Reprinted from the *Journal of Scientific Instruments*, Vol. VI, No. 6, June 1929

PRINTED IN GREAT BRITAIN

AN INSTRUMENT FOR MEASURING SMALL AMPLITUDES OF VIBRATIONS. By SIR WILLIAM BRAGG, K.B.E., M.A., D.Sc., F.R.S.

[*MS. received 25th April, 1929.*]

About twelve years ago there was occasion to measure the very small amplitudes of movement of vibrating diaphragms; and I made use of a certain simple device for the purpose. My friend Dr A. B. Wood wishes to refer to this device in a book which is to appear shortly. I do not remember any public description of it, at any rate in accessible form; and therefore the following will not, I hope, be out of place.

In Fig. 1 let *DD* represent the diaphragm and *M* a mass which is mounted on a spring *S*; the latter is supported on a block *B* which can be moved along the line *TT*. The natural period of vibration of the mass *M* at the end of the spring is much greater than the natural period of vibration of the diaphragm, say *p* times as great.

Fig. 1 Fig. 2

Suppose that the block *B* is moved along *TT* until the mass *M* just touches the diaphragm. Contact may be signalled electrically. Suppose that the diaphragm is then set in vibration; chattering will at once arise between the mass and the diaphragm. The block *B* is then moved along *TT* until the chattering ceases (Fig. 2); let the extent of the movement be denoted by *A*. Then the amplitude of vibration of the diaphragm is equal to A/p^2 to a first and usually quite sufficient approximation.

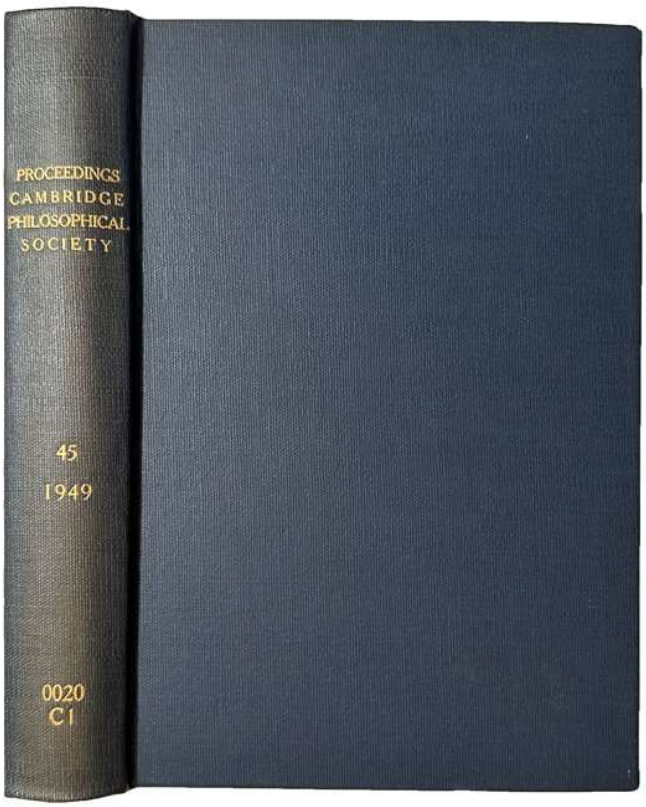
For, let $x = a \sin nt$ represent the motion of the diaphragm at the point where *M* touches it. The greatest acceleration of the diaphragm towards the left is then an^2: it occurs at the extreme of its motion to the right in the figure.

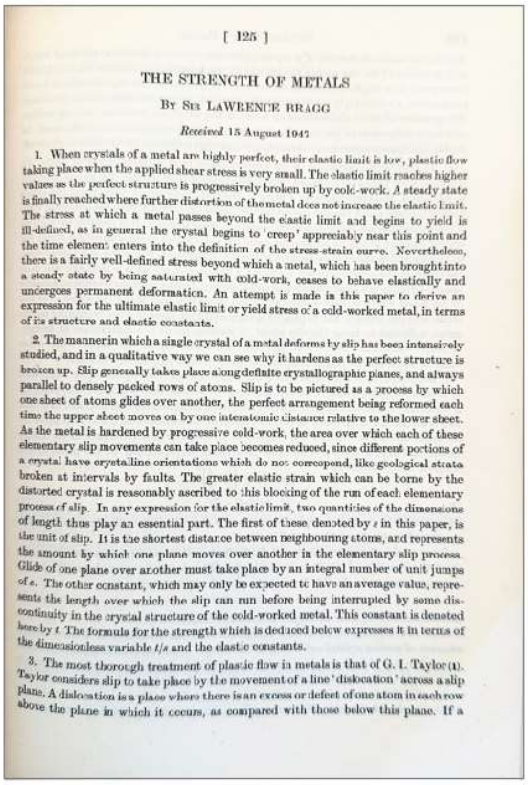
If the force which the spring exerts on *M* is sufficient to produce an acceleration in *M* as great as an^2 no gap will be left between *M* and the diaphragm. This acceleration may be taken as FA/M, where *F* is a constant. It is actually equal to $\frac{F(A+a)}{M}$, but *a* is in practice

202. **BRAGG, Sir William Henry** (1862-1942). *An instrument for measuring small amplitudes of vibrations.* Offprint from: *Journal of Scientific Instruments*, Vol. VI, No. 6, June 6, 1929. ¶ 283 x 205 mm. 4to. 2 pp. 2 figs. Self-wraps; edges dog-eared, rough at top with small tears. Good. S3090

$ 20

In 1909 Bragg became Professor of Physics at the University of Leeds. There, he and his son William Lawrence Bragg worked out how to determine the molecular structure of crystals using X-rays, for which in 1915 they jointly won the Nobel Prize.





[125]

THE STRENGTH OF METALS

By Sir LAWRENCE BRAGG

Received 15 August 1947

1. When crystals of a metal are highly perfect, their elastic limit is low, plastic flow taking place when the applied shear stress is very small. The elastic limit reaches higher values as the perfect structure is progressively broken up by cold-work. A steady state is finally reached where further distortion of the metal does not increase the elastic limit. The stress at which a metal passes beyond the elastic limit and begins to yield is ill-defined, as in general the crystal begins to 'creep' appreciably near this point and the time element enters into the definition of the stress-strain curve. Nevertheless, there is a fairly well-defined stress beyond which a metal, which has been brought into a steady state by being saturated with cold-work, ceases to behave elastically and undergoes permanent deformation. An attempt is made in this paper to derive an expression for the ultimate elastic limit or yield stress of a cold-worked metal, in terms of its structure and elastic constants.

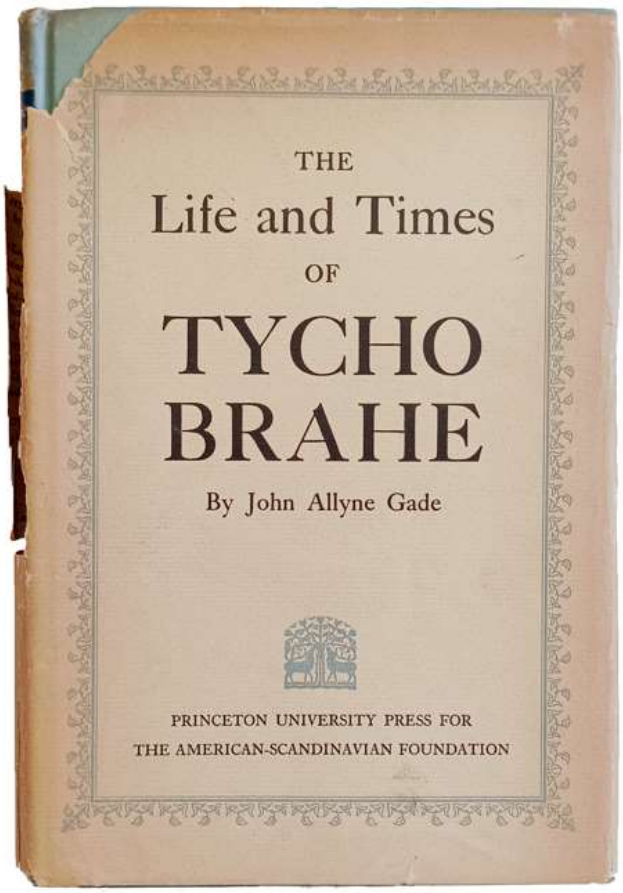
2. The manner in which a single crystal of a metal deforms by slip has been intensively studied, and in a qualitative way we can see why it hardens as the perfect structure is broken up. Slip generally takes place along definite crystallographic planes, and always parallel to densely packed rows of atoms. Slip is to be pictured as a process by which one sheet of atoms glides over another, the perfect arrangement being reformed each time the upper sheet moves on by one interatomic distance relative to the lower sheet. As the metal is hardened by progressive cold-work, the area over which each of these elementary slip movements can take place becomes reduced, since different portions of a crystal have crystalline orientations which do not correspond, like geological strata broken at intervals by faults. The greater elastic strain which can be borne by the distorted crystal is reasonably ascribed to this blocking of the run of each elementary process of slip. In any expression for the elastic limit, two quantities of the dimensions of length thus play an essential part. The first of these, denoted by s in this paper, is the unit of slip. It is the shortest distance between neighbouring atoms, and represents the amount by which one plane moves over another in the elementary slip process. Glide of one plane over another must take place by an integral number of unit jumps of s. The other constant, which may only be expected to have an average value, represents the length over which the slip can run before being interrupted by some discontinuity in the crystal structure of the cold-worked metal. This constant is denoted here by t. The formula for the strength which is deduced below expresses it in terms of the dimensionless variable t/s and the elastic constants.

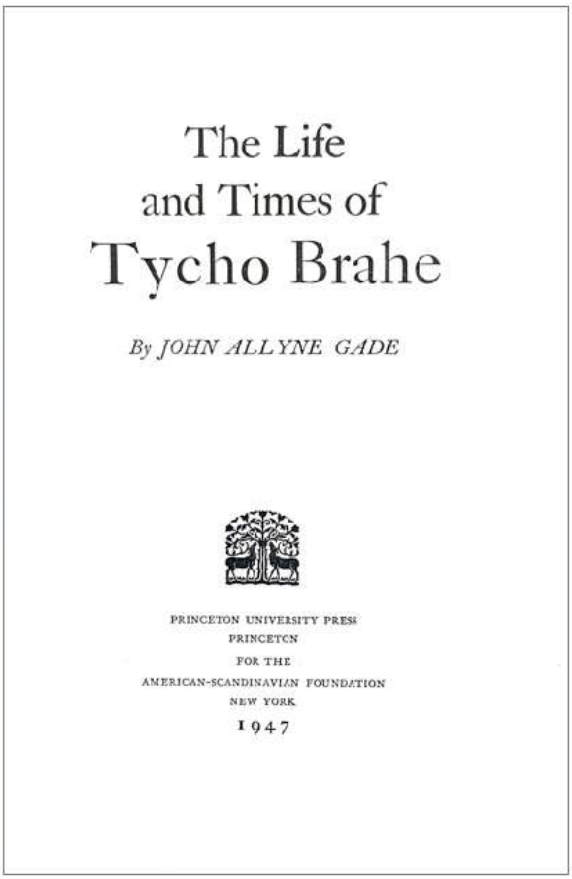
3. The most thorough treatment of plastic flow in metals is that of G. I. Taylor (1). Taylor considers slip to take place by the movement of a line 'dislocation' across a slip plane. A dislocation is a place where there is an excess or defect of one atom in each row above the plane in which it occurs, as compared with those below this plane. If a

203. **BRAGG, Sir William Lawrence** (1890-1971). *The strength of metals*. In: *Proceedings of the Cambridge Philosophical Society,* Vol. 45, 1949. Cambridge: University Press, 1949. ¶ 255 x 180 mm. Tall 8vo. Pages 125-130. [Entire volume: iv, 686, [2] pp.] 1 fig., 1 table. Full navy buckram, gilt spine. Blind stamp of the Carnegie Institution of Washington, Mount Wilson Observatory. Fine. S3092

$ 45

This late paper by Lawrence Bragg links the elasticity of metals to their crystal structure through mathematical analysis. Bragg's work on metals was limited to the theoretical analysis of order-disorder phenomena. In 1915 Lawrence Bragg was jointly awarded the Nobel prize for physics with his father for work on the X-ray determination of crystal structures. In 1937, Bragg was director of the National Physical Laboratory, Cavendish Professor at Cambridge (1938-1953), and, after 1954, Director of the Royal Institution. See: *DSB*, XV, pp. 61-64; *McGraw-Hill modern men of science*, pp. 61-62.

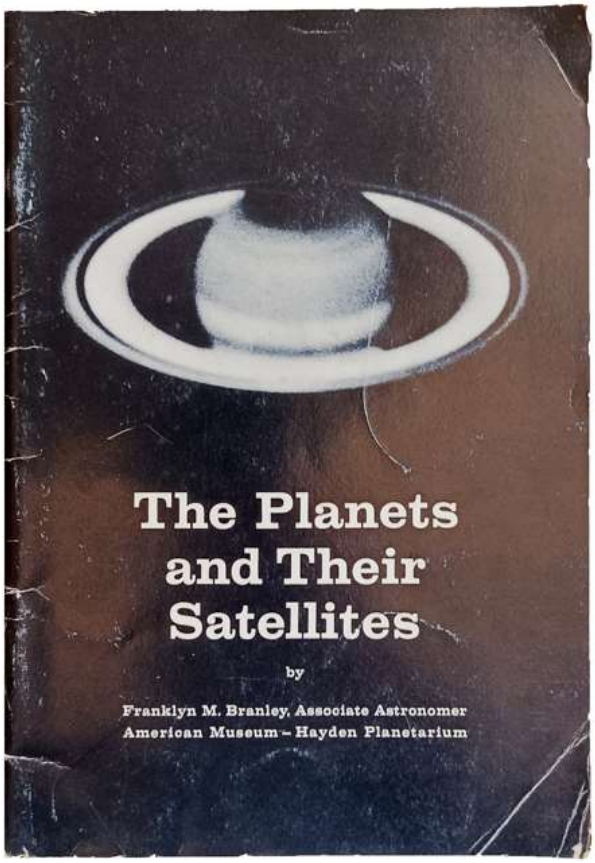


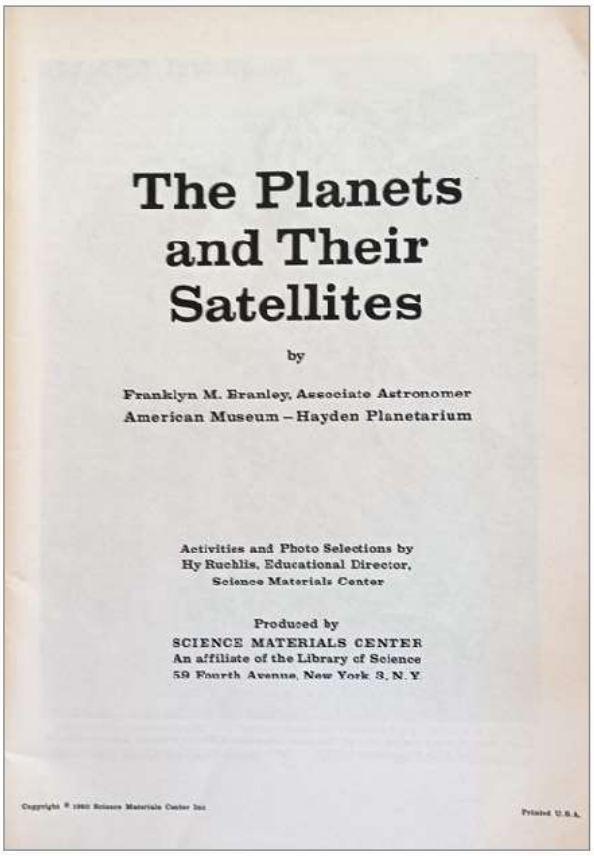


204. [**BRAHE, Tycho** (1546-1601)] **GADE, John Allyne** (1875-1955). *The Life and Times of Tycho Brahe.* Princeton: Princeton University Press for the American-Scandinavian Foundation, 1947. ¶ 8vo. xii, 209 pp. Frontis., 19 illustrations, appendix, bibliog., index. Original gilt-stamped teal cloth, dust jacket; edges worn, jacket spine torn and worn. Very good. S9101

$ 25

Article on Tycho Brahe by Owen Gingerich from AB Oct 21, 1991, laid in.

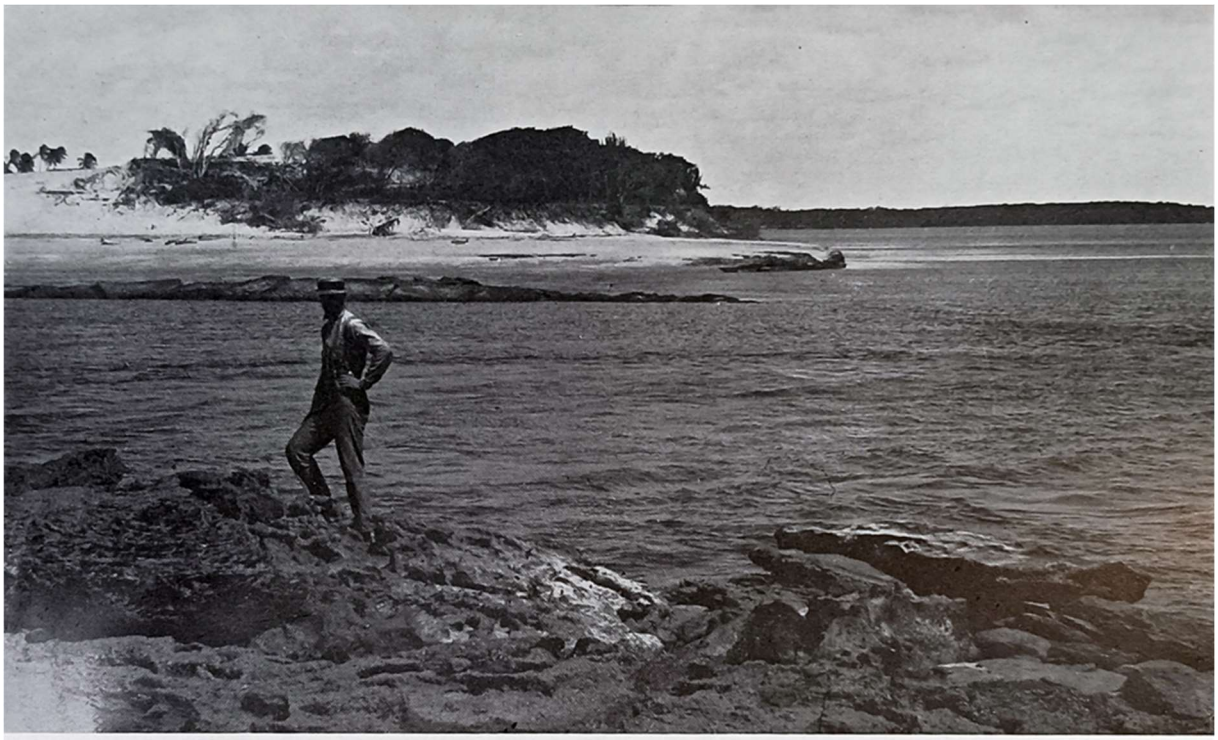




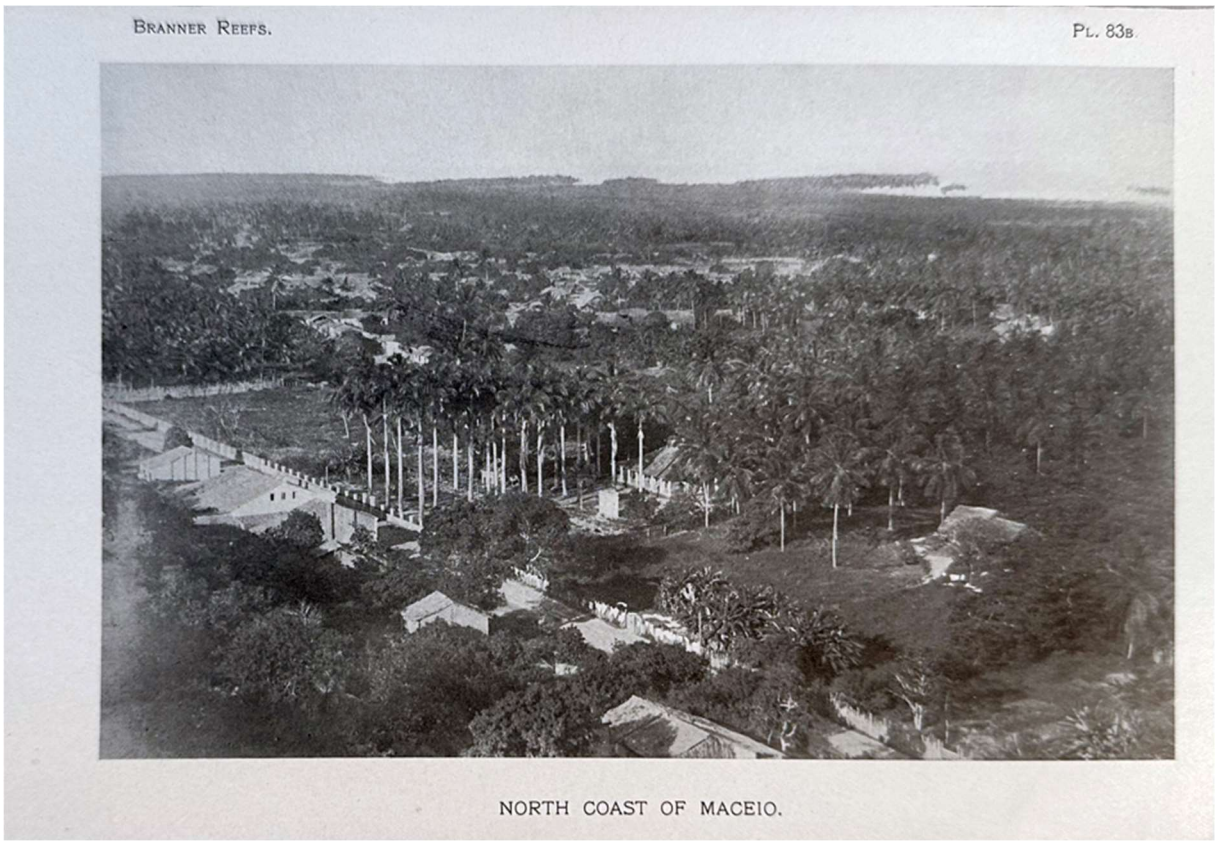
205. **BRANLEY, Franklyn M**. (1915-2002). *The planets and their satellites*. New York: Science Materials Center, 1960. ¶ 8vo. 36 pp. Figs. Pictorial wrappers. Very good. S5838

$ 5

Franklyn M. Branley was the originator of the Let's-Read-and-Find-Out Science series and the author of close to 150 popular books about scientific topics for young readers of all ages. He was Astronomer Emeritus and former Chairman of the American Museum of Natural History-Hayden Planetarium.



MAMANGUÁPE POINT.



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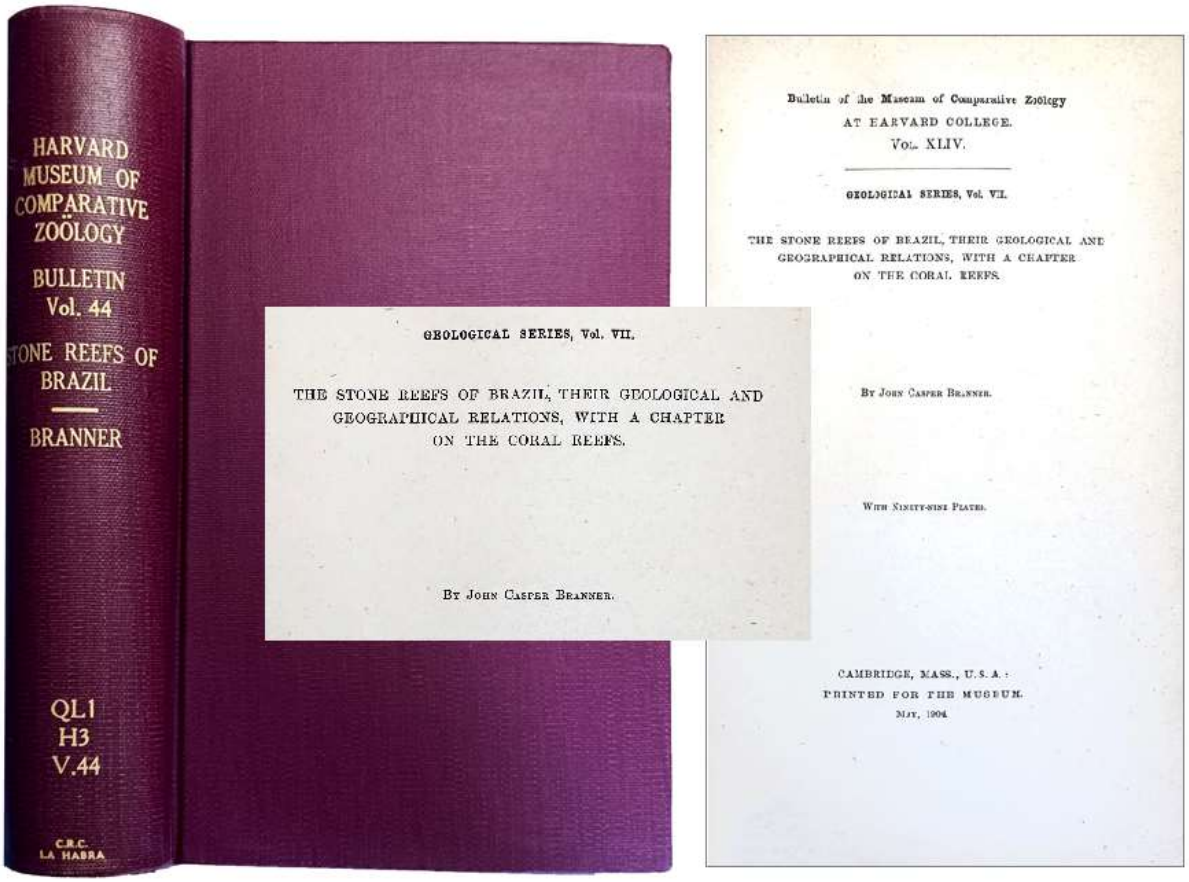
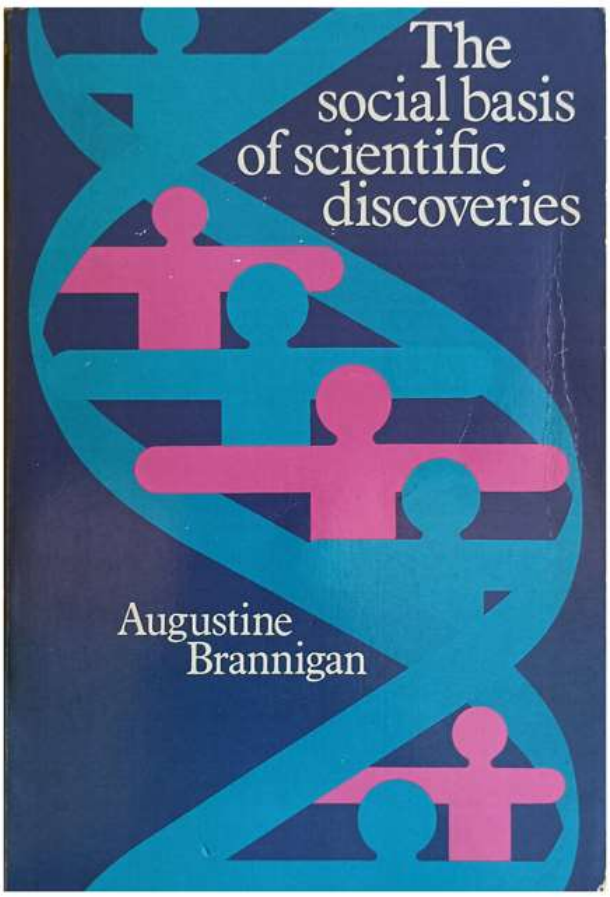


206. **BRANNER, John Casper** (1850-1922). *The stone reefs of Brazil, their geological and geographical relations, with a chapter on the coral reefs*. Cambridge, MA: Museum of Comparative Zoology, 1904. ¶ *Bulletin of the Museum of Comparative Zoology at Harvard College*, Vol. XLIV, *Geological Series*, Vol. VII. 244 x 158 mm. [iv], 285 pp. 104 figs., tables, more than 83 plates (including 6 folding maps). Red buckram, gilt spine. Ex library rubber stamp. Very good. S2332

$ 25

John Casper Branner was an American geologist and academic who discovered bauxite in Arkansas in 1887 as State Geologist for the Geological Survey of Arkansas. He was chair of the Departments of Botany and Geology at Indiana University Bloomington and later at Stanford University. Stanford's Branner Earth Sciences library is named after him (where I got my first job!).



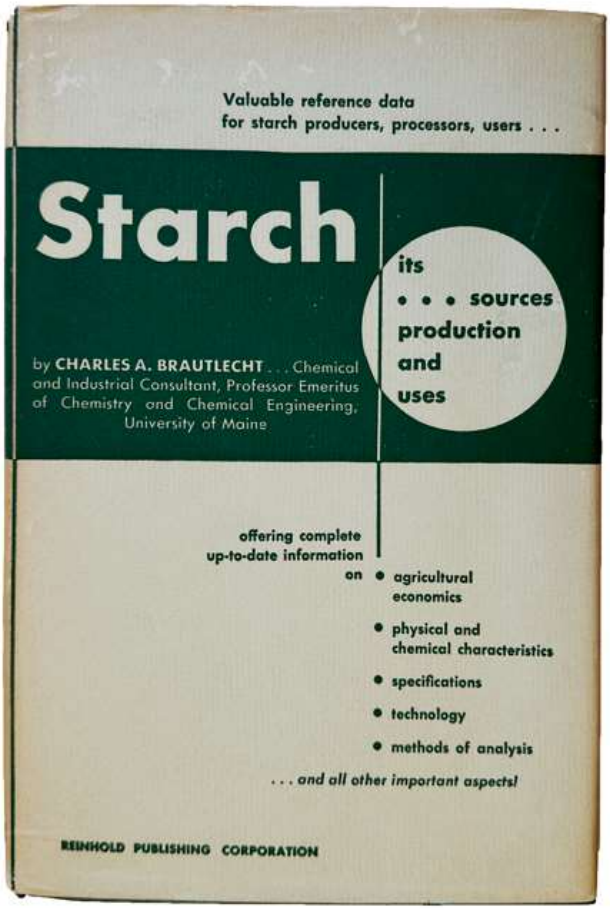
207. **BRANNIGAN, Augustine** (1949-). *The Social Basis of Scientific Discoveries*. Cambridge: Cambridge University Press, 1981. ¶ First edition. 8vo. xi, 212 pp. Bibliography, index. Printed wrappers; crinkled. Very good. [RH1023]

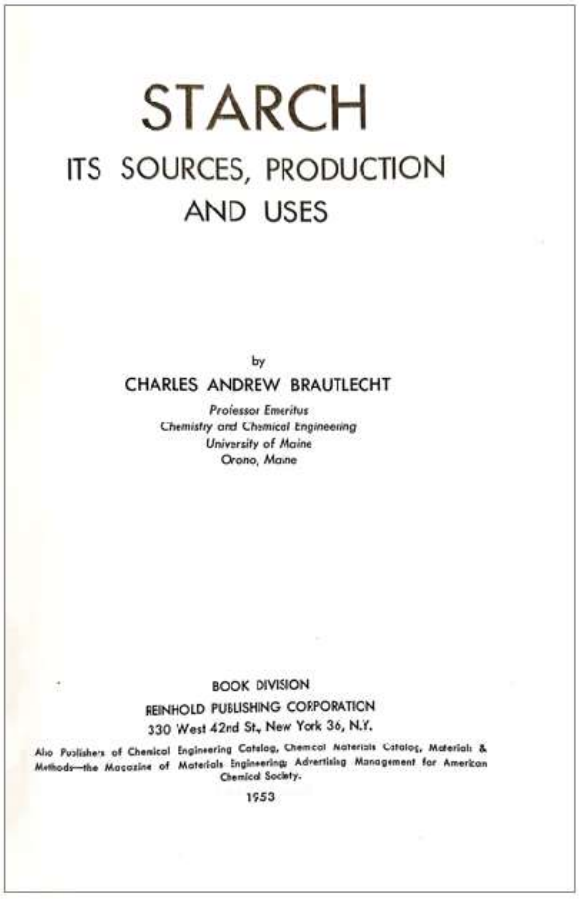
$ 8

What constitutes a scientific discovery? How do discoveries happen and how are they recognised as such? These are questions of central concern to scientists and philosophers. In this book, Augustine Brannigan provides a critical examination of the major theories which have been devised to account for discoveries and innovations in science, and develops a fresh alternative. Dr Brannigan begins by arguing that most theories fall into one of two classes: mentalistic theories, which describe how ideas come into the mind, and cultural theories, which describe how they 'mature' in a particular culture. His account reveals a series of empirical and methodological problems that make these existing models untenable and he proposes as an alternative a sociological approach, which draws attention not to what makes discoveries happen, but to the processes whereby certain achievements are recognised and labelled as discoveries. This approach is illustrated in detail with a number of important scientific cases. The book throws light not only on the conventional character of discoveries but also on the folk elements in popular theories about discovery, such as genius, gestalt switch and simultaneous invention. [Publisher].

Augustine Brannigan is Professor Emeritus of Sociology at the University of Calgary, Canada.

CONTENTS: Preface Michael Mulkay. 1. The topic of discovery and the concept of nature; 2. Psychological accounts of discovery; 3. A synthetic assessment of the psychological accounts; 4. The emergence of a social model of discovery; 5. Discovery as meaningful action; 6. The law valid for Pisum and the reification of Mendal; 7. Perspective, reflexivity and the apparent objectivity of discovery; 8. Folk reasoning in theories about scientific discovery; 9. Some sociological features of discovery. Notes.



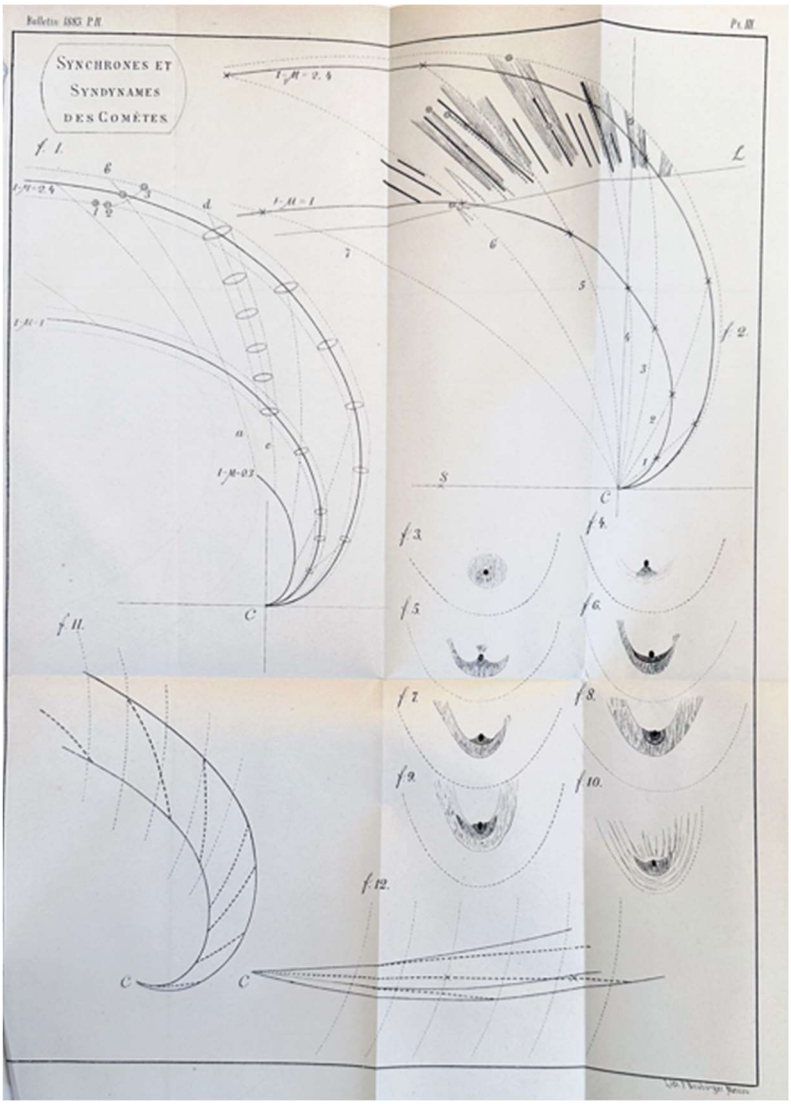


208. **BRAUTLECHT, Charles Andrew**. *Starch, its sources, production and uses*. New York: Reinhold Publishing Corp., 1953. ¶ 8vo. [6], 408 pp. Numerous text figs., index. Green cloth, gilt-stamped spine title, dust jacket. Very good. Rare. S9468

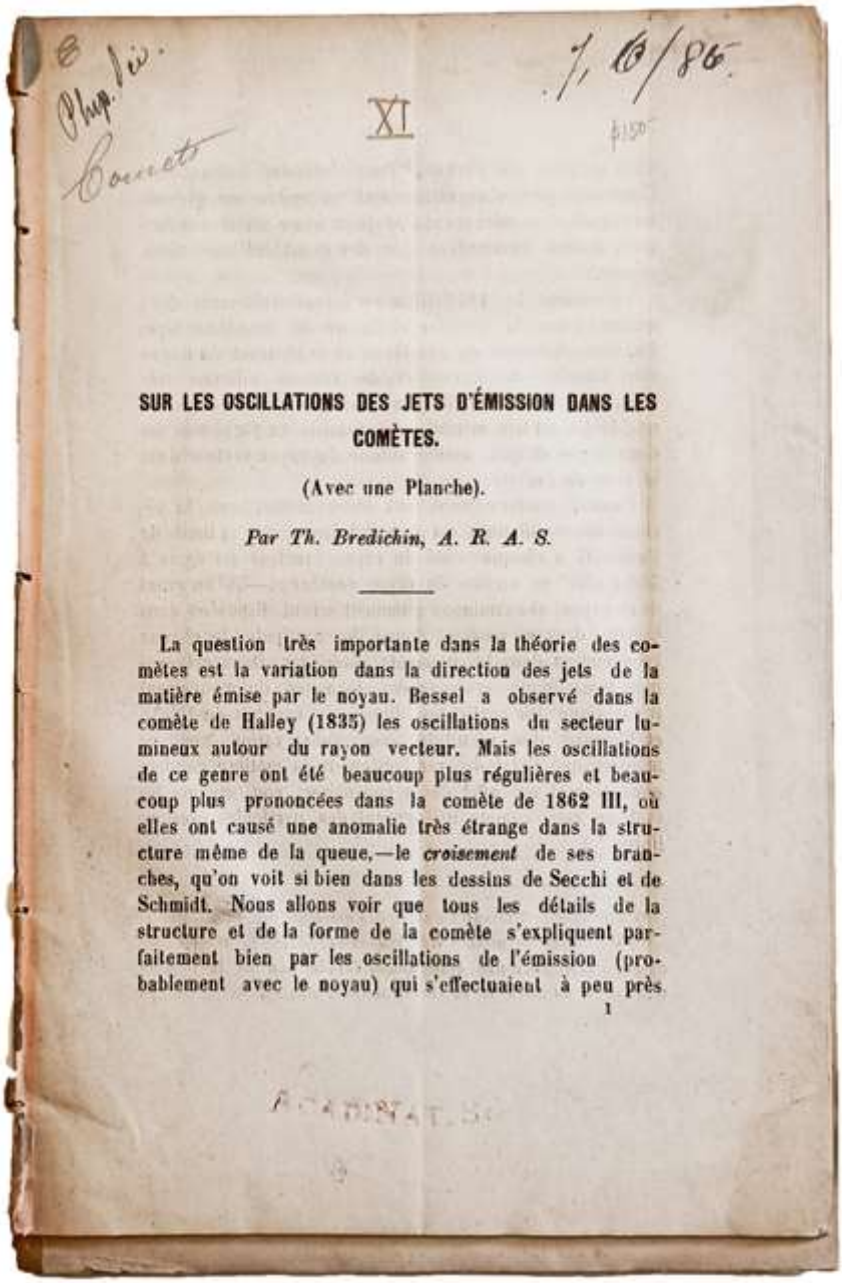
$ 16.95

Based on the following review, this book contains many inaccuracies. However, the review does give praise to the descriptive material relating to the potato starch

industry. “Numerous inaccuracies detract seriously from what otherwise might have been a very useful book on the starch industry . . . The portion of the book dealing with the potato starch industry, a total of 163 pages, is very well written and valuable. Here one will find extensive information on the history and development of the potato starch industry, the agricultural production of potatoes, their grading, handling, composition, and analysis. An excellent and authoritative chapter deals with the manufacture of potato starch.” – Roy L. Whistler, review, *Science*, 6 Nov. 1953, Vol 118, Issue 3071, p. 565.



[209] BREDIKHIN



XI

SUR LES OSCILLATIONS DES JETS D'ÉMISSION DANS LES COMÈTES.

(Avec une Planche).

Par Th. Bredichin, A. R. A. S.

La question très importante dans la théorie des comètes est la variation dans la direction des jets de la matière émise par le noyau. Bessel a observé dans la comète de Halley (1835) les oscillations du secteur lumineux autour du rayon vecteur. Mais les oscillations de ce genre ont été beaucoup plus régulières et beaucoup plus prononcées dans la comète de 1862 III, où elles ont causé une anomalie très étrange dans la structure même de la queue,—le *croisement* de ses branches, qu'on voit si bien dans les dessins de Secchi et de Schmidt. Nous allons voir que tous les détails de la structure et de la forme de la comète s'expliquent parfaitement bien par les oscillations de l'émission (probablement avec le noyau) qui s'effectuaient à peu près

1

Comets

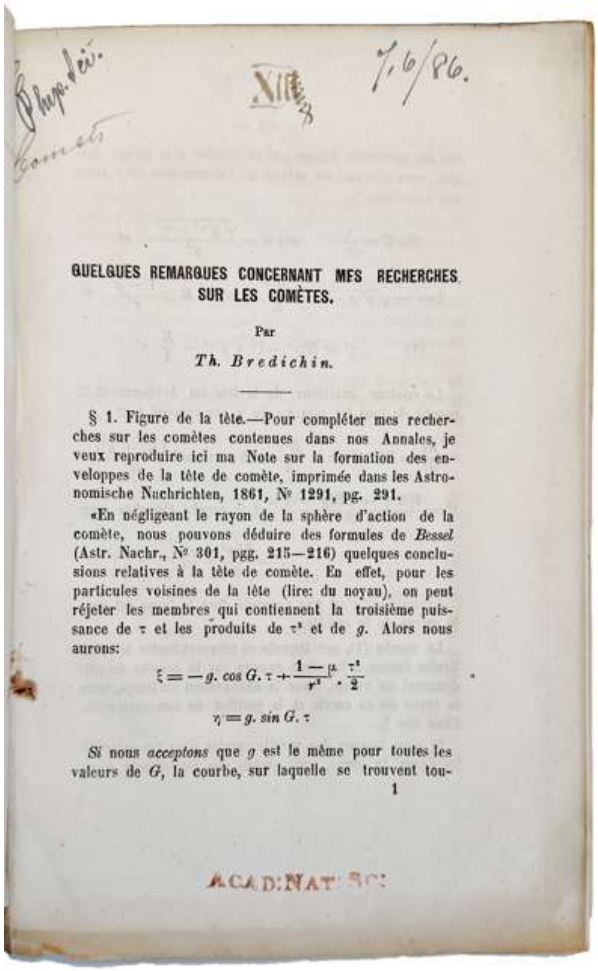
209. **BREDIKHIN, Fedor Aleksandrovich** (1831-1904). [3 offprints] *"Sur les oscillations des jets d'emission dans les cometes."*

with: *"Quelques remarques concernant mes recherches sur les cometes."*

with: *"Sur les anomalies apparentes dans la structure de la grande comete de 1744."*
Offprints from: *Bulletin Ovshchestva Isp'itatelei Pripod'i.* Moscow: Katkove, 1884-1885. ¶ 8vo. 26; 20; 15 pp. No. 1: 1 folding lithographic plate. No. 3: 1 folding

lithographic plate. Dis-bound. Ms. notations on first pages. Ex library rubber stamp. Very good. S6270

$ 75



QUELQUES REMARQUES CONCERNANT MES RECHERCHES SUR LES COMÈTES.

Par

Th. Bredichin.

§ 1. Figure de la tête.—Pour compléter mes recherches sur les comètes contenues dans nos Annales, je veux reproduire ici ma Note sur la formation des enveloppes de la tête de comète, imprimée dans les Astronomische Nachrichten, 1861, № 1291, pg. 291.

«En négligeant le rayon de la sphère d'action de la comète, nous pouvons déduire des formules de *Bessel* (Astr. Nachr., № 301, pgg. 215—216) quelques conclusions relatives à la tête de comète. En effet, pour les particules voisines de la tête (lire: du noyau), on peut réjeter les membres qui contiennent la troisième puissance de τ et les produits de τ^2 et de g. Alors nous aurons:

$$\xi = -g.\cos G.\tau + \frac{1-\mu}{r^3}.\frac{\tau^2}{2}$$

$$\eta = g.\sin G.\tau$$

Si nous *acceptons* que g est le même pour toutes les valeurs de G, la courbe, sur laquelle se trouvent tou-

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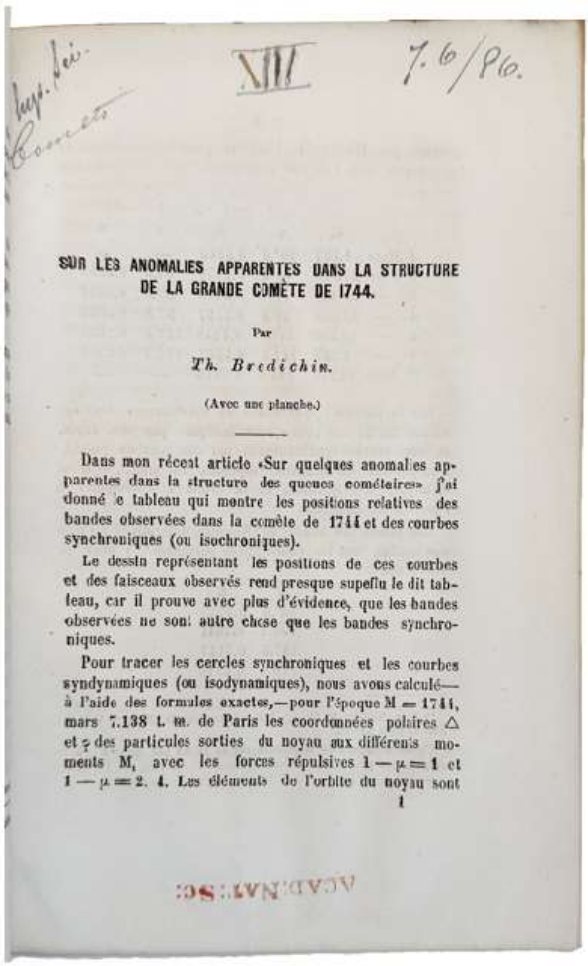


SUR LES ANOMALIES APPARENTES DANS LA STRUCTURE DE LA GRANDE COMÈTE DE 1744.

Par

Th. Bredichin.

(Avec une planche.)

Dans mon récent article «Sur quelques anomalies apparentes dans la structure des queues cométaires» j'ai donné le tableau qui montre les positions relatives des bandes observées dans la comète de 1744 et des courbes synchroniques (ou isochroniques).

Le dessin représentant les positions de ces courbes et des faisceaux observés rend presque superflu le dit tableau, car il prouve avec plus d'évidence, que les bandes observées ne sont autre chose que les bandes synchroniques.

Pour tracer les cercles synchroniques et les courbes syndynamiques (ou isodynamiques), nous avons calculé—à l'aide des formules exactes,—pour l'époque M = 1744, mars 7.138 t. m. de Paris les coordonnées polaires Δ et ϱ des particules sorties du noyau aux différents moments M_1 avec les forces répulsives $1-\mu = 1$ et $1-\mu = 2$. 4. Les éléments de l'orbite du noyau sont

1

The study of comets was the major work of Fedor Bredikhin, who developed an important mechanical theory of a comet's form. *DSB*, II, pp. 432-435.

Reprinted from the Proceedings of the National Academy of Sciences,
Vol. 41, No. 11, pp. 862–863. November, 1955

*TRYPTOPHAN BIOSYNTHESIS IN SALMONELLA TYPHIMURIUM**

By Sydney Brenner†

DEPARTMENT OF GENETICS, CARNEGIE INSTITUTION OF WASHINGTON
COLD SPRING HARBOR, NEW YORK

Communicated by M. Demerec, July 19, 1955

Recent studies have demonstrated that tryptophan is synthesized in *Escherichia coli* from anthranilic acid via indole.[1] A study has been made of tryptophan auxotrophs of *Salmonella typhimurium*, and the results, reported below, indicate that the same pathway of tryptophan biosynthesis is followed in this strain.

Ten tryptophan-requiring mutants of *S. typhimurium*, strain LT2, kindly provided by Dr. M. Demerec, have been investigated. The nutritional properties of the strains were established by inoculating *ca.* 10^6 cells into 5 ml. of A medium[2] with added supplements and incubating the cultures for 18 hours at 37° C. Accumulations were studied by centrifuging 48-hour-aerated cultures of the strains in A medium supplemented with 5 μg/ml L-tryptophan, followed by the application of various procedures to the supernatant fluids. Anthranilic acid was identified by its characteristic blue fluorescence, by its ultraviolet absorption spectrum with a maximum at 3100 A, by the red-purple color (absorption maximum at 5550 A) developed with the Bratton-Marshall reagents[3] and prevention of color development by prior acetylation, and by paper chromatography. Compound B is an as yet unidentified substance characterized by an ultraviolet absorption maximum at 2780 A, a blue color (absorption maximum at 6250 A) with the Bratton-Marshall reagents unaffected by prior acetylation, insolubility in ether, no color reaction with *p*-dimethylaminobenzaldehyde, and conversion to indole by steam distillation in the presence of 0.1 *N* NaOH.[4] Indole was identified by its solubility in ether, the characteristic rose color developed with *p*-dimethylaminobenzaldehyde, and a red color reaction (absorption maximum at 5350 A) with the Bratton-Marshall reagents which is unaffected by prior acetylation.

The results are given in Table 1, from which it can be seen that the mutants can be divided into four distinct groups. Demerec and his collaborators[5] have shown that these mutants can be separated into four classes, depending on the frequencies

TABLE 1

GROWTH REQUIREMENTS AND ACCUMULATIONS OF TRYPTOPHAN AUXOTROPHS OF *S. Typhimurium*

	Growth in A Medium plus 20 μg/Ml Supplements					
try-Mutants	None	Anthranilic Acid	Indole	L-Tryptophan	Accumulations	Group
−8	−	+	+	+	None detected	I
−2; −4	−	−	+	+	Anthranilic acid	II
−3	−	−	+	+	Compound B	III
−1; −6; −7; −9; −10; −11	−	−	−	+	Mixture of compound B and indole	IV

of transductions; transductions between members of the same class occur with a smaller frequency than do those between members of different classes. The indication is that all the members of one transduction class possess mutations in the same gene locus (nonidentical alleles), while different classes are characterized by

210. **BRENNER, Sydney** (1927-2019). *"Tryptophan Biosynthesis in Salmonella Typhimurium."* Offprint from: *Proceedings of the National Academy of Sciences*, vol. 41, no. 11, 1955. ¶ 8vo. 862-863 pp. Single leaf; extremities worn. Ownership rubber stamp of Norman Horowitz. FINE. S8224

$ 175

"Recent studies have demonstrated that tryptophan is synthesized in *Escherichia coli* from anthranilic acid via indole. A study has been made of tryptophan auxotrophs of *Salmonella typhimurium*, and the results, reported below, indicate that the same pathway of tryptophan biosynthesis is followed in this strain." [Abstract].

"In 2002, he shared the Nobel Prize in Physiology or Medicine with H. Robert Horvitz and Sir John E. Sulston. Brenner made significant contributions to work on the genetic code, and other areas of molecular biology while working in the Medical Research Council (MRC) Laboratory of Molecular Biology in Cambridge, England."

Brenner was a pioneer geneticist who co-authored vital papers with Francis Crick, and Francois Jacob.

PROVENANCE: Norman Horowitz (of Caltech) was a colleague of George W. Beadle and E. L. Tatum and, like Brenner, an early pioneer of genetics.

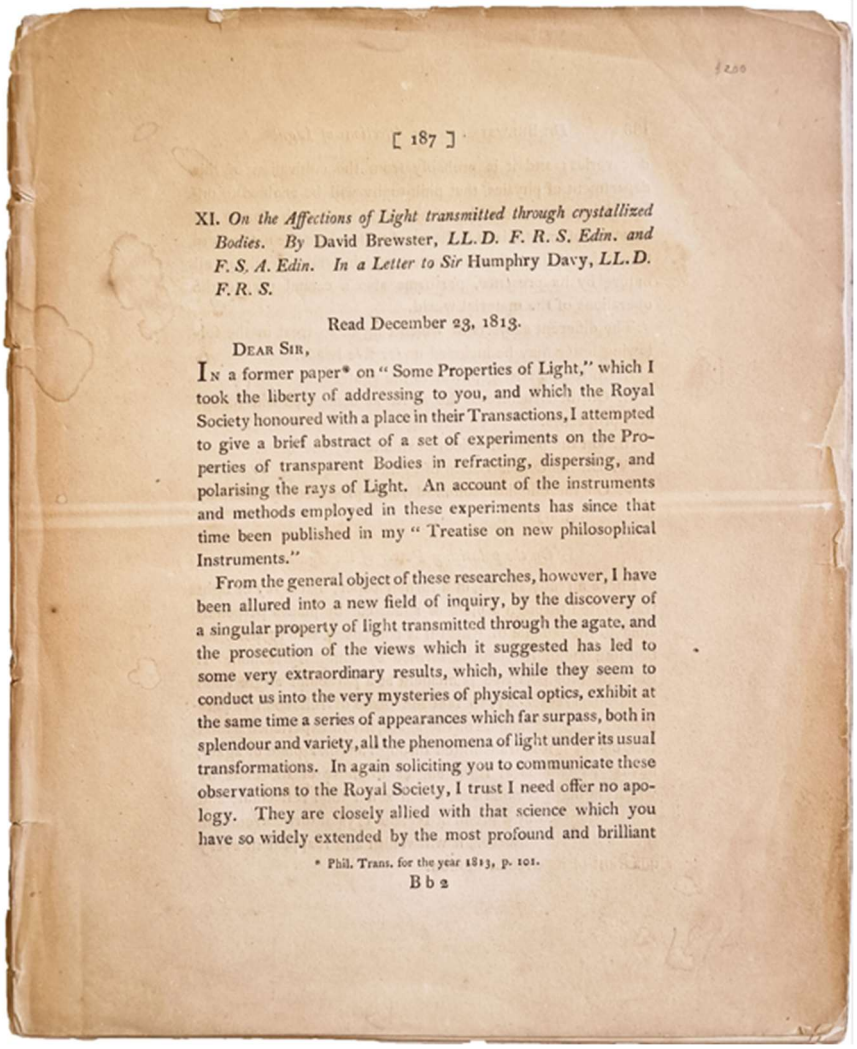
□ See: Garrison and Morton 256. 8 & 256.

211. **BREWSTER, Sir David** (1781-1868). *"On the affections of light transmitted through crystallized bodies."* Extracted from: *The Philosophical Transactions of the Royal Society of London*, Vol. 104, [1814]. ¶ 263 x 214 mm. 4to. Pages 187-218. 3 engraved plates; first and last leaves browned, brittle, extremities chipped, plates lightly browned. Dis-bound. Very good. S3643

$ 50

FIRST EDITION. "Dear Sir, In a former paper on "Some Properties of Light," which I took the liberty of addressing to you, and which the Royal Society honoured with a place in their Transactions, I attempted to give a brief abstract of a set of experiments on the Properties of transparent Bodies in refracting, dispersing, and polarising the rays of Light. An account of the instruments and methods employed in these experiments has since that time been published in my "Treatise on new philosophical Instruments." From the general object of these researches, however, I have been allured into a new field of inquiry, by the discovery of a singular property of light transmitted through the agate, and the prosecution of the views which it suggested has led to some very extraordinary

results, which, while they seem to conduct us into the very mysteries of physical optics, exhibit at the same time a series of appearances which far surpass, both in splendour and variety, all the phenomena of light under its usual transformations. In again soliciting you to communicate these observations to the Royal Society, I trust I need offer no apology. They are closely allied with that science which you have so widely extended by the must profound and brilliant discoveries; and it is probably from the cultivation of this department of physics, that philosophy will be enabled to unfold the secrets of double refraction, to explain the forms and structure of crystallized bodies, and to develope the nature and properties of that ethereal matter, which, while it enlivens all nature by its presence, performs also a capital part in the operations of the material world." Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 188. See: DSB, II, pp. 451-454.



[187]

XI. *On the Affections of Light transmitted through crystallized Bodies. By* David Brewster, *LL.D. F. R. S. Edin. and F. S. A. Edin. In a Letter to Sir* Humphry Davy, *LL.D. F. R. S.*

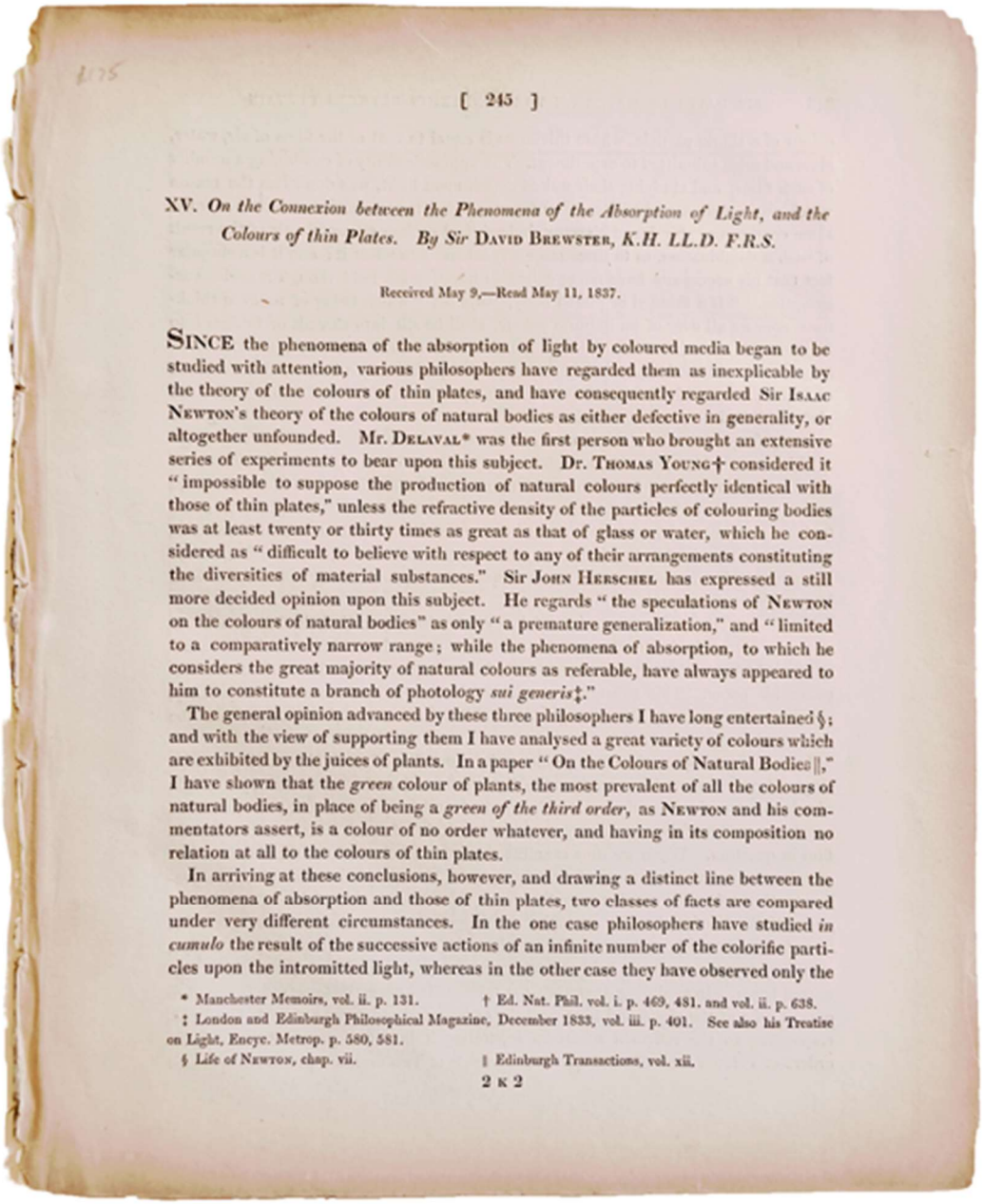
Read December 23, 1813.

DEAR SIR,

IN a former paper* on "Some Properties of Light," which I took the liberty of addressing to you, and which the Royal Society honoured with a place in their Transactions, I attempted to give a brief abstract of a set of experiments on the Properties of transparent Bodies in refracting, dispersing, and polarising the rays of Light. An account of the instruments and methods employed in these experiments has since that time been published in my "Treatise on new philosophical Instruments."

From the general object of these researches, however, I have been allured into a new field of inquiry, by the discovery of a singular property of light transmitted through the agate, and the prosecution of the views which it suggested has led to some very extraordinary results, which, while they seem to conduct us into the very mysteries of physical optics, exhibit at the same time a series of appearances which far surpass, both in splendour and variety, all the phenomena of light under its usual transformations. In again soliciting you to communicate these observations to the Royal Society, I trust I need offer no apology. They are closely allied with that science which you have so widely extended by the most profound and brilliant

* Phil. Trans. for the year 1813, p. 101.



[245]

XV. *On the Connexion between the Phenomena of the Absorption of Light, and the Colours of thin Plates.* *By Sir* DAVID BREWSTER, *K.H. LL.D. F.R.S.*

Received May 9,—Read May 11, 1837.

SINCE the phenomena of the absorption of light by coloured media began to be studied with attention, various philosophers have regarded them as inexplicable by the theory of the colours of thin plates, and have consequently regarded Sir ISAAC NEWTON's theory of the colours of natural bodies as either defective in generality, or altogether unfounded. Mr. DELAVAL* was the first person who brought an extensive series of experiments to bear upon this subject. Dr. THOMAS YOUNG† considered it "impossible to suppose the production of natural colours perfectly identical with those of thin plates," unless the refractive density of the particles of colouring bodies was at least twenty or thirty times as great as that of glass or water, which he considered as "difficult to believe with respect to any of their arrangements constituting the diversities of material substances." Sir JOHN HERSCHEL has expressed a still more decided opinion upon this subject. He regards "the speculations of NEWTON on the colours of natural bodies" as only "a premature generalization," and "limited to a comparatively narrow range; while the phenomena of absorption, to which he considers the great majority of natural colours as referable, have always appeared to him to constitute a branch of photology *sui generis*‡."

The general opinion advanced by these three philosophers I have long entertained §; and with the view of supporting them I have analysed a great variety of colours which are exhibited by the juices of plants. In a paper "On the Colours of Natural Bodies ‖," I have shown that the *green* colour of plants, the most prevalent of all the colours of natural bodies, in place of being a *green of the third order*, as NEWTON and his commentators assert, is a colour of no order whatever, and having in its composition no relation at all to the colours of thin plates.

In arriving at these conclusions, however, and drawing a distinct line between the phenomena of absorption and those of thin plates, two classes of facts are compared under very different circumstances. In the one case philosophers have studied *in cumulo* the result of the successive actions of an infinite number of the colorific particles upon the intromitted light, whereas in the other case they have observed only the

* Manchester Memoirs, vol. ii. p. 131. † Ed. Nat. Phil. vol. i. p. 469, 481. and vol. ii. p. 638.
‡ London and Edinburgh Philosophical Magazine, December 1833, vol. iii. p. 401. See also his Treatise on Light, Encyc. Metrop. p. 580, 581.
§ Life of NEWTON, chap. vii. ‖ Edinburgh Transactions, vol. xii.

212. **BREWSTER, Sir David** (1781-1868). *"On the Connexion between the Phenomena of the Absorption of Light, and the Colours of thin Plates."* Extracted from: *The Philosophical Transactions of the Royal Society of London*, Vol. 127, [1837]. ¶ 272 x 220 mm. 4to. Pages 245-252. Dis-bound. Very good. S3644

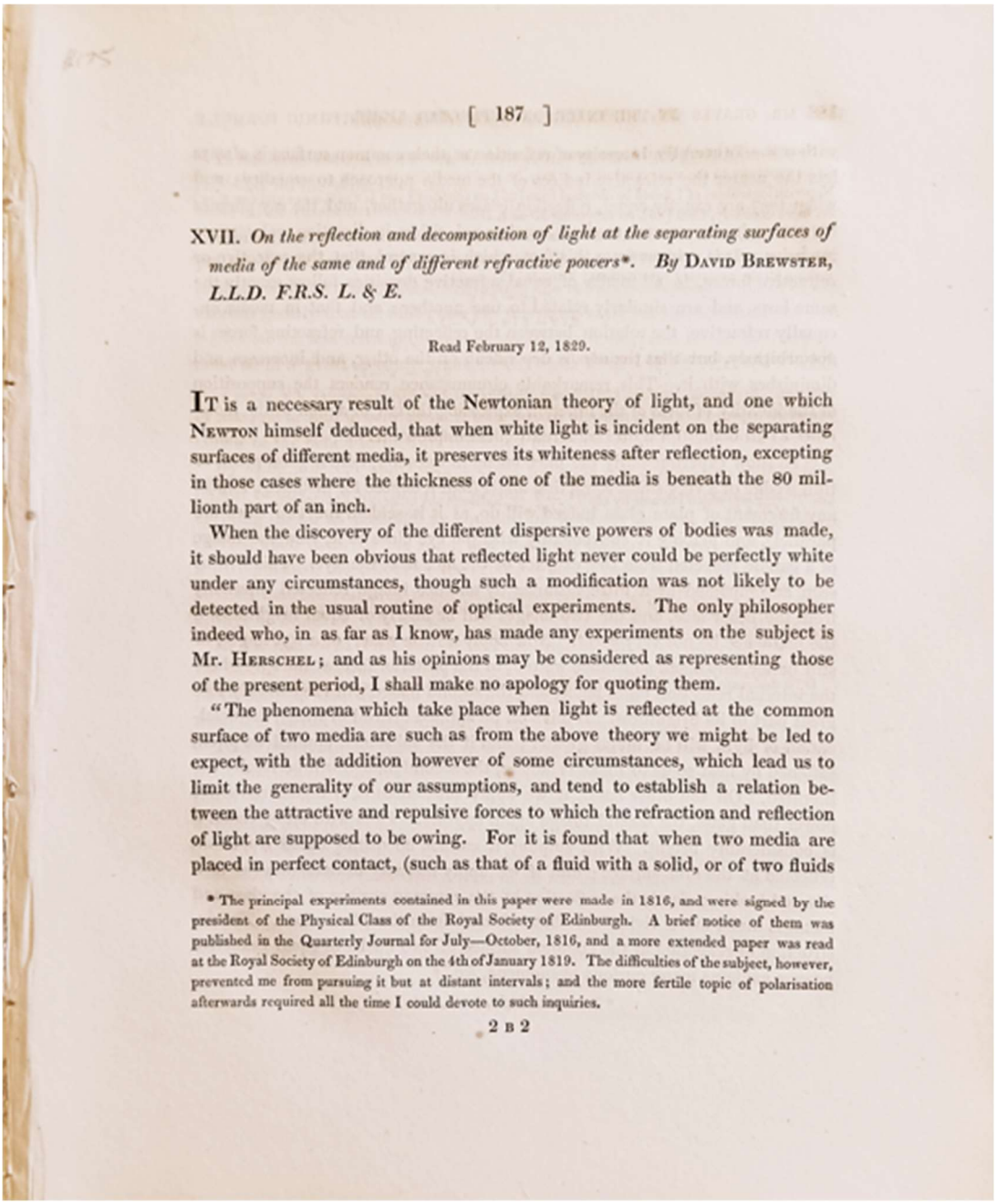
$ 40

FIRST EDITION. "Sir David Brewster's paper was resumed and concluded. The phenomena of the absorption of light by coloured media have been regarded by modern philosophers as inexplicable on the theory of the colours of thin plates, and therefore irreconcileable with the Newtonian hypothesis, that the colours of natural bodies are dependent on the same causes as the colours of thin plates. The discovery by Mr. Horner of a peculiar nacreous substance possessing remarkable

optical properties, of which the author has already given an account, furnished him with the means of instituting a more accurate comparison between these two classes of phenomena. By a careful and minute analysis of the reflected tints of its first three orders of colours exhibited by a single film of the above-mentioned substance, they were found to consist of that part of the spectrum which gives the predominating colour of the tint mixed with the rays on each side of it. In analysing the transmitted beam, bands of the colours complementary to the former are seen, with intervening dark bands; and when the analysis is made with a high magnifying power, the spectrum is observed to be crossed throughout its whole extent with alternate dark and coloured bands, increasing in number and diminishing in magnitude with the thickness of its plate. In the phenomena of periodical colours there are three peculiarities demanding notice; first, that the dark lines change their places by varying the inclination of the plate; secondly, that two or more lines never coalesce into one; and thirdly, that the colour of the luminous bands in the complementary spectrum are the same as those of the original spectrum when the thin plate is perfectly colourless. The author institutes a comparison of these phenomena with those of absorption as exhibited by a solid, a fluid, and a gaseous body; employing as an example of the first, smalt blue glass; of the second, the green sap of vegetables; and of the third, nitrous acid gas. No connecting link between these phenomena appeared to exist, excepting that both exhibited a divided or mutilated spectrum; but even this common fact has not the same character in both. The nacreous substance described by Mr. Horner, however, in some cases, when the plates were small, was found to produce bands perfectly identical with those of thin plates; while in other cases the bands were exactly similar to those of coloured media. By employing the iridescent films of decomposed glass, the author obtained combinations of films which gave, by transmitted light, the most rich and splendid colours, surpassing every thing he had previously seen among the colours either of nature or of art. These facts have proved that the transmitted colours, though wholly unlike those of thin plates, are yet produced by the same causes, and are residuary, and generally complementary to the sum of the reflected tints. Thus the author has succeeded in completely identifying in their primary features the two classes of facts; the one resulting from absorption, the other from periodic action. The minor points of difference, namely, the uniformity of the bands and tints of absorbing media at all incidences, and the non-appearance of the reflected tints in such media, are endeavoured to be explained by the introduction of several considerations, the complete discussion of which the author reserves for the subject of a future paper. From the phenomena of thin plates, of polarized tints, and of absorption, the existence of a new property of light is deduced, in virtue of which the reflecting force selects out of differently coloured rays of the same refrangibility rays of a particular colour, allowing the others to pass into the transmitted ray; a principle not provided for in either of the

theories of light to which the phenomena of absorption are ultimately referable, and furnishing an explanation of certain remarkable phenomena of dichroism in doubly refracting bodies, in which rays of the same refrangibility, but of different colours, pass into the ordinary and extraordinary pencils." – Abstracts of the Papers Printed in the Philosophical Transactions of the Royal Society of London.

Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 691. See: *DSB*, II, pp. 451-454.



[187]

XVII. *On the reflection and decomposition of light at the separating surfaces of media of the same and of different refractive powers*.* *By* DAVID BREWSTER, *L.L.D. F.R.S. L. & E.*

Read February 12, 1829.

IT is a necessary result of the Newtonian theory of light, and one which NEWTON himself deduced, that when white light is incident on the separating surfaces of different media, it preserves its whiteness after reflection, excepting in those cases where the thickness of one of the media is beneath the 80 millionth part of an inch.

When the discovery of the different dispersive powers of bodies was made, it should have been obvious that reflected light never could be perfectly white under any circumstances, though such a modification was not likely to be detected in the usual routine of optical experiments. The only philosopher indeed who, in as far as I know, has made any experiments on the subject is Mr. HERSCHEL; and as his opinions may be considered as representing those of the present period, I shall make no apology for quoting them.

"The phenomena which take place when light is reflected at the common surface of two media are such as from the above theory we might be led to expect, with the addition however of some circumstances, which lead us to limit the generality of our assumptions, and tend to establish a relation between the attractive and repulsive forces to which the refraction and reflection of light are supposed to be owing. For it is found that when two media are placed in perfect contact, (such as that of a fluid with a solid, or of two fluids

* The principal experiments contained in this paper were made in 1816, and were signed by the president of the Physical Class of the Royal Society of Edinburgh. A brief notice of them was published in the Quarterly Journal for July—October, 1816, and a more extended paper was read at the Royal Society of Edinburgh on the 4th of January 1819. The difficulties of the subject, however, prevented me from pursuing it but at distant intervals; and the more fertile topic of polarisation afterwards required all the time I could devote to such inquiries.

[213] Brewster

213. **BREWSTER, Sir David** (1781-1868). *"On the Reflection and Decomposition of Light at the separating surfaces of media of the same and of different refractive powers."* Extracted from: *The Philosophical Transactions of the Royal Society of London*, Vol. 119, [1829]. ¶ 272 x 220 mm. 4to. Pages 187-205. 6 figs., 1 table. Dis-bound. Very good. S3646

$ 50

FIRST EDITION. "When white light is incident upon a surface which separates two different media, the portion that is reflected should, according to the Newtonian theory of light, preserve its whiteness, provided the thick-ness of either of the media exceed the eighty millionth of an inch. But since the dispersive powers of bodies are different, it must follow as a necessary consequence, that reflected light can never under any circumstances retain perfect whiteness, although the modification it experiences is not of sufficient amount to become sensible in ordinary experiments. The author during his investigations of the laws of polarization for light reflected at the separating surface of different media, had occasion to inclose oil of cassia between two prisms of flint glass, and was surprised to find that the light reflected was cf a blue colour. The fact was new, but might be readily explained upon the principle that although the refractive density of oil of cassia greatly exceeds that of flint glass for the mean rays, yet the action of these two bodies is nearly the same on the less refrangible rays: hence it may happen that a larger proportion of the former than of the latter is transmitted, and the pencil formed by reflexion will then appear blue. The partial decomposition thus effected in the incident rays will be the same in kind, though it may vary in degree, at different angles of incidence, and cannot therefore give rise to any variation of colour in the reflected rays, although they may differ in intensity according to the obliquity of the incidence. By using dif-ferent kinds of glass, and of interposed fluids, the author obtained various analogous results, different rays of the spectrum being sepa-rated according to the prevalence, in each particular case, of one or other of the opposite actions exerted upon them by the solid and the fluid medium. The author directed his attention more particularly to those conditions in which the nearest approach could be made to a perfect equilibrium of all the forces which affect the incident rays. The solids which he employed in his experiments were two prisms of plate glass, of which the sections were right-angled isosceles triangles, and differing hut very slightly in their refractive indices. The fluids were castor oil and balsam of copivi, the former having a less, and the latter a greater refractive power than the glass prisms; a thin film of either fluid being interposed between them. With castor oil, and within the limit of total reflexion, the reflected light is yellow; on gradually diminishing the angle of incidence, it passes in succession through all the tints of three orders of colours, of which the

details are presented in a table exhibiting those which correspond to different angles of incidence. When the incident light is homogeneous, no colours are seen, but the reflected pencils have their maxima and minima of intensity; like the rays of thin plates, or the fringes of inflected light formed by homogeneous rays. When copivi balsam is employed as the fluid medium, the same orders of colours are ob-tained by reflexion, but at smaller angles of incidence than with cas-tor oil. Having ascertained that at a temperature of about 94° the mean refractive index of the balsam became equal to that of the glass prisms, the author examined the influence of a gradual elevation of temperature upon the colours of the reflected pencils ; and found that no particular change marked the instant when the refractive densi-ties of the two media became equal; although when the temperature was increased considerably, the tints entirely disappeared. Analogous results were obtained by employing prisms of obsidian instead of glass." – Abstracts of the Papers Printed in the Philosophical Transactions of the Royal Society of London.

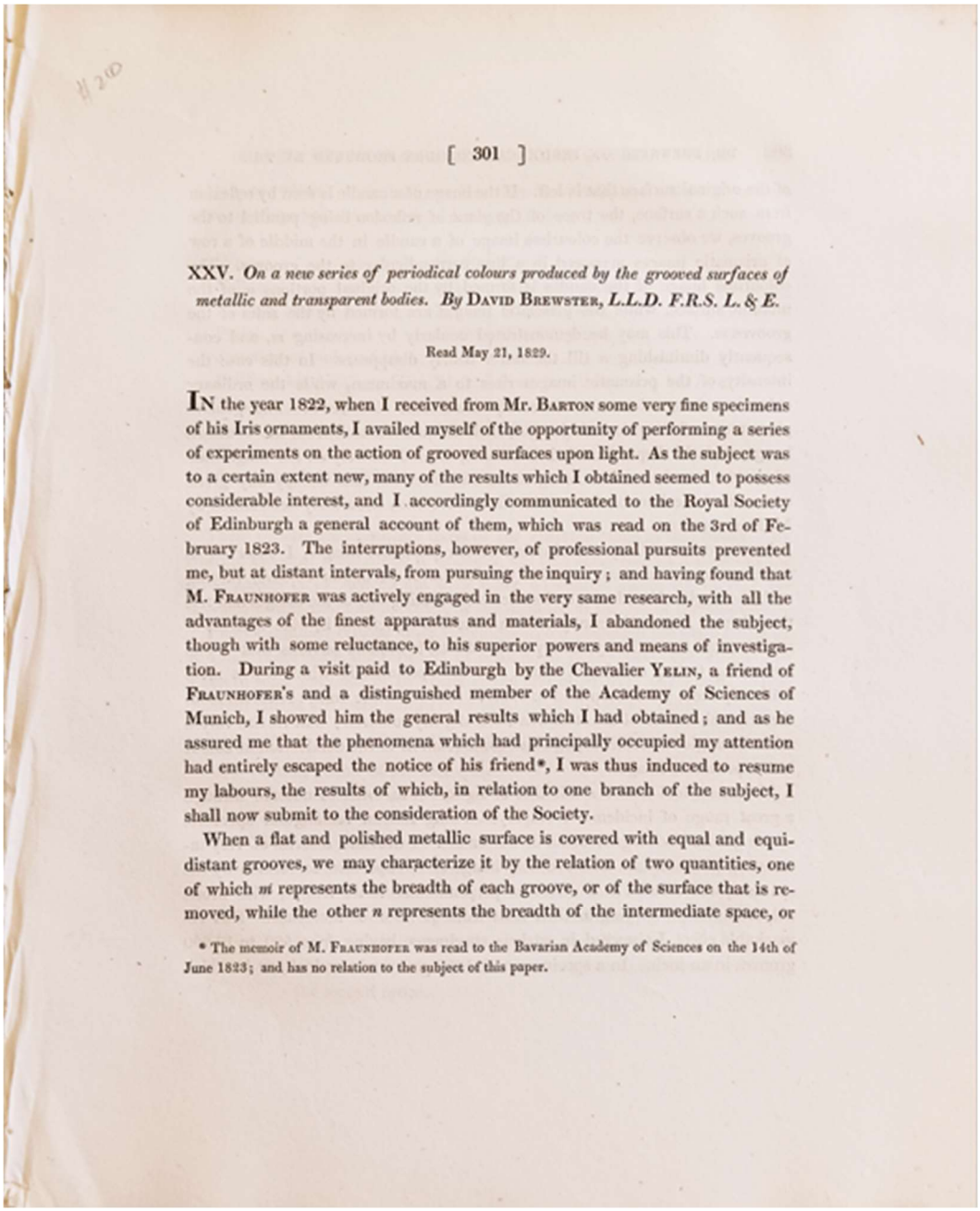
Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 446. See: DSB, II, pp. 451-454.

214. **BREWSTER, Sir David** (1781-1868). *"On a new series of periodical colours produced by the grooved surfaces of metallic and transparent bodies."* Extracted from: *The Philosophical Transactions of the Royal Society of London*, Vol. 119, [1829]. ¶ 279 x 223 mm. 4to. Pages 301-316. 4 figs. Dis-bound. Very good. S3647

$ 30

"IN the year 1822, when I received from Mr. BARTON some very fine specimens of his Iris ornaments, I availed myself of the opportunity of performing a series of experiments on the action of grooved surfaces upon light. As the subject was to a certain extent new, many of the results which I obtained seemed to possess considerable interest, and I accordingly communicated to the Royal Society of Edinburgh a general account of them, which was read on the 3rd of February 1823. The interruptions, however, of professional pursuits prevented me, but at distant intervals, from pursuing the inquiry; and having found that M. FRAUNHOFER was actively engaged in the very same research, with all the advantages of the finest apparatus and materials, I abandoned the subject, though with some reluctance, to his superior powers and means of investigation. During a visit paid to Edinburgh by the Chevalier YELIN, a friend of FRAUNHOFER's and a distinguished member of the Academy of Sciences of Munich, I showed him the general results

which I had obtained; and as he assured me that the phenomena which had principally occupied my attention had entirely escaped the notice of his friend*, I was thus induced to resume my labours, the results of which, in relation to one branch of the subject, I shall now submit to the consideration of the Society." – Brewster. Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 450. See: *DSB*, II, pp. 451-454.



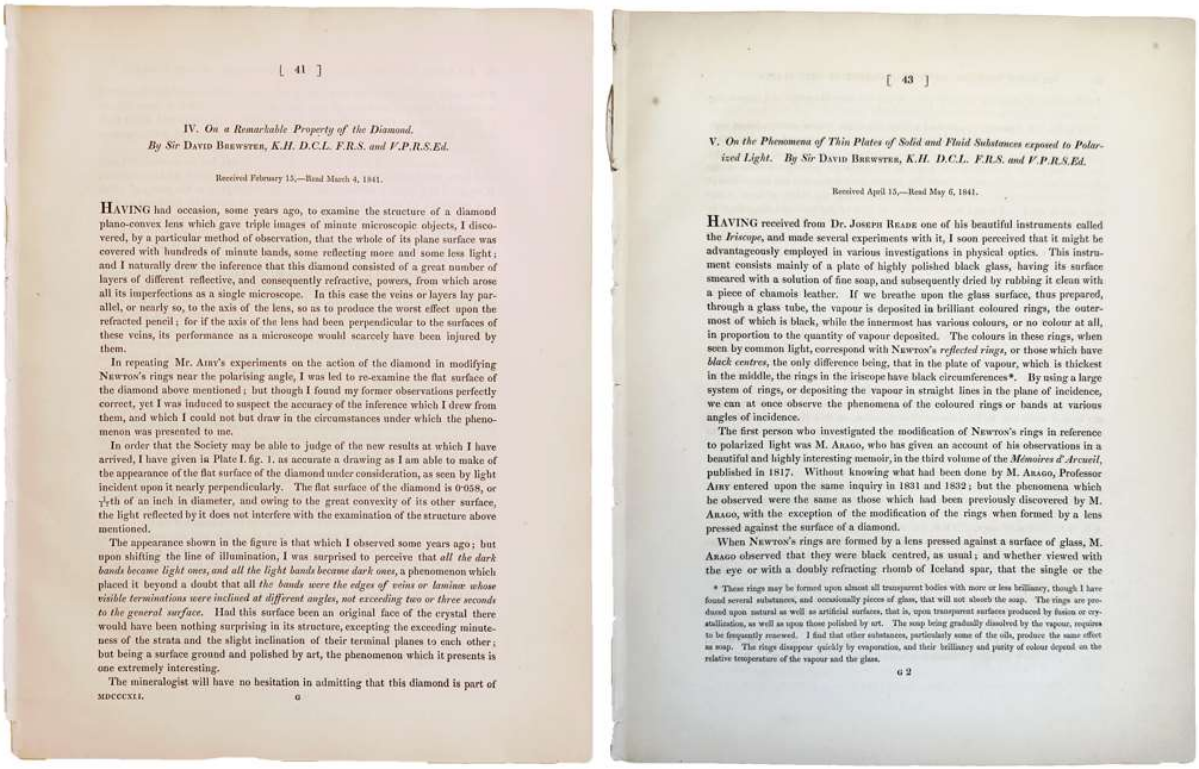
XXV. *On a new series of periodical colours produced by the grooved surfaces of metallic and transparent bodies. By* DAVID BREWSTER, *L.L.D. F.R.S. L. & E.*

Read May 21, 1829.

IN the year 1822, when I received from Mr. BARTON some very fine specimens of his Iris ornaments, I availed myself of the opportunity of performing a series of experiments on the action of grooved surfaces upon light. As the subject was to a certain extent new, many of the results which I obtained seemed to possess considerable interest, and I accordingly communicated to the Royal Society of Edinburgh a general account of them, which was read on the 3rd of February 1823. The interruptions, however, of professional pursuits prevented me, but at distant intervals, from pursuing the inquiry; and having found that M. FRAUNHOFER was actively engaged in the very same research, with all the advantages of the finest apparatus and materials, I abandoned the subject, though with some reluctance, to his superior powers and means of investigation. During a visit paid to Edinburgh by the Chevalier YELIN, a friend of FRAUNHOFER's and a distinguished member of the Academy of Sciences of Munich, I showed him the general results which I had obtained; and as he assured me that the phenomena which had principally occupied my attention had entirely escaped the notice of his friend*, I was thus induced to resume my labours, the results of which, in relation to one branch of the subject, I shall now submit to the consideration of the Society.

When a flat and polished metallic surface is covered with equal and equidistant grooves, we may characterize it by the relation of two quantities, one of which m represents the breadth of each groove, or of the surface that is removed, while the other n represents the breadth of the intermediate space, or

* The memoir of M. FRAUNHOFER was read to the Bavarian Academy of Sciences on the 14th of June 1823; and has no relation to the subject of this paper.



[41]

IV. *On a Remarkable Property of the Diamond.*
By Sir David Brewster, *K.H. D.C.L. F.R.S. and V.P.R.S.Ed.*

Received February 15,—Read March 4, 1841.

HAVING had occasion, some years ago, to examine the structure of a diamond plano-convex lens which gave triple images of minute microscopic objects, I discovered, by a particular method of observation, that the whole of its plane surface was covered with hundreds of minute bands, some reflecting more and some less light; and I naturally drew the inference that this diamond consisted of a great number of layers of different reflective, and consequently refractive, powers, from which arose all its imperfections as a single microscope. In this case the veins or layers lay parallel, or nearly so, to the axis of the lens, so as to produce the worst effect upon the refracted pencil; for if the axis of the lens had been perpendicular to the surfaces of these veins, its performance as a microscope would scarcely have been injured by them.

In repeating Mr. Airy's experiments on the action of the diamond in modifying Newton's rings near the polarising angle, I was led to re-examine the flat surface of the diamond above mentioned; but though I found my former observations perfectly correct, yet I was induced to suspect the accuracy of the inference which I drew from them, and which I could not but draw in the circumstances under which the phenomenon was presented to me.

In order that the Society may be able to judge of the new results at which I have arrived, I have given in Plate I. fig. 1. as accurate a drawing as I am able to make of the appearance of the flat surface of the diamond under consideration, as seen by light incident upon it nearly perpendicularly. The flat surface of the diamond is 0·058, or $\frac{1}{17}$th of an inch in diameter, and owing to the great convexity of its other surface, the light reflected by it does not interfere with the examination of the structure above mentioned.

The appearance shown in the figure is that which I observed some years ago; but upon shifting the line of illumination, I was surprised to perceive that *all the dark bands became light ones, and all the light bands became dark ones*, a phenomenon which placed it beyond a doubt that all *the bands were the edges of veins or laminæ whose visible terminations were inclined at different angles, not exceeding two or three seconds to the general surface.* Had this surface been an original face of the crystal there would have been nothing surprising in its structure, excepting the exceeding minuteness of the strata and the slight inclination of their terminal planes to each other; but being a surface ground and polished by art, the phenomenon which it presents is one extremely interesting.

The mineralogist will have no hesitation in admitting that this diamond is part of

MDCCCXLI. a

[43]

V. *On the Phenomena of Thin Plates of Solid and Fluid Substances exposed to Polarized Light. By Sir* David Brewster, *K.H. D.C.L. F.R.S. and V.P.R.S.Ed.*

Received April 15,—Read May 6, 1841.

HAVING received from Dr. Joseph Reade one of his beautiful instruments called the *Iriscope*, and made several experiments with it, I soon perceived that it might be advantageously employed in various investigations in physical optics. This instrument consists mainly of a plate of highly polished black glass, having its surface smeared with a solution of fine soap, and subsequently dried by rubbing it clean with a piece of chamois leather. If we breathe upon the glass surface, thus prepared, through a glass tube, the vapour is deposited in brilliant coloured rings, the outermost of which is black, while the innermost has various colours, or no colour at all, in proportion to the quantity of vapour deposited. The colours in these rings, when seen by common light, correspond with Newton's *reflected rings*, or those which have *black centres*, the only difference being, that in the plate of vapour, which is thickest in the middle, the rings in the iriscope have black circumferences*. By using a large system of rings, or depositing the vapour in straight lines in the plane of incidence, we can at once observe the phenomena of the coloured rings or bands at various angles of incidence.

The first person who investigated the modification of Newton's rings in reference to polarized light was M. Arago, who has given an account of his observations in a beautiful and highly interesting memoir, in the third volume of the *Mémoires d'Arcueil*, published in 1817. Without knowing what had been done by M. Arago, Professor Airy entered upon the same inquiry in 1831 and 1832; but the phenomena which he observed were the same as those which had been previously discovered by M. Arago, with the exception of the modification of the rings when formed by a lens pressed against the surface of a diamond.

When Newton's rings are formed by a lens pressed against a surface of glass, M. Arago observed that they were black centred, as usual; and whether viewed with the eye or with a doubly refracting rhomb of Iceland spar, that the single or the

* These rings may be formed upon almost all transparent bodies with more or less brilliancy, though I have found several substances, and occasionally pieces of glass, that will not absorb the soap. The rings are produced upon natural as well as artificial surfaces, that is, upon transparent surfaces produced by fusion or crystallization, as well as upon those polished by art. The soap being gradually dissolved by the vapour, requires to be frequently renewed. I find that other substances, particularly some of the oils, produce the same effect as soap. The rings disappear quickly by evaporation, and their brilliancy and purity of colour depend on the relative temperature of the vapour and the glass.

G 2

215. **BREWSTER, Sir David** (1781-1868). [2 papers]: *"On a remarkable property of the diamond."*

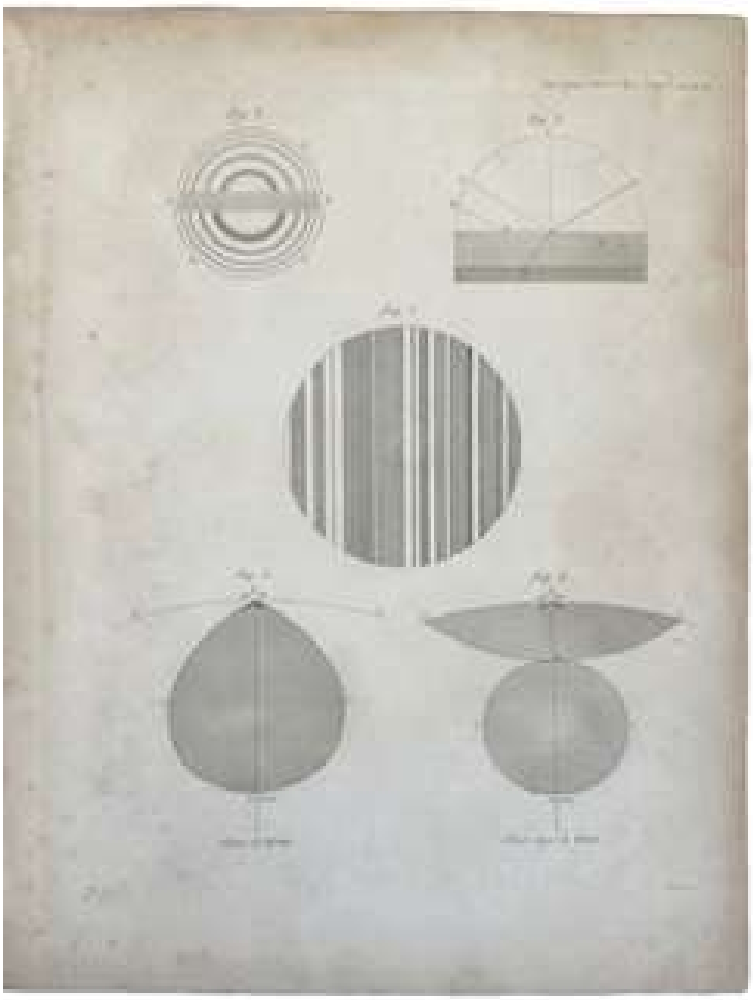
with: *"On the phenomena of thin plates of solid and fluid substances exposed to polarized light."* Extracted from: The Philosophical Transactions of the Royal Society of London, Vol. 131, [1841]. ¶ 288 x 224 mm. 4to. Pages 41-42; 43-58. 1 engraved plate (second article). Dis-bound. Very good. S3648

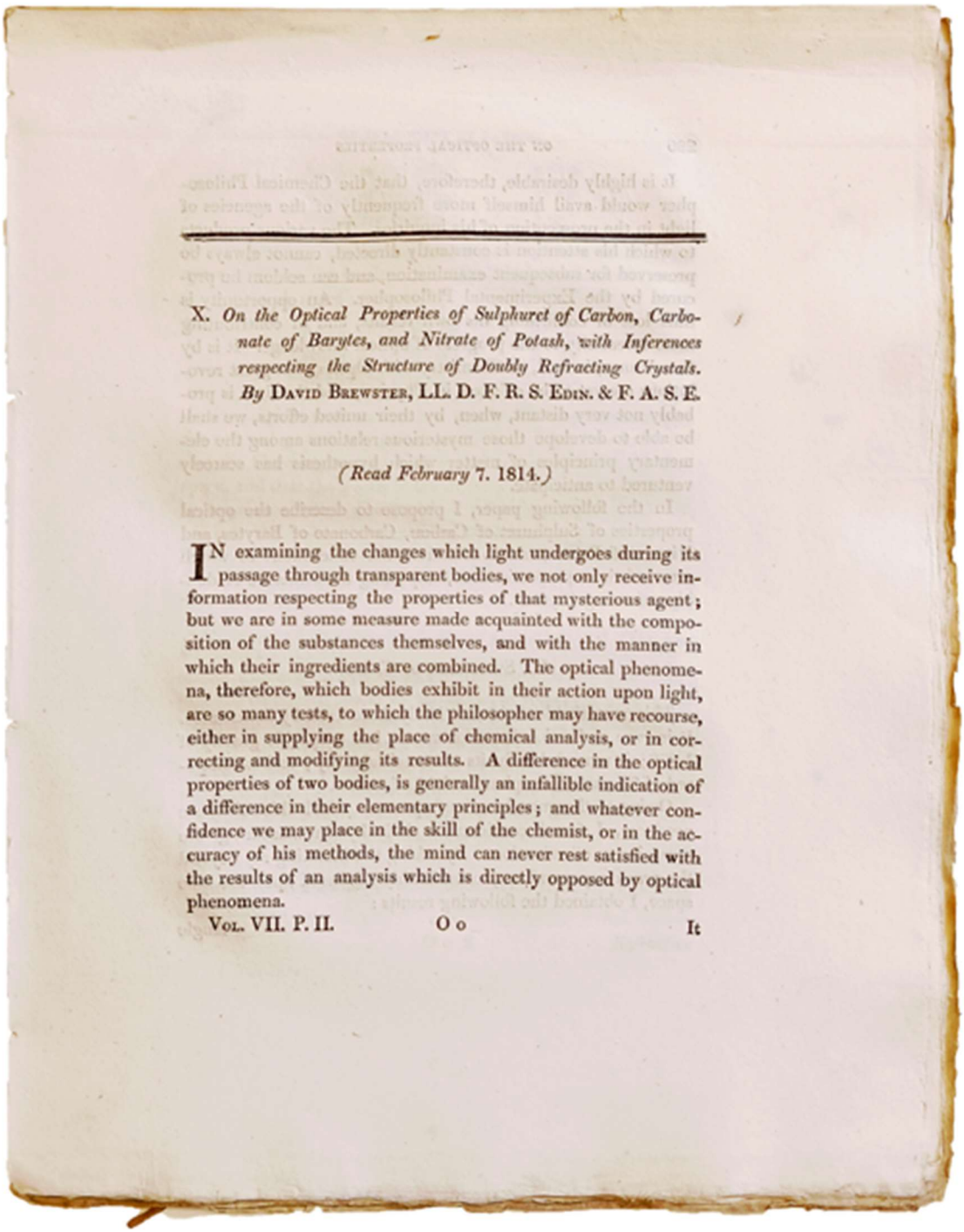
$ 50

FIRST EDITIONS. [1] "Having had occasion, some years ago, to examine the structure of a diamond plano-convex lens which gave triple images of minute microscopic objects, I discovered, by a particular method of observation, that the whole of its plane surface was covered with . . ."

[2] "Having received from Dr. Joseph Reade one of his beautiful instruments called the Iriscope, and made several experiments with it, I soon perceived that it might be advantageously employed in various investigations in physical optics. This instrument consists mainly of a plate of highly polished black glass, having its surface smeared with a solution of fine soap, and subsequently dried by rubbing it clean with a piece of chamois leather. If we breathe upon the glass surface, thus prepared, through a glass tube, the vapour is deposited in brilliant coloured rings, the outermost of which is black, while the innermost has various colours, or no

colour at all, in proportion to the quantity of vapour deposited. The colours in these rings, when seen by common light, correspond with Newton's reflected rings, or those which have black centres, the only difference being, that in the plate of vapour, which is thickest in the middle, the rings in the iriscope have black circumferences. By using a large system of rings, or depositing the vapour in straight lines in the plane of incidence, we can at once observe the phenomena of the coloured rings or bands at various angles of incidence. The first person who investigated the modification of Newton's rings in reference to polarized light was M. Arago, who has given an account of his observations in a beautiful and highly interesting memoir, in the third volume of the Mémoires d' Arcueil, published in 1817. Without knowing what had been done by M. Arago, Professor Airy entered upon the same inquiry in 1831 and 1832; but the phenomena which he observed were the same as those which had been previously discovered by M. Arago, with the exception of the modification of the rings when formed by a lens pressed against the surface of a diamond." – Brewster. Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 748; 751. See: DSB, II, pp. 451-454.





X. *On the Optical Properties of Sulphuret of Carbon, Carbonate of Barytes, and Nitrate of Potash, with Inferences respecting the Structure of Doubly Refracting Crystals.* By DAVID BREWSTER, LL. D. F. R. S. EDIN. & F. A. S. E.

(Read February 7. 1814.)

IN examining the changes which light undergoes during its passage through transparent bodies, we not only receive information respecting the properties of that mysterious agent; but we are in some measure made acquainted with the composition of the substances themselves, and with the manner in which their ingredients are combined. The optical phenomena, therefore, which bodies exhibit in their action upon light, are so many tests, to which the philosopher may have recourse, either in supplying the place of chemical analysis, or in correcting and modifying its results. A difference in the optical properties of two bodies, is generally an infallible indication of a difference in their elementary principles; and whatever confidence we may place in the skill of the chemist, or in the accuracy of his methods, the mind can never rest satisfied with the results of an analysis which is directly opposed by optical phenomena.

VOL. VII. P. II. O o It

216. **BREWSTER, Sir David** (1781-1868). *"On the Optical Properties of Sulphuret of Carbon, Carbonate of Barytes, and Nitrate of Potash, with Inferences respecting the Structure of Doubly Refracting Crystals."* Extracted from: *The Transactions of the Royal Society of Edinburgh*, Vol. 7, [1815]. ¶ 287 x 228 mm. 4to. Pages (285)-302. Tables; occasional foxing. Dis-bound. Very good. S3649

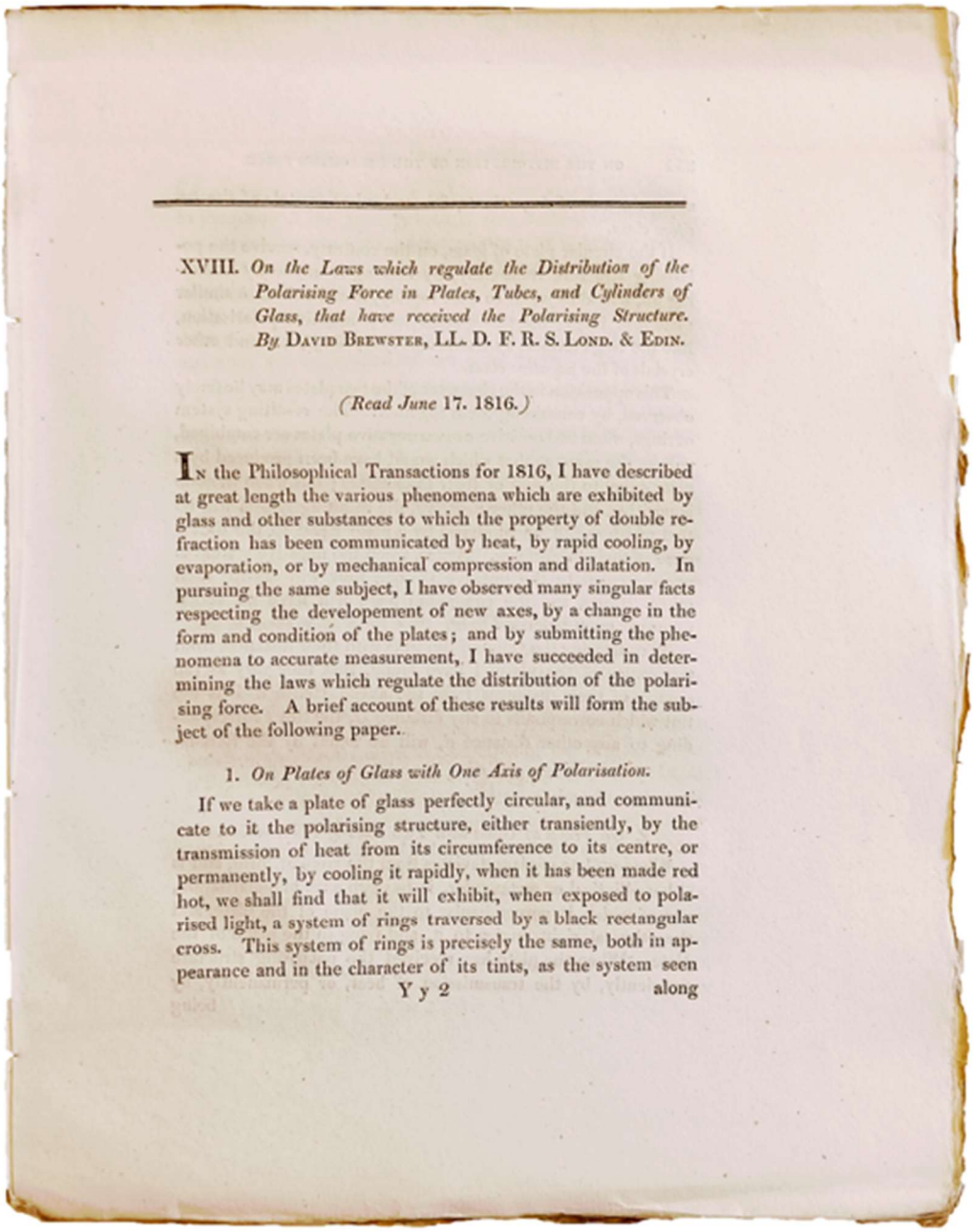
$ 55

FIRST EDITION. Brewster parted company with Newton and the traditional projectile theory of light by rejecting a central role for short-range forces in accounting for inflection. His optical research was directed to discovering the interaction of light and different forms of matter. From the start of his research career these interactions were conceived in terms of particles and forces and his subsequent experience only increased his commitment to this paradigm. His important work on polarization and double refraction was largely conceived in terms of differential forces acting on the ordinary and extraordinary rays. Moreover, his commitment to the corpuscular nature of light drew considerable strength from chemistry since he firmly believed that it would be "by the alliance . . . of Chemistry with Optics, that great revolutions are yet to be effected in Physics." See page 286 of this article. See: Cantor, "Brewster on the nature of light," in: Morrison-Low and Christie, 'Martyr of science', p. 71. Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 196. See: DSB, II, pp. 451-454.

217. **BREWSTER, Sir David** (1781-1868). *"On the laws which regulate the distribution of the polarising force in plates, tubes, and cylinders of glass, that have received the polarising structure."* Extracted from: *The Transactions of the Royal Society of Edinburgh*, Vol. 8, [1818]. ¶ 287 x 228 mm. 4to. Pages (353)-372. 1 engraved plate. Dis-bound. Very good. S3650

$ 55

FIRST EDITION. This paper contains one of many statements of Brewster's most famous law; Brewster's law, which connects refractive index with angle of polarization. In this paper Brewster described for the first time a teinometer, an instrument designed to ascertain the elasticity of bodies. See: Cantor, "Brewster on the nature of light," in: Morrison-Low and Christie, 'Martyr of science', p. 69; Morrison-Low, "Brewster and scientific instruments," in Morrison-Low and Christie, 'Martyr of science', p. 59. Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 230. See: DSB, II, pp. 451-454.



XVIII. *On the Laws which regulate the Distribution of the Polarising Force in Plates, Tubes, and Cylinders of Glass, that have received the Polarising Structure.* By DAVID BREWSTER, LL. D. F. R. S. LOND. & EDIN.

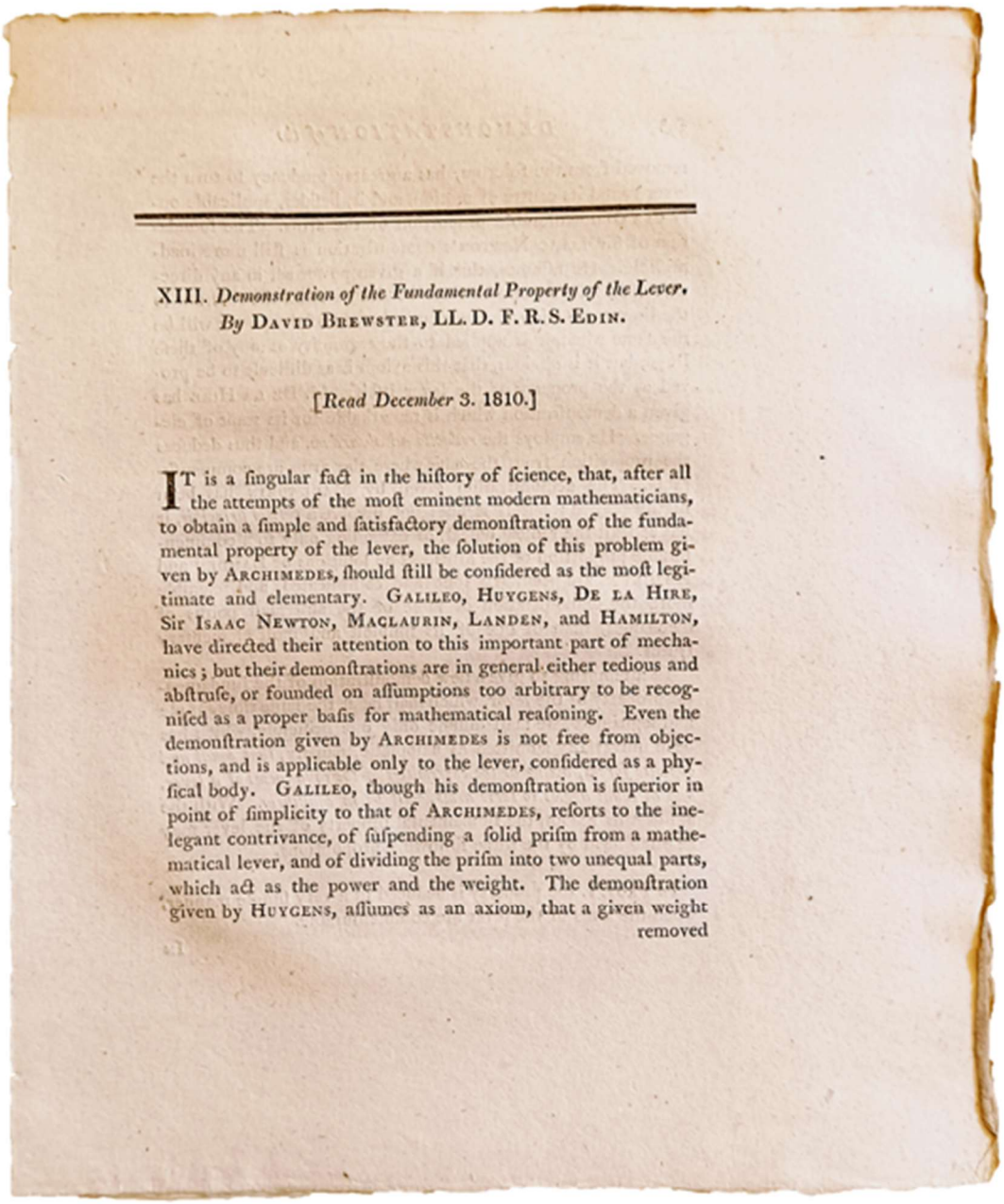
(Read June 17. 1816.*)*

IN the Philosophical Transactions for 1816, I have described at great length the various phenomena which are exhibited by glass and other substances to which the property of double refraction has been communicated by heat, by rapid cooling, by evaporation, or by mechanical compression and dilatation. In pursuing the same subject, I have observed many singular facts respecting the developement of new axes, by a change in the form and condition of the plates; and by submitting the phenomena to accurate measurement, I have succeeded in determining the laws which regulate the distribution of the polarising force. A brief account of these results will form the subject of the following paper.

1. *On Plates of Glass with One Axis of Polarisation.*

If we take a plate of glass perfectly circular, and communicate to it the polarising structure, either transiently, by the transmission of heat from its circumference to its centre, or permanently, by cooling it rapidly, when it has been made red hot, we shall find that it will exhibit, when exposed to polarised light, a system of rings traversed by a black rectangular cross. This system of rings is precisely the same, both in appearance and in the character of its tints, as the system seen

[217] Brewster



XIII. *Demonstration of the Fundamental Property of the Lever.* By DAVID BREWSTER, LL.D. F.R.S. EDIN.

[*Read December* 3. 1810.]

IT is a ſingular fact in the hiſtory of ſcience, that, after all the attempts of the moſt eminent modern mathematicians, to obtain a ſimple and ſatisfactory demonſtration of the fundamental property of the lever, the ſolution of this problem given by ARCHIMEDES, ſhould ſtill be conſidered as the moſt legitimate and elementary. GALILEO, HUYGENS, DE LA HIRE, Sir ISAAC NEWTON, MACLAURIN, LANDEN, and HAMILTON, have directed their attention to this important part of mechanics; but their demonſtrations are in general either tedious and abſtruſe, or founded on aſſumptions too arbitrary to be recogniſed as a proper baſis for mathematical reaſoning. Even the demonſtration given by ARCHIMEDES is not free from objections, and is applicable only to the lever, conſidered as a phyſical body. GALILEO, though his demonſtration is ſuperior in point of ſimplicity to that of ARCHIMEDES, reſorts to the inelegant contrivance, of ſuſpending a ſolid priſm from a mathematical lever, and of dividing the priſm into two unequal parts, which act as the power and the weight. The demonſtration given by HUYGENS, aſſumes as an axiom, that a given weight removed

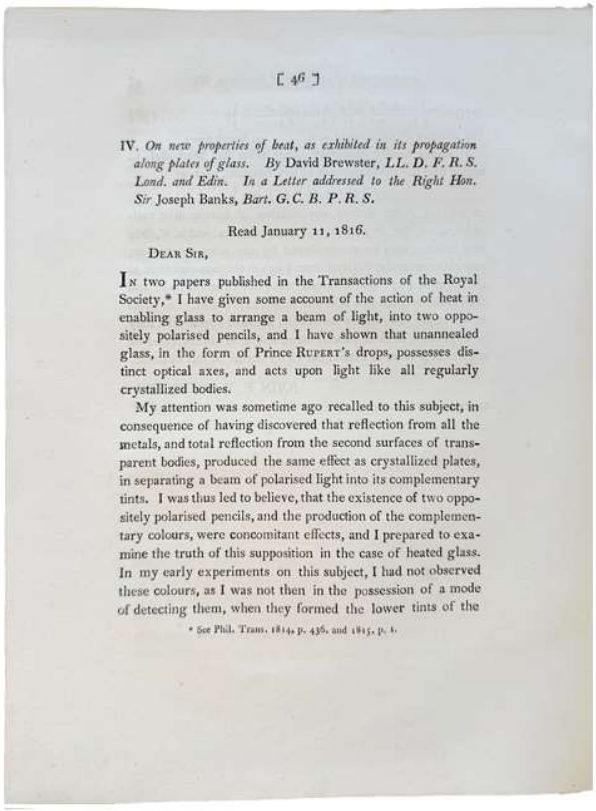
218. **BREWSTER, Sir David** (1781-1868). *"Demonstration of the fundamental property of the lever."* Extracted from: *The Transactions of the Royal Society of Edinburgh*, Vol. 6, [1812]. ¶ 285 x 226 mm. 4to. Pages (397)-404. 1 engraved folding plate. Dis-bound. Very good. S3651

$ 25

FUNDAMENTAL PROPERTY OF THE LEVER. "It is a singular fact in the history of science, that, after all the attempts of the most eminent modern mathematicians, to obtain a simple and satisfactory demonstration of the fundamental property of the lever, the solution of this problem given by Archimedes, should still be considered as the most legitimate and elementary. Galileo, Huygens, De la Hire, Sir Isaac Newton, Maclaurin, Landen, and Hamilton,

have directed their attention to this important part of mechanics; but their demonstrations are in general either tedious and abstruse, or founded on assumptions too arbitrary to be recognised as a proper basis for mathematical reasoning. Even the demonstration given by Archimedes is not free from objections, and is applicable only to the lever, considered as a physical body." – Abstract.

Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 184. See: DSB, II, pp. 451-454.



[46]

IV. *On new properties of heat, as exhibited in its propagation along plates of glass. By* David Brewster, *LL. D. F. R. S. Lond. and Edin. In a Letter addressed to the Right Hon. Sir* Joseph Banks, *Bart. G. C. B. P. R. S.*

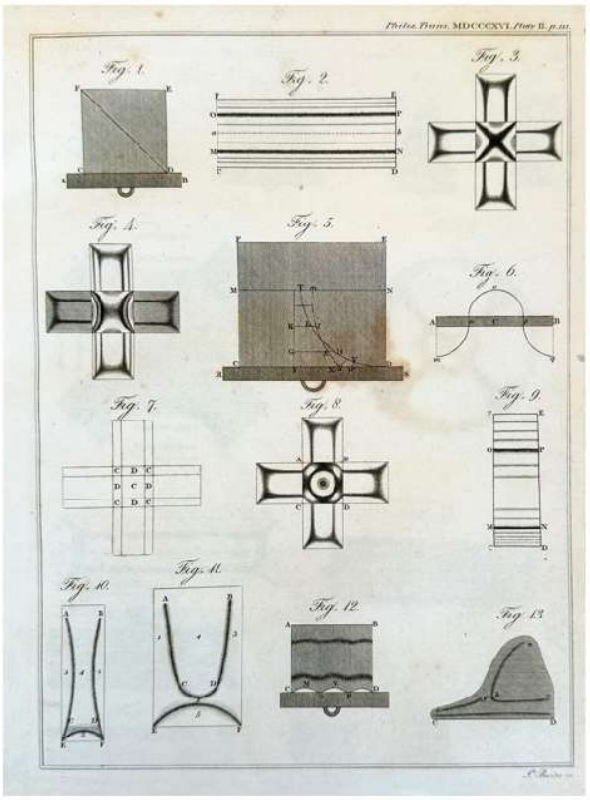
Read January 11, 1816.

DEAR SIR,

IN two papers published in the Transactions of the Royal Society,* I have given some account of the action of heat in enabling glass to arrange a beam of light, into two oppositely polarised pencils, and I have shown that unannealed glass, in the form of Prince RUPERT's drops, possesses distinct optical axes, and acts upon light like all regularly crystallized bodies.

My attention was sometime ago recalled to this subject, in consequence of having discovered that reflection from all the metals, and total reflection from the second surfaces of transparent bodies, produced the same effect as crystallized plates, in separating a beam of polarised light into its complementary tints. I was thus led to believe, that the existence of two oppositely polarised pencils, and the production of the complementary colours, were concomitant effects, and I prepared to examine the truth of this supposition in the case of heated glass. In my early experiments on this subject, I had not observed these colours, as I was not then in the possession of a mode of detecting them, when they formed the lower tints of the

* See Phil. Trans. 1814, p. 436. and 1815, p. 1.



219. **BREWSTER, Sir David** (1781-1868). *"On new properties of heat, as exhibited in its propagation along plates of glass."* Extracted from: *The Philosophical Transactions of the Royal Society of London*, Vol. 106, 1816. ¶ 260 x 202 mm. 4to. Pages 45-114. 1 table, 4 engraved plates. Dis-bound. Very good. S3653

$ 35

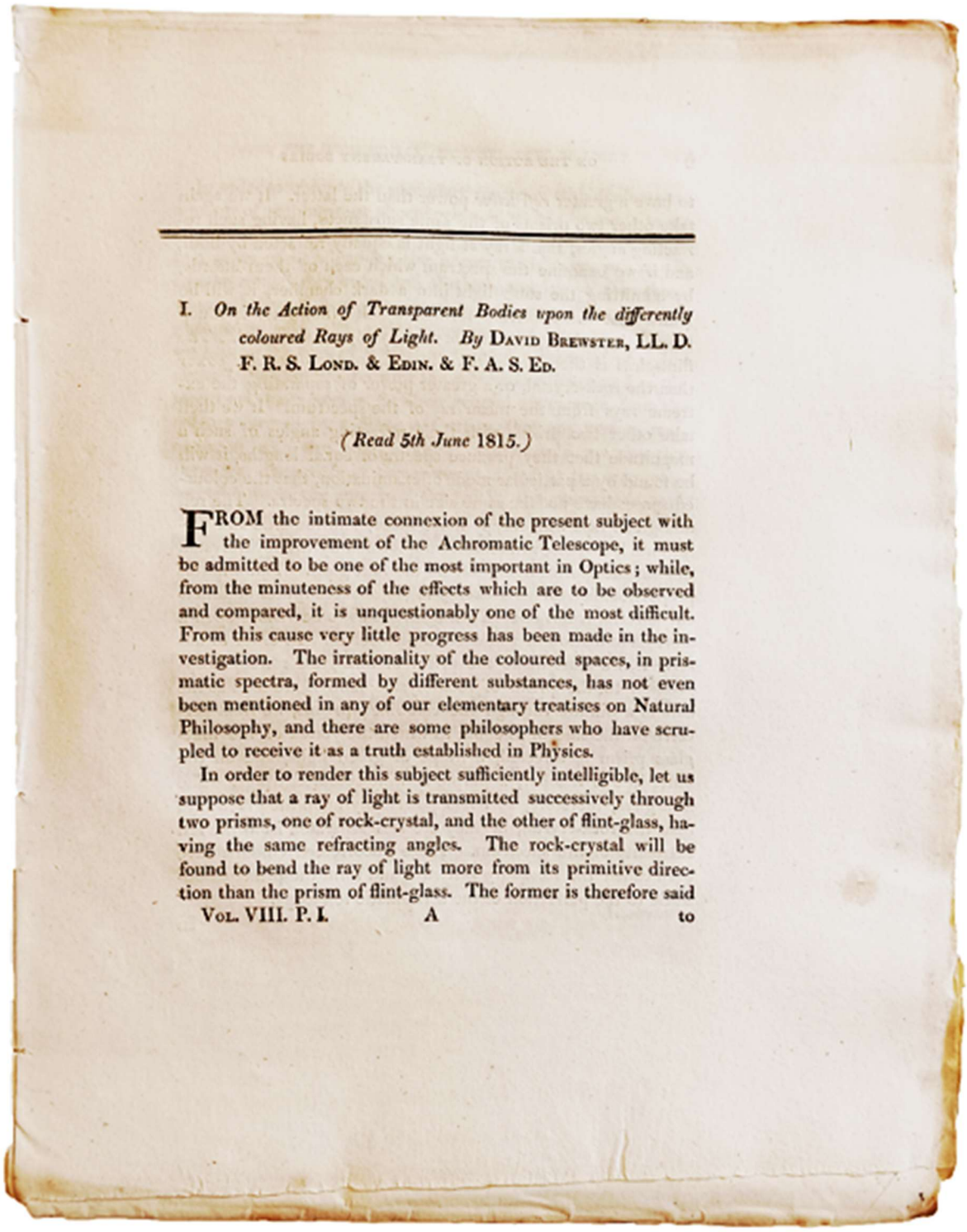
Abstract: In a paper communicated to the Society in May 1814, Dr. Brewster observed that glass, when raised to a high temperature, had the property of depolarizing light, and in this respect resembled crystallized substances; but he did not at that time succeed in tracing a resemblance in other points, which he left for future investigation. On resuming this inquiry in the present paper, the subject is divided into two parts; in the former of which he describes the transient effects

exhibited during the propagation of heat along plates of glass, whether received from adjacent bodies or communicated to them; and in the latter he describes the permanent optical properties produced in glass by being suddenly and partially cooled when red hot. Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 205. See: DSB, II, pp. 451-454.

220. **BREWSTER, Sir David** (1781-1868). *"On the action of transparent bodies upon the differently coloured rays of light."* Extracted from: *The Transactions of the Royal Society of Edinburgh*, Vol. 8, [1818]. ¶ 287 x 225 mm. 4to. Pages (1)-23. Disbound. Very good. S3654

$ 40

From the intimate connexion of the present subject with the improvement of the Achromatic Telescope, it must be admitted to be one of the most important in Optics; while, from the minuteness of the effects which are to be observed and compared, it is unquestionably one of the most difficult. From this cause very little progress has been made in the investigation. The irrationality of the coloured spaces, in prismatic spectra, formed by different substances, has not even been mentioned in any of our elementary treatises on Natural Philosophy, and there are some philosophers who have scrupled to receive it as a truth established in Physics. [Abstract]. Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 225. See: *DSB*, II, pp. 451-454.



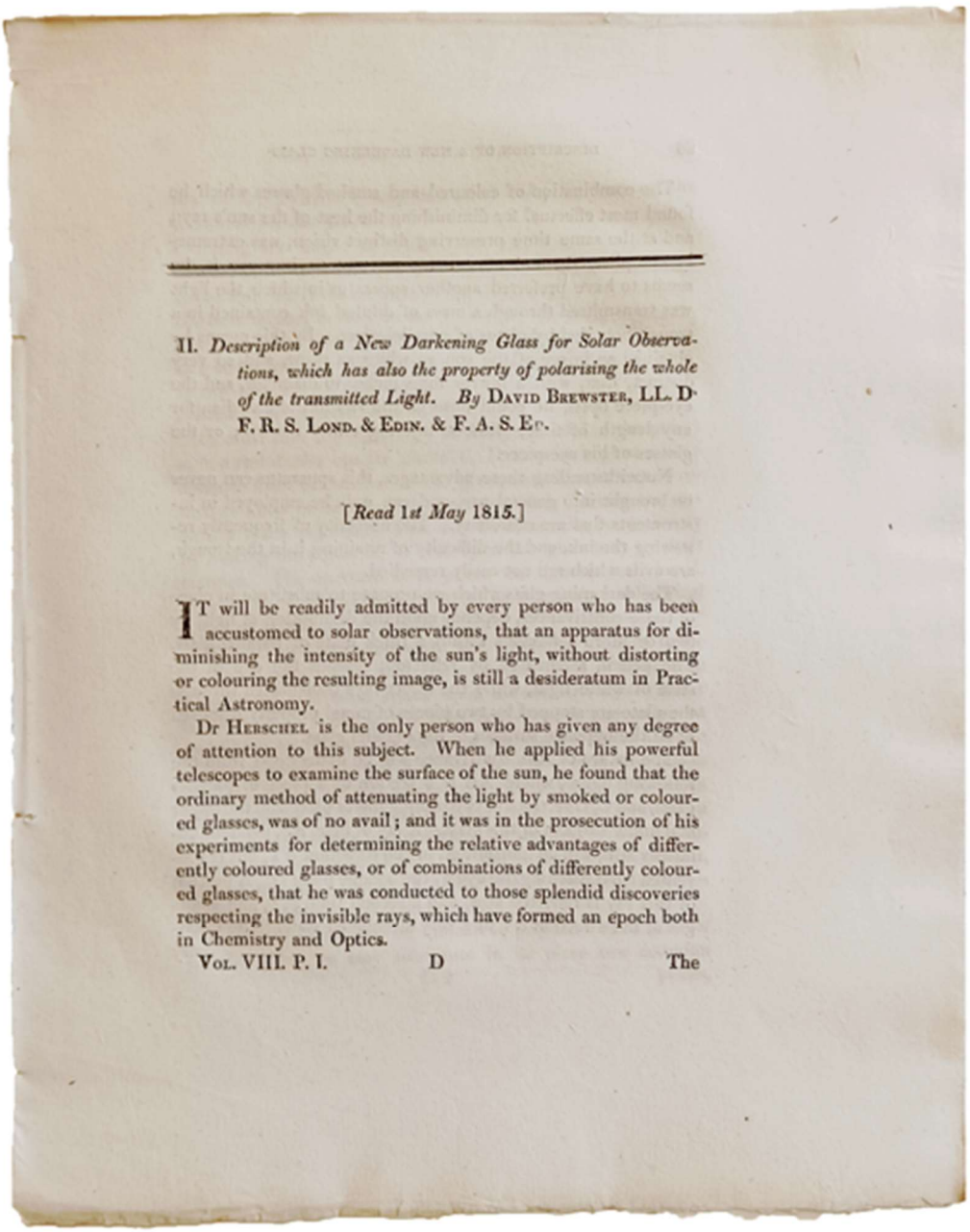
I. *On the Action of Transparent Bodies upon the differently coloured Rays of Light.* *By* David Brewster, LL. D. F. R. S. Lond. & Edin. & F. A. S. Ed.

(Read 5th June 1815.*)*

FROM the intimate connexion of the present subject with the improvement of the Achromatic Telescope, it must be admitted to be one of the most important in Optics; while, from the minuteness of the effects which are to be observed and compared, it is unquestionably one of the most difficult. From this cause very little progress has been made in the investigation. The irrationality of the coloured spaces, in prismatic spectra, formed by different substances, has not even been mentioned in any of our elementary treatises on Natural Philosophy, and there are some philosophers who have scrupled to receive it as a truth established in Physics.

In order to render this subject sufficiently intelligible, let us suppose that a ray of light is transmitted successively through two prisms, one of rock-crystal, and the other of flint-glass, having the same refracting angles. The rock-crystal will be found to bend the ray of light more from its primitive direction than the prism of flint-glass. The former is therefore said

[220] Brewster



II. *Description of a New Darkening Glass for Solar Observations, which has also the property of polarising the whole of the transmitted Light.* By DAVID BREWSTER, LL. D. F. R. S. LOND. & EDIN. & F. A. S. Ec.

[*Read 1st May* 1815.]

IT will be readily admitted by every person who has been accustomed to solar observations, that an apparatus for diminishing the intensity of the sun's light, without distorting or colouring the resulting image, is still a desideratum in Practical Astronomy.

Dr HERSCHEL is the only person who has given any degree of attention to this subject. When he applied his powerful telescopes to examine the surface of the sun, he found that the ordinary method of attenuating the light by smoked or coloured glasses, was of no avail; and it was in the prosecution of his experiments for determining the relative advantages of differently coloured glasses, or of combinations of differently coloured glasses, that he was conducted to those splendid discoveries respecting the invisible rays, which have formed an epoch both in Chemistry and Optics.

VOL. VIII. P. I. D The

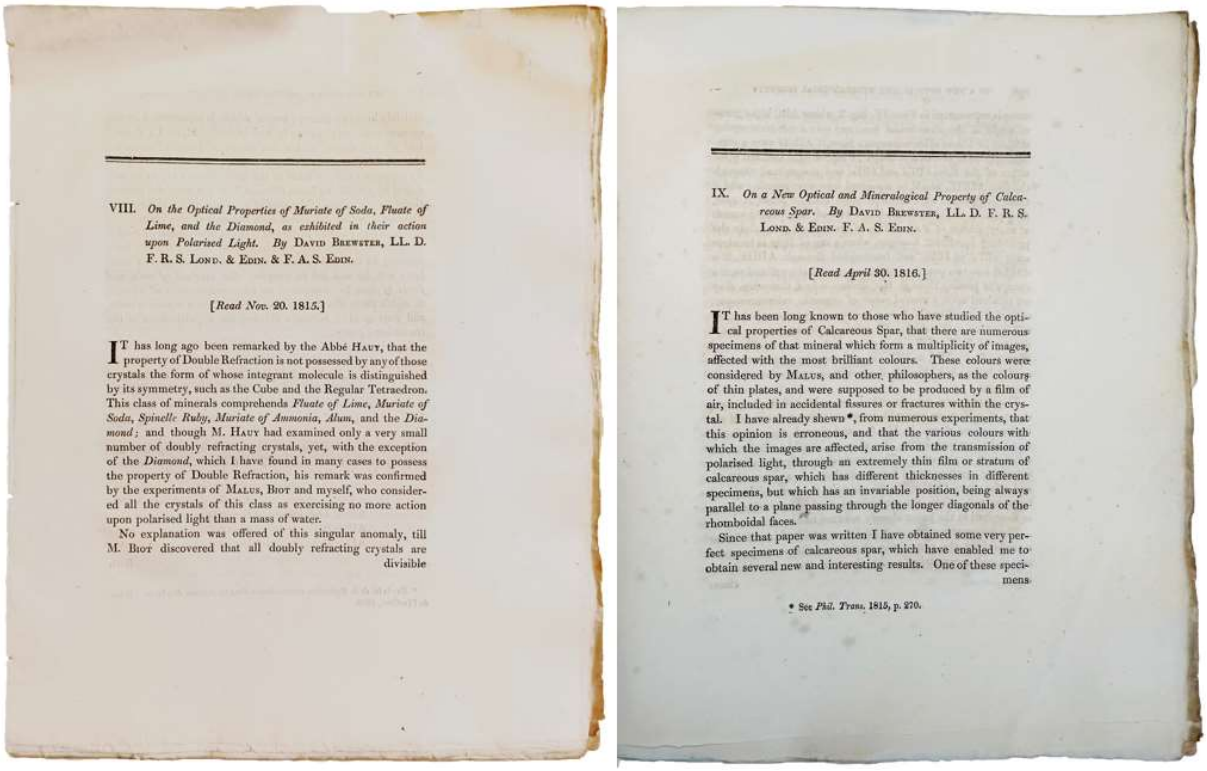
221. **BREWSTER, Sir David** (1781-1868). *"Description of a new darkening glass for solar observations, which has also the property of polarising the whole of the transmitted light."* Extracted from: *The Transactions of the Royal Society of Edinburgh*, Vol. 8, [1818]. ¶ 287 x 225 mm. 4to. Pages (25)-29. 1 fig. Dis-bound. Very good. S3655

$ 45

It will be readily admitted by every person who has been accustomed to solar observations, that an apparatus for diminishing the intensity of the sun's light, without distorting or colouring the resulting image, is still a desideratum in Practical Astronomy.

Dr Herschel is the only person who has given any degree of attention to this subject. When he applied his powerful telescopes to examine the surface of the sun, he found that the ordinary method of attenuating the light by smoked or coloured glasses, was of no avail; and it was in the prosecution of his experiments for determining the relative advantages of differently coloured glasses, or of combinations of differently coloured glasses, that he was conducted to those splendid discoveries respecting the invisible rays, which have formed an epoch both in Chemistry and Optics. [Abstract].

Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 226. See: DSB, II, pp. 451-454.



VIII. *On the Optical Properties of Muriate of Soda, Fluate of Lime, and the Diamond, as exhibited in their action upon Polarised Light.* By DAVID BREWSTER, LL. D. F. R. S. LOND. & EDIN. & F. A. S. EDIN.

[*Read Nov.* 20. 1815.]

IT has long ago been remarked by the Abbé HAUY, that the property of Double Refraction is not possessed by any of those crystals the form of whose integrant molecule is distinguished by its symmetry, such as the Cube and the Regular Tetraedron. This class of minerals comprehends *Fluate of Lime*, *Muriate of Soda*, *Spinelle Ruby*, *Muriate of Ammonia*, *Alum*, and the *Diamond*; and though M. HAUY had examined only a very small number of doubly refracting crystals, yet, with the exception of the *Diamond*, which I have found in many cases to possess the property of Double Refraction, his remark was confirmed by the experiments of MALUS, BIOT and myself, who considered all the crystals of this class as exercising no more action upon polarised light than a mass of water.

No explanation was offered of this singular anomaly, till M. BIOT discovered that all doubly refracting crystals are divisible

IX. *On a New Optical and Mineralogical Property of Calcareous Spar.* By DAVID BREWSTER, LL. D. F. R. S. LOND. & EDIN. F. A. S. EDIN.

[*Read April* 30. 1816.]

IT has been long known to those who have studied the optical properties of Calcareous Spar, that there are numerous specimens of that mineral which form a multiplicity of images, affected with the most brilliant colours. These colours were considered by MALUS, and other philosophers, as the colours of thin plates, and were supposed to be produced by a film of air, included in accidental fissures or fractures within the crystal. I have already shewn *, from numerous experiments, that this opinion is erroneous, and that the various colours with which the images are affected, arise from the transmission of polarised light, through an extremely thin film or stratum of calcareous spar, which has different thicknesses in different specimens, but which has an invariable position, being always parallel to a plane passing through the longer diagonals of the rhomboidal faces.

Since that paper was written I have obtained some very perfect specimens of calcareous spar, which have enabled me to obtain several new and interesting results. One of these specimens

* See *Phil. Trans.* 1815, p. 270.

222. **BREWSTER, Sir David** (1781-1868). *"On the optical properties of muriate of soda, fluate of lime, and the diamond, as exhibited in their action upon polarised light."*

with: *"On a new optical and mineralogical property of calcareous spar."* Extracted from: *The Transactions of the Royal Society of Edinburgh*, Vol. 8, [1818]. ¶ 281 x 226 mm. 4to. Pages (157)-164; (165)-169. 1 engraved plate. Dis-bound. Very good. S3656

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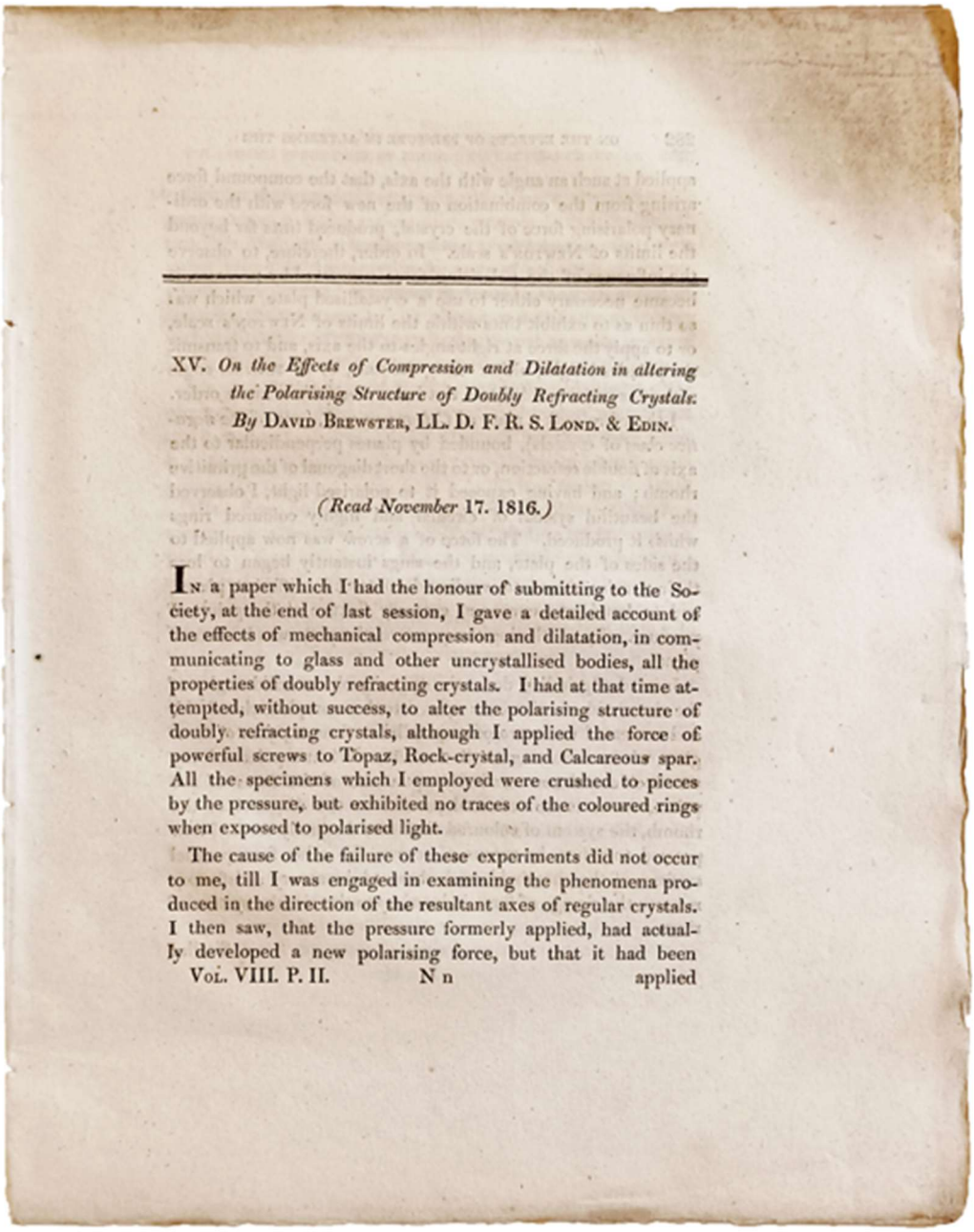
FIRST EDITION. In late 1815 Brewster published his recognition that Biot and Laplace had elaborated force theories to account for double refraction. In this second paper, Brewster promulgated his discovery that heat and mechanical stress

could produce double refraction in glass. Thus, the application of external pressure could realign the forces internal to a piece of glass. Force, to Brewster, seemed responsible for light-matter interaction.

See: Cantor, "Brewster on the nature of light," in: Morrison-Low and Christie, '*Martyr of science'*, p. 69. Morrison-Low, "*Published writings of Sir David Brewster: a bibliography*," in: Morrison-Low and Christie, '*Martyr of science'*, No. 227; 228. See: *DSB*, II, pp. 451-454.



XV. *On the Effects of Compression and Dilatation in altering the Polarising Structure of Doubly Refracting Crystals.* By DAVID BREWSTER, LL. D. F. R. S. LOND. & EDIN.

(*Read November* 17. 1816.)

IN a paper which I had the honour of submitting to the Society, at the end of last session, I gave a detailed account of the effects of mechanical compression and dilatation, in communicating to glass and other uncrystallised bodies, all the properties of doubly refracting crystals. I had at that time attempted, without success, to alter the polarising structure of doubly refracting crystals, although I applied the force of powerful screws to Topaz, Rock-crystal, and Calcareous spar. All the specimens which I employed were crushed to pieces by the pressure, but exhibited no traces of the coloured rings when exposed to polarised light.

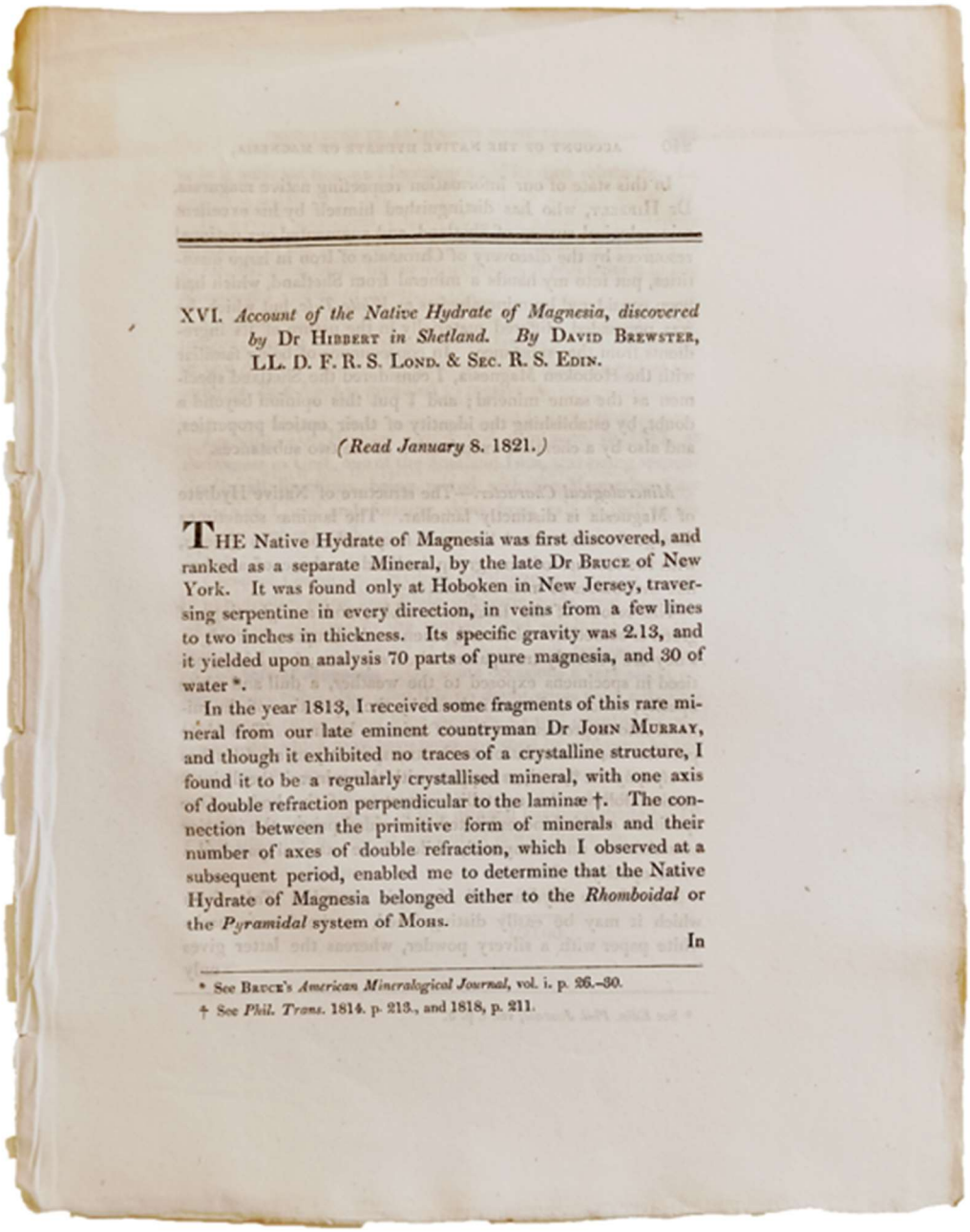
The cause of the failure of these experiments did not occur to me, till I was engaged in examining the phenomena produced in the direction of the resultant axes of regular crystals. I then saw, that the pressure formerly applied, had actually developed a new polarising force, but that it had been

[223] Brewster

223. **BREWSTER, Sir David** (1781-1868). *"On the effects of compression and dilatation in altering the polarising structure of doubly refracting crystals."* Extracted from: The *Transactions of the Royal Society of Edinburgh*, Vol. 8, [1818]. ¶ 284 x 224 mm. 4to. Pages (281)-286. 1 table. Dis-bound. Very good. S3657

$ 30

In a paper which I had the honour of submitting to the Society, at the end of last session, I gave a detailed account of the effects of mechanical compression and dilatation, in communicating to glass and other uncrystallised bodies, all the properties of doubly refracting crystals. I had at that time attempted, without success, to alter the polarising structure of doubly refracting crystals, although I applied the force of powerful screws to Topaz, Rock-crystal, and Calcareous spar. All the specimens which I employed were crushed to pieces by the pressure, but exhibited no traces of the coloured rings when exposed to polarised light. [Abstract]. Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 229. See: DSB, II, pp. 451-454.



XVI. *Account of the Native Hydrate of Magnesia, discovered by* Dr Hibbert *in Shetland. By* David Brewster, LL. D. F. R. S. Lond. & Sec. R. S. Edin.

(*Read January* 8. 1821.)

THE Native Hydrate of Magnesia was first discovered, and ranked as a separate Mineral, by the late Dr Bruce of New York. It was found only at Hoboken in New Jersey, traversing serpentine in every direction, in veins from a few lines to two inches in thickness. Its specific gravity was 2.13, and it yielded upon analysis 70 parts of pure magnesia, and 30 of water *.

In the year 1813, I received some fragments of this rare mineral from our late eminent countryman Dr John Murray, and though it exhibited no traces of a crystalline structure, I found it to be a regularly crystallised mineral, with one axis of double refraction perpendicular to the laminæ †. The connection between the primitive form of minerals and their number of axes of double refraction, which I observed at a subsequent period, enabled me to determine that the Native Hydrate of Magnesia belonged either to the *Rhomboidal* or the *Pyramidal* system of Mohs.

In

* See Bruce's *American Mineralogical Journal*, vol. i. p. 26.–30.

† See *Phil. Trans.* 1814. p. 213., and 1818, p. 211.

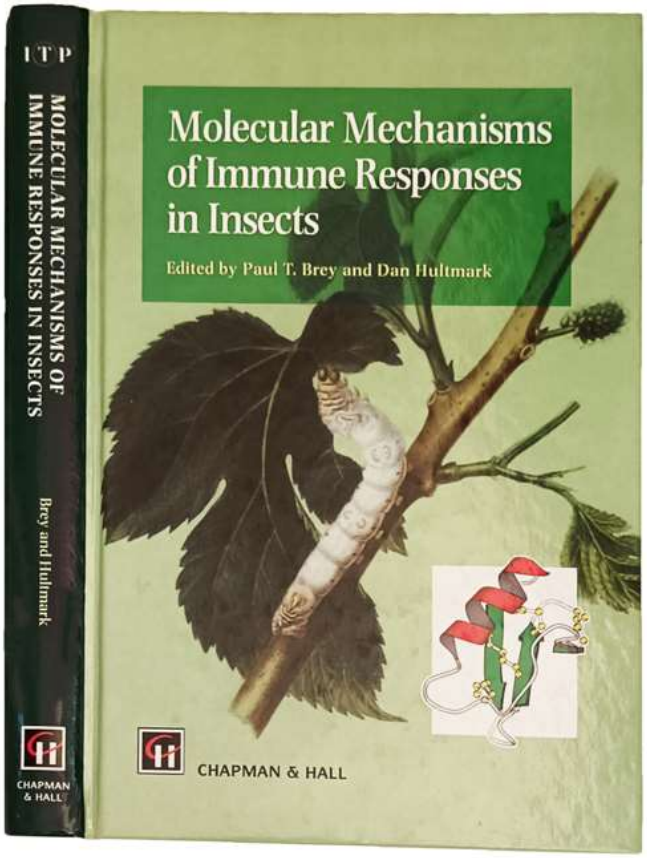
224. **BREWSTER, Sir David** (1781-1868). *"Account of the native hydrate of magnesia, discovered by Dr. Hibbert in Shetland."* Extracted from: *The Transactions of the Royal Society of Edinburgh*, Vol. 9, [1823]. ¶ 283 x 226 mm. 4to. Pages (239)-242. Dis-bound. Very good. S3659

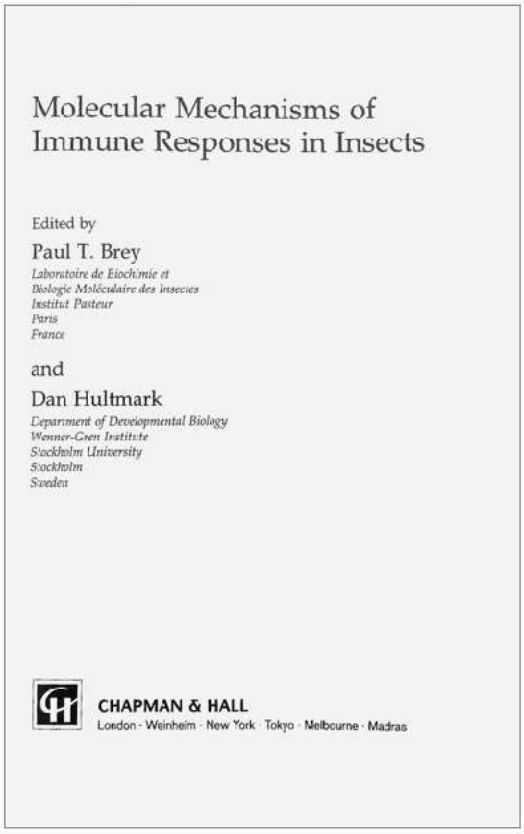
$ 40

The Native Hydrate of Magnesia was first discovered, and ranked as a separate Mineral, by the late Dr Bruce of New York. It was found only at Hoboken in New Jersey, traversing serpentine in every direction, in veins from a few lines to two inches in thickness. Its specific gravity was 2.13, and it yielded upon analysis 70 parts of pure magnesia, and 30 of water.

In the year 1813, I received some fragments of this rare mineral from our late eminent countryman Dr John Murray, and though it exhibited no traces of a crystalline structure, I found it to be a regularly crystallised mineral, with one axis of double refraction perpendicular to the laminæ. The connection between the primitive form of minerals and their number of axes of double refraction, which I observed at a subsequent period, enabled me to determine that the Native Hydrate of Magnesia belonged either to the Rhomboidal or the Pyramidal system of Mohs. [Abstract].

Morrison-Low, "Published writings of Sir David Brewster: a bibliography," in: Morrison-Low and Christie, 'Martyr of science', No. 294. See: DSB, II, pp. 451-454.



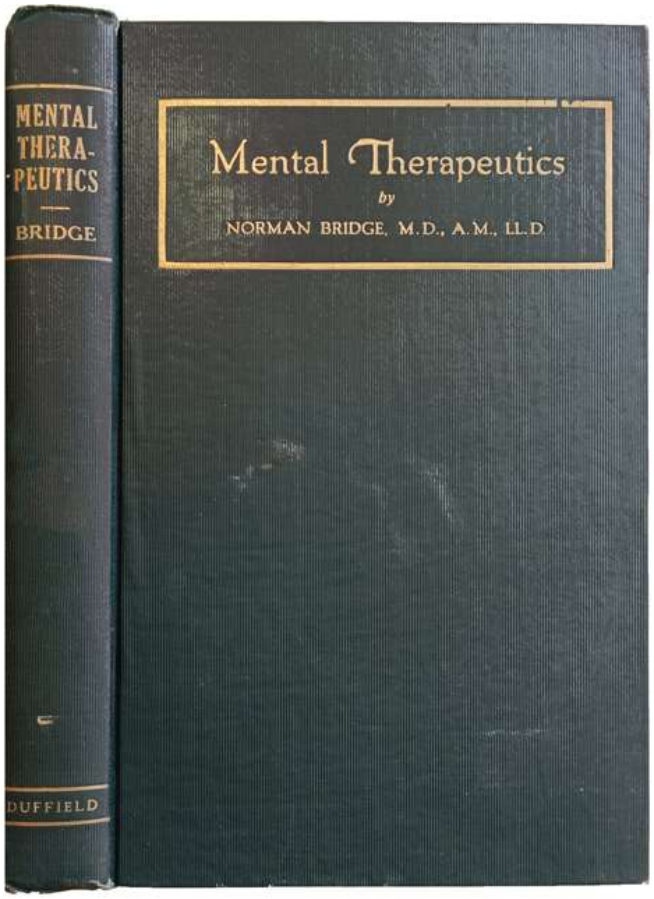


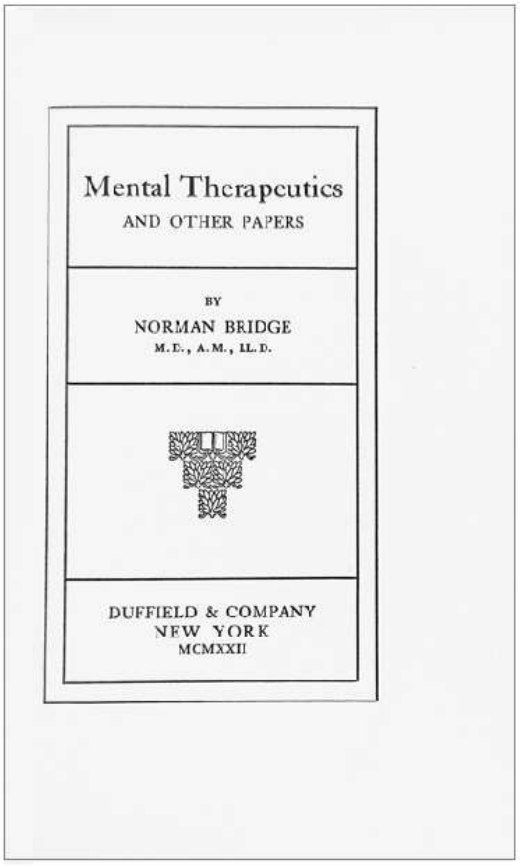
225. **BREY, Paul T.** (ed.). *Molecular Mechanisms of Immune Responses in Insects*. London: Chapman & Hall, (1998). ¶ 8vo. xii, 325 pp. Articles, photos, figs. Pictorial boards. FINE. S7898

$ 225

FIRST EDITION. Includes: ASHIDA, Masaaki, & Paul T. BREY. "Recent Advances in Research on the Insect Prohenoloxidase Cascade." 135-172 pp. Photos, figs., tables. Also includes a 3 page typed letter on headed paper of

Hokkaido University from Ashida to Norman Horowitz concerning this article, and SIGNED by Ashida.

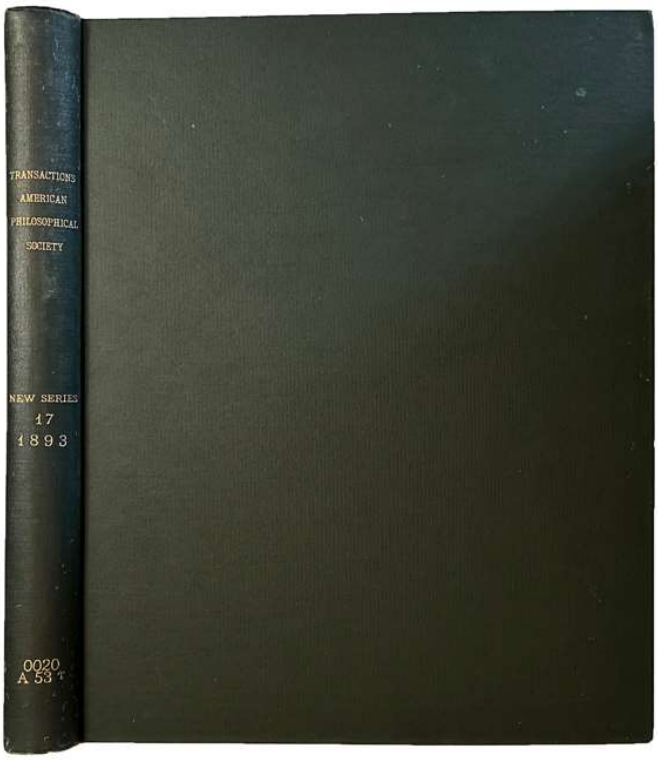


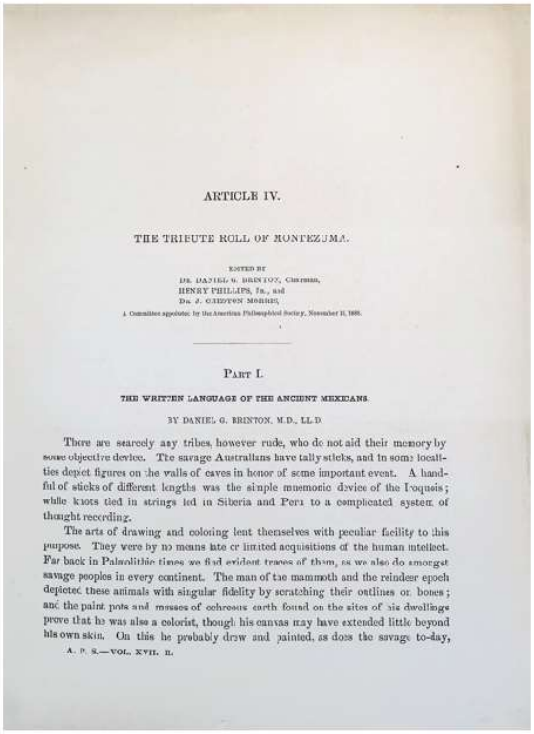


226. **BRIDGE, Norman**, A.M., LL.D. (1844-1925). *Mental therapeutics and other papers*. New York: Duffield, 1922. ¶ FIRST EDITION. 197 x 128 mm. 8vo. 182 pp. Gilt-stamped dark green cloth. INSCRIBED BY THE AUTHOR to Force Parker, Esq. Very good. S1585

$ 20

"While Bridge had a distinguished medical career, he was actually far better known for his substantial fortune earned from his work in the oil industry and the resulting philanthropic endeavors that involved large sums donated to many regional organizations." He also served on the board of Cal-Tech.





ARTICLE IV.

THE TRIBUTE ROLL OF MONTEZUMA.

Part I.

THE WRITTEN LANGUAGE OF THE ANCIENT MEXICANS.

BY DANIEL G. BRINTON, M.D., LL.D.

There are scarcely any tribes, however rude, who do not aid their memory by some objective device. The savage Australians have tally sticks, and in some localities depict figures on the walls of caves in honor of some important event. A handful of sticks of different lengths was the simple mnemonic device of the Iroquois; while knots tied in strings led in Siberia and Peru to a complicated system of thought recording.

The arts of drawing and coloring lent themselves with peculiar facility to this purpose. They were by no means late or limited acquisitions of the human intellect. Far back in Palæolithic times we find evident traces of them, as we also do amongst savage peoples in every continent. The man of the mammoth and the reindeer epoch depicted these animals with singular fidelity by scratching their outlines on bones; and the paint pots and masses of ochreous earth found on the sites of his dwellings prove that he was also a colorist, though his canvas may have extended little beyond his own skin. On this he probably drew and painted, as does the savage to-day,

A. P. S.—VOL. XVII. B.

227. **BRINTON, Daniel Garrison** (1837-1899); **Henry PHILLIPS, Jr.**; **J. Cheston MORRIS**. *"The Tribute Roll of Montezuma."* In: *Transactions of the American Philosophical Society*, Vol. XVII, New Series, 1893. Philadelphia: MacCalla, 1893. ¶ 4to. (53)-61 pp. Errata slip, 3 folding color plates. Dark green cloth, gilt spine. Blind-stamp of Mount Wilson Observatory. FINE. S8226

$ 125

"These general remarks are not out of place in this connection necessary, for the method of writing developed by the ancient in which it existed at the time of their subjection by the Europeans, embodied, curiously enough, every one of these elements, pictures, symbols, ideograms and phonetic signs; and it is only by keeping this fact constantly in mind, and by seeking to render under each according to the special system which it represents, can we hope to untangle the labyrinth of the Aztec codices."

"It is because this essential fact has been overlooked that the syllabaries and lists of Mexican hieroglyphs hitherto published have proved almost worthless for the decipherment of the manuscripts which have been preserved."

"While it is my conviction that the above principles, judiciously applied, will result in the decipherment of the ancient records of the Nahuas, such as that which is here presented, all who are conversant with the subject will acknowledge the propriety of calling to our aid the widest range of comparisons possible before

proceeding to the interpretation of a particular manuscript. The mass of unexcelled material for this study which was originally collected by Boturini [Lorenzo Boturini Benaducci (1698-1749)], and which through many perils is at last in a fair way to be rendered accessible to the scientific world, will add so much to our knowledge that it would be time lost to seek definite conclusions from the fragment here present." [Brinton].

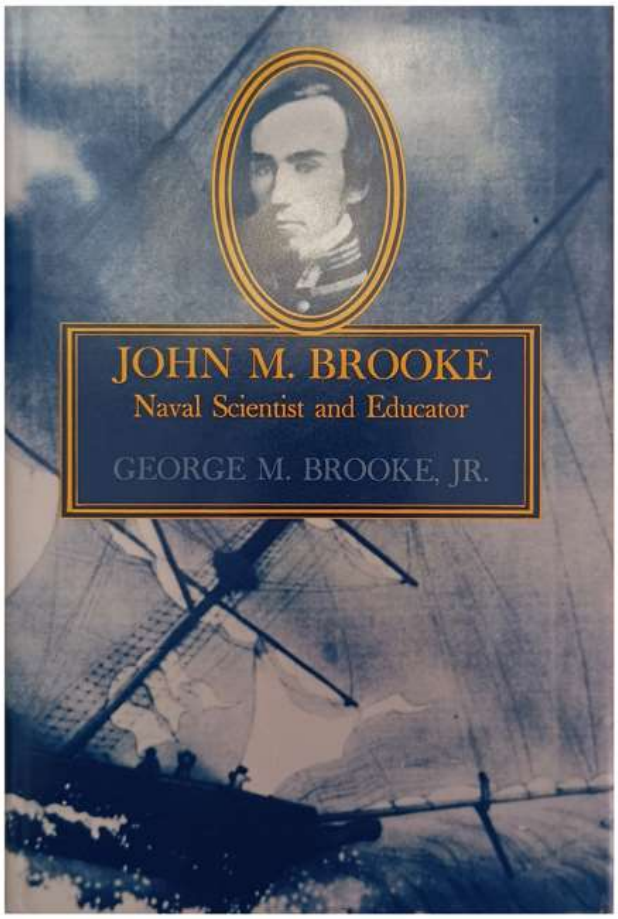

Tribute Roll 27. (TLAUHQUITEPEC.)

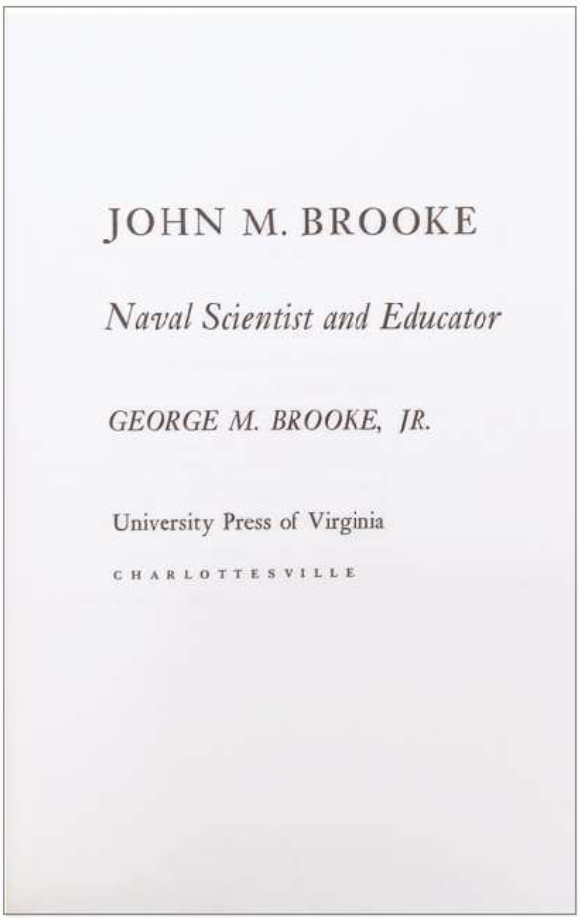

Tribute Roll 1. (TLATELULCO.)

"Boturini went to New Spain in 1736, where he remained eight years, exploring remote regions and, in the words of Prescott, "living much with the natives, passing his nights sometimes in their huts, sometimes in caves, and the depths of the lonely forests." During those years he assembled a vast collection of paintings, maps, manuscripts and native codices. He copied more than 500 pre-Columbian inscriptions and made his own drawings of monuments and sculptures, and he investigated the history of the apparition of the Virgin of Guadalupe on the hill of Tepeyac. He traveled widely and on his travels brought together the largest collection of Mexican antiquities assembled to that time by a European."

But the jealous Spanish government threw Boturini into prison; his library was scattered and partly lost, and he died of chagrin and disappointment. Yet to him we probably owe the preservation of the wings of Ixtlilxochitl, Tezozomoc, and others who wrote in Spanish, and whose volumes have since seen the light in the collections of Bustamente, Lord Kingsborough, Ternaux-Compans, and elsewhere. The documents were neglected there for years and suffered considerable pilferage.

Daniel Brinton was a pioneer anthropologist in the United States. Brinton was Professor of Ethnology and Archeology in the Academy of Natural Sciences of Philadelphia, and in 1886 became Professor of American Linguistics and Archeology in the University of Pennsylvania. *DAB*, III, pp. 50-51.





228. **BROOKE, George M., Jr.** *John M. Brooke: Naval Scientist and Educator.* Charlottesville: University Press of Virginia, 1980. ¶ FIRST EDITION. 8vo. xiii, 372 pp. Illustrations, maps, index. Navy cloth, gilt-stamped spine title, dust-jacket. Burndy bookplate. Fine. BL2024 $ 10

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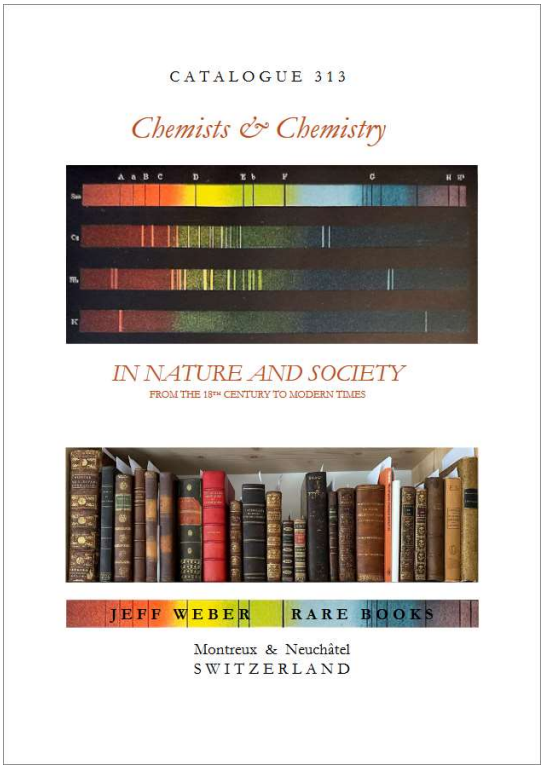

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