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History of Science

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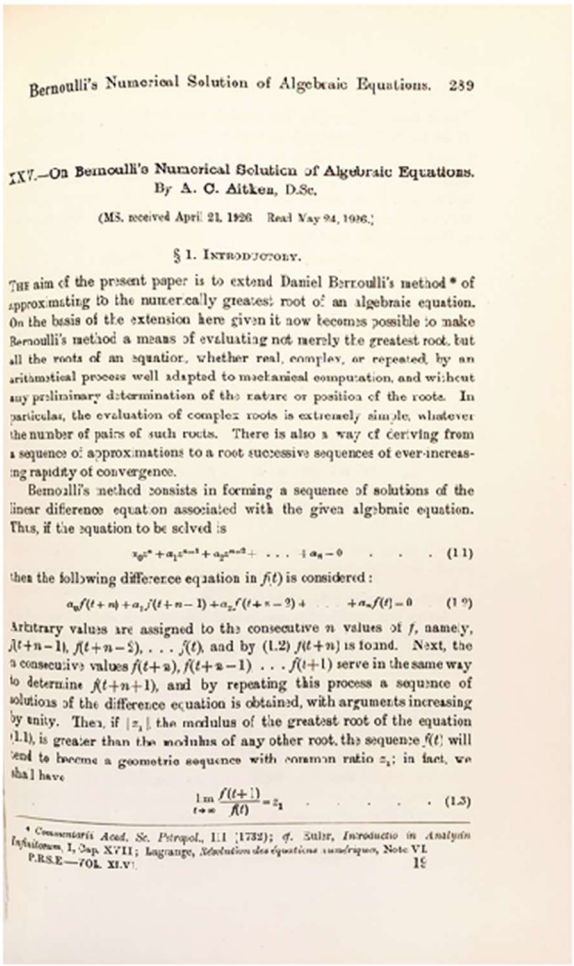


Bernoulli's Numerical Solution of Algebraic Equations. 239

XXV.—On Bernoulli's Numerical Solution of Algebraic Equations.
By A. C. Aitken, D.Sc.

(MS. received April 21, 1926. Read May 24, 1926.)

§ 1. Introductory.

The aim of the present paper is to extend Daniel Bernoulli's method * of approximating to the numerically greatest root of an algebraic equation. On the basis of the extension here given it now becomes possible to make Bernoulli's method a means of evaluating not merely the greatest root, but all the roots of an equation, whether real, complex, or repeated, by an arithmetical process well adapted to mechanical computation, and without any preliminary determination of the nature or position of the roots. In particular, the evaluation of complex roots is extremely simple, whatever the number of pairs of such roots. There is also a way of deriving from a sequence of approximations to a root successive sequences of ever-increasing rapidity of convergence.

Bernoulli's method consists in forming a sequence of solutions of the linear difference equation associated with the given algebraic equation. Thus, if the equation to be solved is

$$a_0 z^n + a_1 z^{n-1} + a_2 z^{n-2} + \ldots + a_n = 0 \quad . \quad . \quad . \quad (1.1)$$

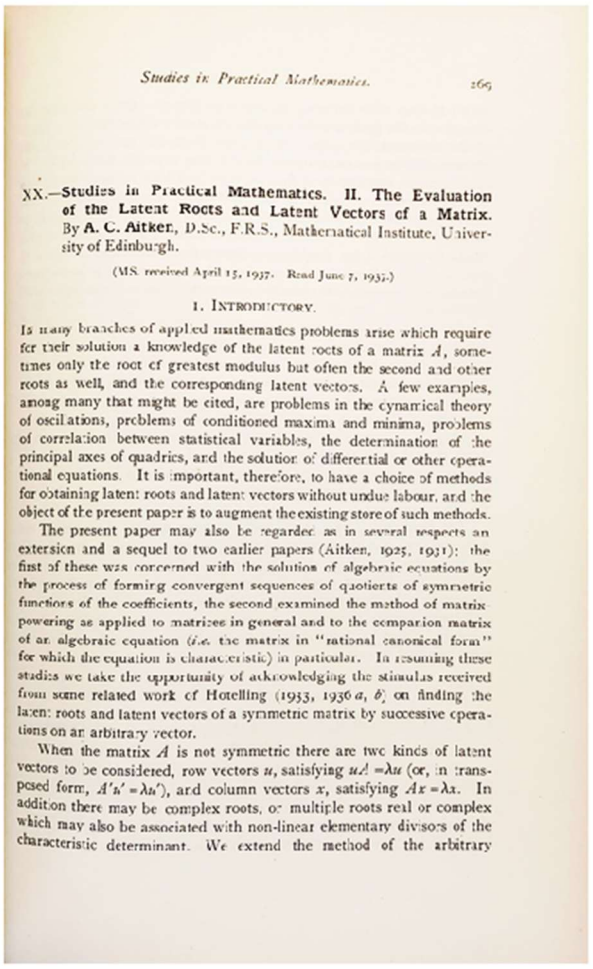
then the following difference equation in $f(t)$ is considered:

$$a_0 f(t+n) + a_1 f(t+n-1) + a_2 f(t+n-2) + \ldots + a_n f(t) = 0 \quad (1.2)$$

Arbitrary values are assigned to the consecutive n values of f, namely, $f(t+n-1)$, $f(t+n-2)$, . . . $f(t)$, and by (1.2) $f(t+n)$ is found. Next, the n consecutive values $f(t+n)$, $f(t+n-1)$ . . . $f(t+1)$ serve in the same way to determine $f(t+n+1)$, and by repeating this process a sequence of solutions of the difference equation is obtained, with arguments increasing by unity. Then, if $|z_1|$ the modulus of the greatest root of the equation (1.1), is greater than the modulus of any other root, the sequence $f(t)$ will tend to become a geometric sequence with common ratio z_1; in fact, we shall have

$$\lim_{t \to \infty} \frac{f(t+1)}{f(t)} = z_1 \quad . \quad . \quad . \quad . \quad . \quad (1.3)$$

* *Commentarii Acad. Sc. Petropol.*, I. (1732); *cf.* Euler, *Introductio in Analysin Infinitorum*, I, Cap. XVII; Lagrange, *Résolution des équations numériques*, Note VI.



XX.—Studies in Practical Mathematics. II. The Evaluation of the Latent Roots and Latent Vectors of a Matrix.
By A. C. Aitken, D.Sc., F.R.S., Mathematical Institute, University of Edinburgh.

(MS. received April 15, 1937. Read June 7, 1937.)

1. Introductory.

In many branches of applied mathematics problems arise which require for their solution a knowledge of the latent roots of a matrix A, sometimes only the root of greatest modulus but often the second and other roots as well, and the corresponding latent vectors. A few examples, among many that might be cited, are problems in the dynamical theory of oscillations, problems of conditioned maxima and minima, problems of correlation between statistical variables, the determination of the principal axes of quadrics, and the solution of differential or other operational equations. It is important, therefore, to have a choice of methods for obtaining latent roots and latent vectors without undue labour, and the object of the present paper is to augment the existing store of such methods.

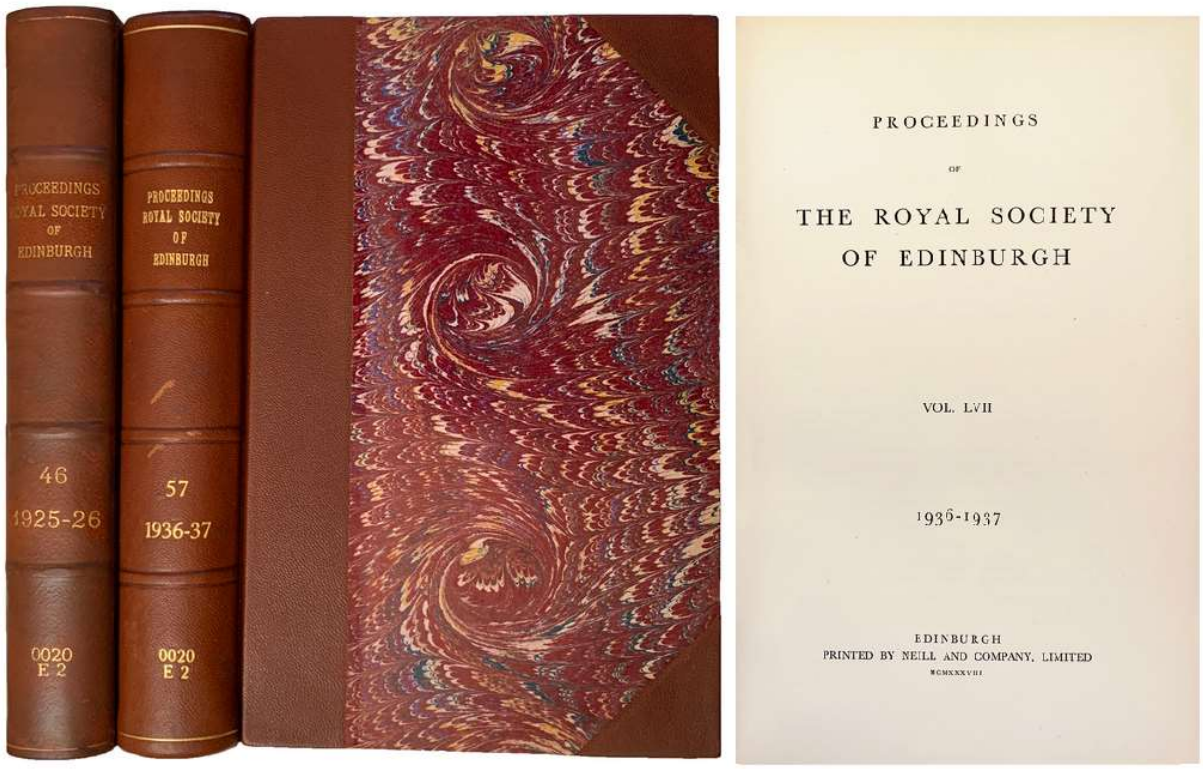
The present paper may also be regarded as in several respects an extension and a sequel to two earlier papers (Aitken, 1925, 1931): the first of these was concerned with the solution of algebraic equations by the process of forming convergent sequences of quotients of symmetric functions of the coefficients, the second examined the method of matrix-powering as applied to matrices in general and to the companion matrix of an algebraic equation (*i.e.* the matrix in "rational canonical form" for which the equation is characteristic) in particular. In resuming these studies we take the opportunity of acknowledging the stimulus received from some related work of Hotelling (1933, 1936 *a*, *b*) on finding the latent roots and latent vectors of a symmetric matrix by successive operations on an arbitrary vector.

When the matrix A is not symmetric there are two kinds of latent vectors to be considered, row vectors u, satisfying $uA = \lambda u$ (or, in transposed form, $A'u' = \lambda u'$), and column vectors x, satisfying $Ax = \lambda x$. In addition there may be complex roots, or multiple roots real or complex which may also be associated with non-linear elementary divisors of the characteristic determinant. We extend the method of the arbitrary

1. **AITKEN, A. C. [Alexander Craig]** (1895-1967). *"On Bernoulli's numerical solution of algebraic equations."* With: *"On the theory of graduation."* With: *"Studies in practical mathematics. I. The evaluation, with applications, of a certain triple product matrix."* With: *"Studies in practical mathematics. II. The evaluation of the latent roots and latent vectors of a matrix."* In: Proceedings of the Royal Society of Edinburgh, Vol. XLVI, 1925-1926; Vol. LVII, 1936-1937. Edinburgh: Neill, 1927, 1938. ¶ Two volumes. 8vo. Pages 289-305; 36-45; 172-181; 269-304. [Entire volume: viii, 458; vii, 520 pp.] A few figs. and tables. Quarter brown morocco, morocco corners, marbled sides, raised bands, gilt spine. Blind stamp of the Carnegie Institution of Washington, Mount Wilson Observatory. Fine. [S6715]

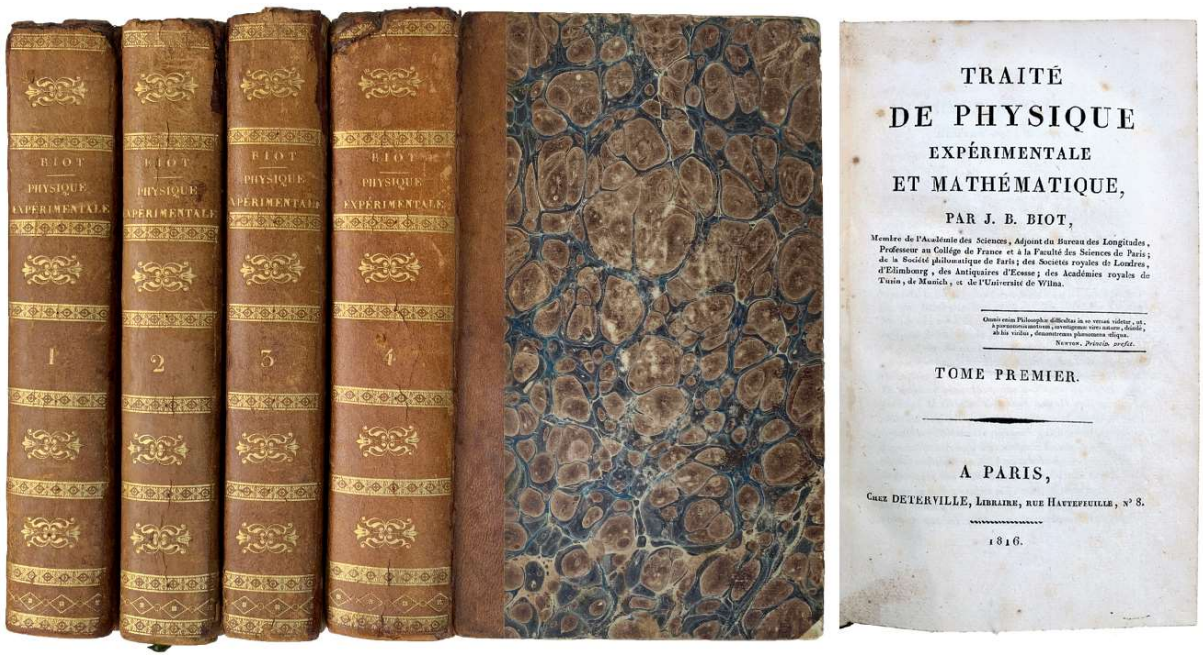
$ 125

FIRST EDITIONS. "The aim of the present paper is to extend Daniel Bernoulli's method of approximating to the numerically greatest root of an algebraic equation. On the basis of the extension here given it now becomes possible to make Bernoulli's method a means of evaluating not merely the greatest root, but all the roots of an equation, whether real, complex, or repeated, by an arithmetical process well adapted to mechanical computation, and without any preliminary determination of the nature or position of the roots. In particular, the evaluation of complex roots is extremely simple, whatever the number of pairs of such roots. There is also a way of deriving from a sequence of approximations to a root successive sequences of ever-increasing rapidity of convergence." – Cambridge Univ. Press.



A. C. Aitken, of the Mathematical Institute, University of Edinburgh, made important contributions in the field of numerical analysis, powerful methods for the solution of general mathematical problems in numerical terms. These methods, in turn, provided the logical basis for modern computers. A practical method for finding a numerical value of f(x), for a given value of x, when several values of x and f(x) are known, as Aitken's process of iteration. These methods are well adapted to computing machinery. It consists of an iteration of the familiar process of linear interpolation. These and other methods, such as that in Aitken's paper on Bernoulli's method for solving algebraic equations, are offered here. Engineering

Research Associates, High-speed computing devices, pp. 108-109; Fox, "Early numerical analysis in the United Kingdom," in Nash, A history of scientific computing, p. 284; Hartree, Numerical analysis, pp. 84 & 280. Alexander Craig "Alec" Aitken FRS FRSE FRSL FRSNZ (1 April 1895 – 3 November 1967) was one of New Zealand's most eminent mathematicians.



2. **BIOT, Jean-Baptiste** (1774-1862). *Traite de Physique Expérimentale et Mathématique*. Paris: Chez Deterville, 1816. ¶ 4 volumes. 8vo. lxvi, 538, [2]; [iv], 551, [1]; [iv], 516; [iv], 780, [2] pp. 4 errata sheets (final leaf of each vol.), 22 engraved (by Adam) folding plates (including II and "II bis" in vol. I), 5 folding tables (I: facing p. 158; II: 2 tables facing p. 262; IV facing pp. 542 + 730), 4 placement green ribbons; mild staining (most prominent at preliminaries and rear leaves, burn hole at IV pp.737/8 – touching one letter on recto). Contemporary quarter gilt-stamped calf, marbled boards, vellum tips, edges speckled; joints cracked, spine ends worn, vol. IV with small part of head chipped and laid on. Generally very good. Bookplate of Sydney Ross. RARE. [S13842]

$ 325

First edition of "Biot's *TRAITE DE PHYSIQUE* (1816) constitutes a comprehensive account of contemporary physics, including not only recent original research by himself (e.g. on polarization) but also the recent and often unpublished work of his associates, particularly Laplace, Gay-Lussac, and Dulong." – Crosland in *DSB*.

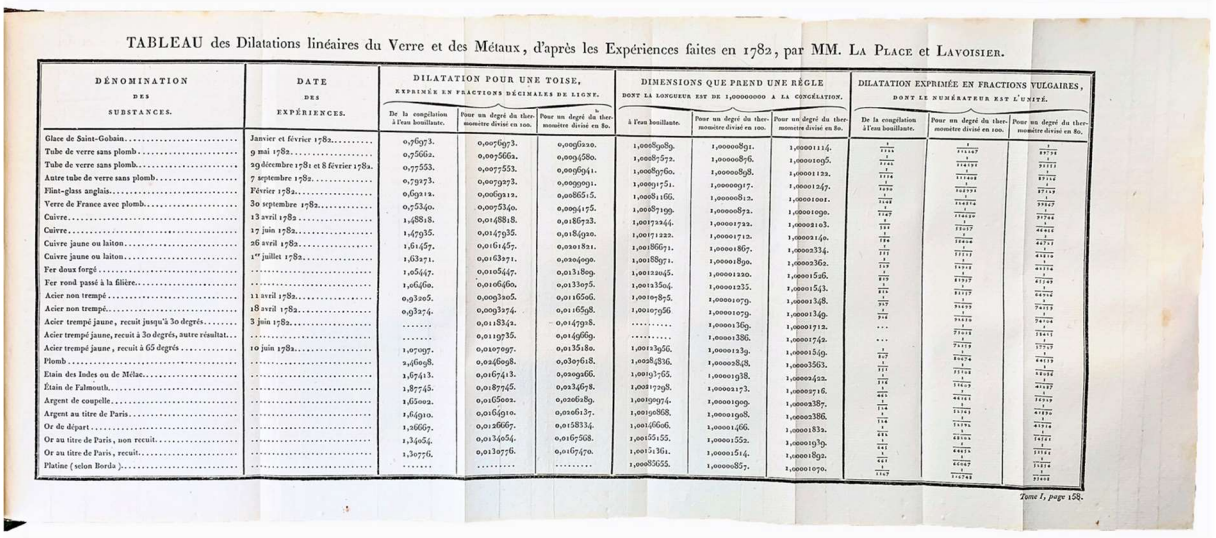
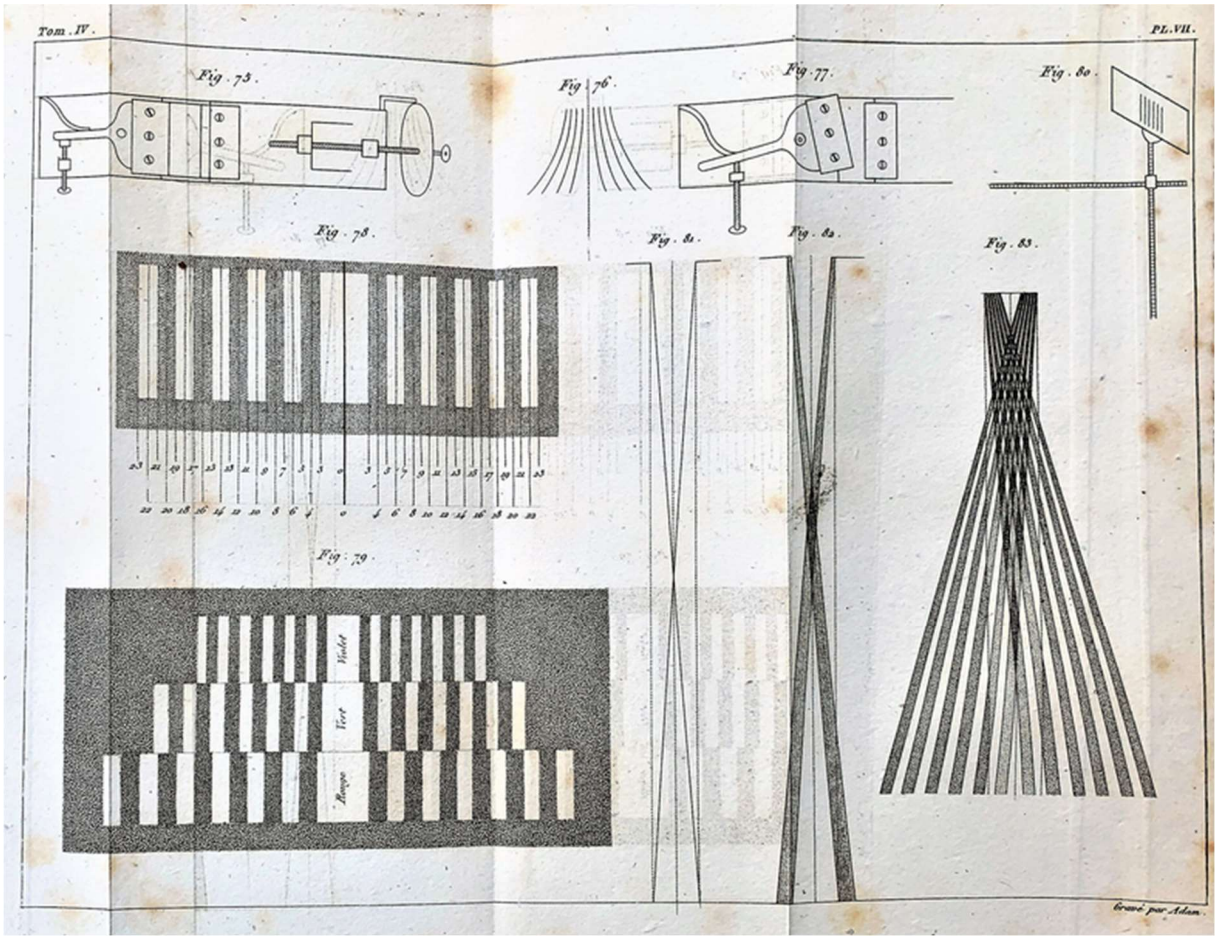


TABLEAU des Dilatations linéaires du Verre et des Métaux, d'après les Expériences faites en 1782, par MM. La Place et Lavoisier.

DÉNOMINATION DES SUBSTANCES.	DATE DES EXPÉRIENCES.	DILATATION POUR UNE TOISE, EXPRIMÉE EN FRACTIONS DÉCIMALES DE LIGNE.			DIMENSIONS QUE PREND UNE RÈGLE DONT LA LONGUEUR EST DE 1,00000000 A LA CONGÉLATION.			DILATATION EXPRIMÉE EN FRACTIONS VULGAIRES, DONT LE NUMÉRATEUR EST L'UNITÉ.		
		De la congélation à l'eau bouillante.	Pour un degré du thermomètre divisé en 100.	Pour un degré du thermomètre divisé en 80.	à l'eau bouillante.	Pour un degré du thermomètre divisé en 100.	Pour un degré du thermomètre divisé en 80.	De la congélation à l'eau bouillante.	Pour un degré du thermomètre divisé en 100.	Pour un degré du thermomètre divisé en 80.
Glace de Saint-Gobain	Janvier et février 1782	0,76973.	0,0076973.	0,0096210.	1,0085089.	1,00000891.	1,00001114.	1/1344	1/134587	1/107732
Tube de verre sans plomb	9 mai 1782	0,75662.	0,0075662.	0,0094580.	1,0083572.	1,00000856.	1,00001096.	1/1346	1/134597	1/107711
Tube de verre sans plomb	29 décembre 1781 et 8 février 1782	0,77553.	0,0077553.	0,0096941.	1,0085760.	1,00000898.	1,00001123.	1/1338	1/134868	1/107142
Autre tube de verre sans plomb	7 septembre 1782	0,79273.	0,0079273.	0,0099091.	1,0087751.	1,00000917.	1,00001147.	1/1314	1/134737	1/107149
Flint-glass anglais	Février 1782	0,69212.	0,0069212.	0,0086515.	1,0076816.	1,00000812.	1,00001001.	1/1498	1/134870	1/107896
Verre de France avec plomb	30 septembre 1782	0,75340.	0,0075340.	0,0094175.	1,0083719.	1,00000873.	1,00001090.	1/1377	1/134872	1/107897
Cuivre	13 avril 1782	1,48818.	0,0148818.	0,0185723.	1,0017344.	1,00001723.	1,00002103.	1/699	1/58028	1/46422
Cuivre	17 juin 1782	1,47935.	0,0147935.	0,0184920.	1,0017222.	1,00001712.	1,00002140.	1/704	1/58418	1/46735
Cuivre jaune ou laiton	26 avril 1782	1,61457.	0,0161457.	0,0201821.	1,0018671.	1,00001867.	1,00002334.	1/645	1/53577	1/42862
Cuivre jaune ou laiton	1er juillet 1782	1,63271.	0,0163271.	0,0204090.	1,0018871.	1,00001890.	1,00002362.	1/638	1/52938	1/42350
Fer doux forgé		1,05447.	0,0105447.	0,0131809.	1,0012045.	1,00001230.	1,00001526.	1/952	1/81307	1/65046
Fer rond passé à la filière		1,06469.	0,0106469.	0,0133075.	1,0012154.	1,00001335.	1,00001543.	1/939	1/81317	1/65054
Acier non trempé	11 avril 1782	0,93205.	0,0093205.	0,0116506.	1,0010585.	1,00001079.	1,00001348.	1/1073	1/92593	1/74074
Acier non trempé	18 avril 1782	0,93274.	0,0093274.	0,0116598.	1,0010596.	1,00001079.	1,00001349.	1/1072	1/92593	1/74074
Acier trempé jaune, recuit jusqu'à 30 degrés	3 juin 1782	.....	0,0118342.	0,0147928.	.....	1,00001369.	1,00001712.	...	1/73019	1/58415
Acier trempé jaune, recuit à 30 degrés, autre résultat		.....	0,0119735.	0,0149669.	.....	1,00001386.	1,00001742.	...	1/72119	1/57715
Acier trempé jaune, recuit à 65 degrés	10 juin 1782	1,07097.	0,0107097.	0,0133180.	1,0012956.	1,00001239.	1,00001549.	1/937	1/80674	1/64539
Plomb		2,46098.	0,0246098.	0,0307618.	1,0028336.	1,00002848.	1,00003563.	1/406	1/35124	1/28099
Etain des Indes ou de Malac		1,67413.	0,0167413.	0,0209266.	1,0019376.	1,00001938.	1,00002422.	1/598	1/51599	1/41279
Etain de Falmouth		1,87745.	0,0187745.	0,0234678.	1,0021798.	1,00002173.	1,00002716.	1/533	1/46021	1/36817
Argent de coupelle		1,65002.	0,0165002.	0,0206289.	1,0019074.	1,00001909.	1,00002387.	1/606	1/52341	1/41873
Argent au titre de Paris		1,64910.	0,0164910.	0,0206137.	1,0019068.	1,00001908.	1,00002386.	1/606	1/52371	1/41896
Or de départ		1,26667.	0,0126667.	0,0158334.	1,0014646.	1,00001466.	1,00001832.	1/789	1/68181	1/54544
Or au titre de Paris, non recuit		1,34054.	0,0134054.	0,0167568.	1,0015155.	1,00001552.	1,00001939.	1/746	1/64431	1/51544
Or au titre de Paris, recuit		1,30776.	0,0130776.	0,0163470.	1,0015161.	1,00001514.	1,00001892.	1/765	1/66027	1/52821
Platine (selon Borda)		.....	.....	.....	1,0008555.	1,00000857.	1,00001070.	1/1167	1/116748	1/93398

Tome I, page 158.

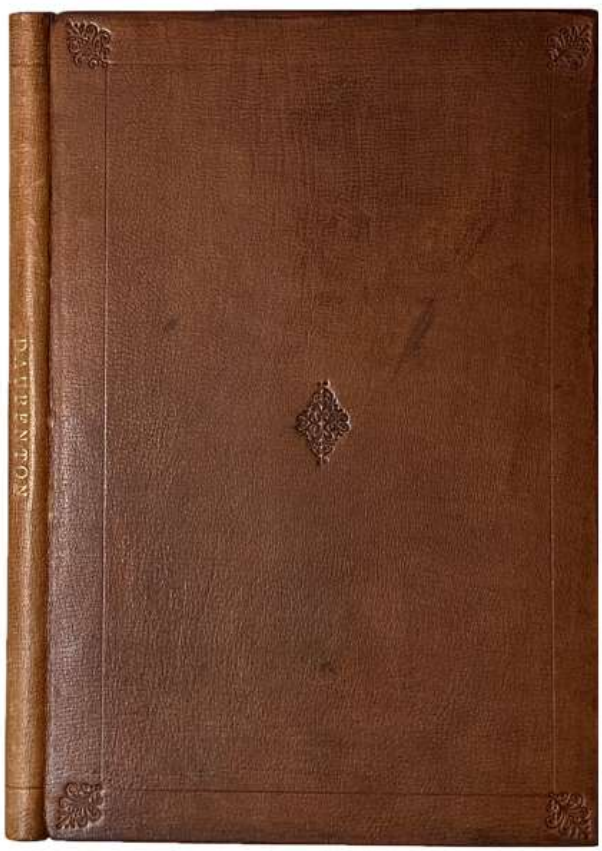
"In volume one of this extensive survey of mathematics and experimental physics, Biot treats the theory of elasticity, adopting the Newtonian hypothesis of molecular construction. In the second he considers sound. The third concerns magnetism and optics, continuing the discussion of optics in the fourth volume together with a presentation of heat theory which includes an essay on steam engines." – Verne L. Roberts & Ivy Trent, *Bibliotheca Mechanica*, (1991), p. 39.

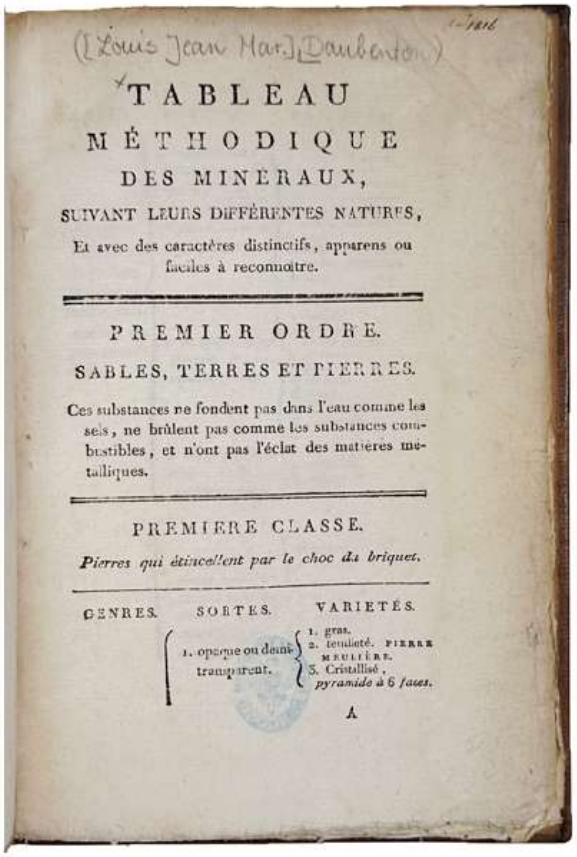


Jean-Baptiste Biot was a French physicist, astronomer, and mathematician. He was able to prove the extraterrestrial origins of meteorites which had been doubted up to this period. With Gay-Lussac, he participated in the first scientific balloon flight in 1804, and, with the present work, studied optics and the polarization of light. "His work in chromatic polarization and rotary polarization greatly advanced the field of optics, although it was later shown that his findings could also be obtained using the wave theory of light." – see: Eugene Frankel, "Corpuscular Optics and the Wave Theory of Light: The Science and Politics of Revolution in Physics." *Social Studies of Science*, vol. 6, no 2. May 1976.

PROVENANCE: Dr. Sydney Ross (1915-2013), born in Scotland, took his degree in analytical chemistry from McGill University (1936). "In 1940, he earned a PhD in chemistry from the University of Illinois, studying x-ray diffraction under George Clark and completing a dissertation on foams and brewing that derived from Clark's consulting work with the Schlitz Brewing Company . . . From a faculty appointment at Monmouth College, Illinois, Ross was called to postdoctoral study under James McBain at Stanford University, investigating the foaming of aircraft-lubricating oil and other military subjects. During this time he matured into a physical chemist with a special interest in colloidal phenomena, identifying himself henceforth as a colloid chemist. . . . In 1948, Ross landed an associate professorship at Rensselaer Polytechnic Institute, becoming a full professor in 1952, an active emeritus in 1980, and a retired emeritus in 1994. During that tenure he wrote 4 books, edited 3 more, published over 150 papers, and mentored more than 30 doctoral students." Emeritus Professor of Colloid Chemistry at Rensselaer Polytechnic Institute. "During his early education at the High School of Glasgow, Ross developed an enthusiasm for the writings of Victorian sage John Ruskin, an avocation that led over the years to collections of many rare books, literary and scientific. In 1981, he donated his Ruskin letters collection to the Rush Rhees Library of the University of Rochester, and in 2001, he published The Catalogue of the Herschel Library, a listing of the books owned by astronomers William and John Herschel, the bulk of which he had purchased at auction. In 1977, Ross founded and endowed the James Clerk Maxwell Foundation to promote education in the physical sciences and to honor famed Edinburgh native James Clerk Maxwell." -- See: BEVAN, Ernest, Jr. & David RIEDE (compilers). *The Sydney Ross Collection of John Ruskin; a Catalogue of an Exhibition Held in the Department of Rare Books, Manuscripts and Archives Rush Rhees Library University of Rochester. 15 February-15 May 1981*. [Web sources].

□ *DSB* II, pp. 133-140 by M.P. Crosland.




(Louis Jean Mar.) Daubenton

TABLEAU

MÉTHODIQUE

DES MINERAUX,

SUIVANT LEURS DIFFÉRENTES NATURES,

Et avec des caractères distinctifs, apparens ou faciles à reconnoître.

PREMIER ORDRE.

SABLES, TERRES ET PIERRES.

Ces substances ne fondent pas dans l'eau comme les sels, ne brûlent pas comme les substances combustibles, et n'ont pas l'éclat des matières métalliques.

PREMIERE CLASSE.

Pierres qui étincellent par le choc du briquet.

GENRES.	SORTES.	VARIETÉS.
1. opaque ou demi-transparent.		1. gras. 2. feuilleté. PIERRE MEULIÈRE. 3. Cristallisé, *pyramide à 6 faces.*

A

3. **DAUBENTON, Louis Jean Marie** (1716-1799). *Tableau Méthodique des Minéraux* . . . Paris: De l'Imprimerie de Du Pont, Imprimeur de l'Académie Royale des Sciences, 1792. ¶ 8vo. 42 ff. Printed on one side only. Full modern blind-stamped brown calf, gilt spine. Ex library rubber stamp on verso of title. Rubber-ownership stamp. Fine. [S6747]

$ 1,250

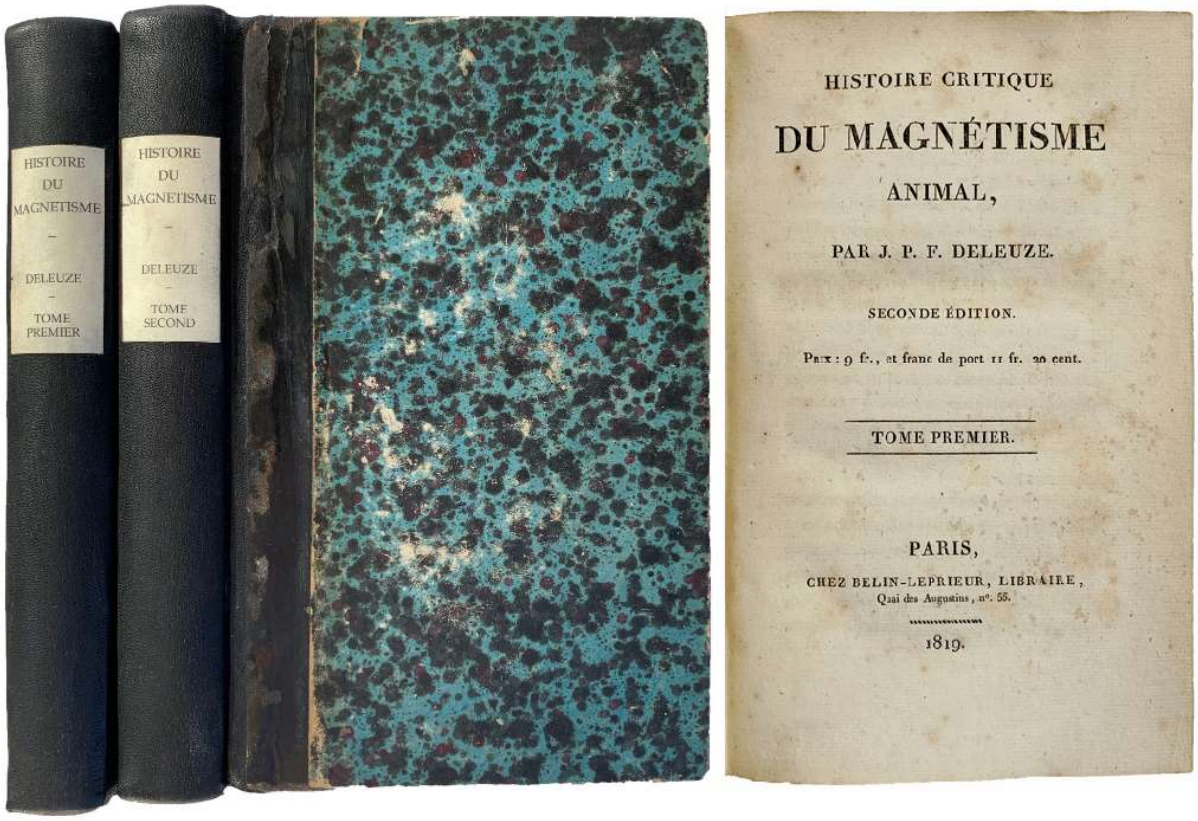
FOURTH EDITION. This work divides minerals into four orders and under these are classes based on physical and chemical properties.

"The first edition of his *Tableau Méthodique des Minéraux* appeared in 1784. While they display no great originality, Daubenton's teaching and writings on mineralogy contributed significantly to the spreading of current knowledge of the subject. It was, moreover, under Daubenton's patronage that Hauy began his career." – *DSB.*

Duveen describes this as "a rare work, the pages of which, being printed on one side only, were presumably intended to be stuck on boards and made up into large tables."

Louis Daubenton was professor of Natural History at the College de France and professor of mineralogy at the Museum of Natural History in Paris.

□ BM (Nat. Hist.), I, p. 424; Cole, *Chemical literature,* 337 (5th ed., An IV de la Republique); *DSB*, XV, p. 113; Duveen, *Bibliotheca alchemica et chemica*, p. 158 (1784); Poggendorff, I, col. 515 (notes an 8th ed. in 1800).



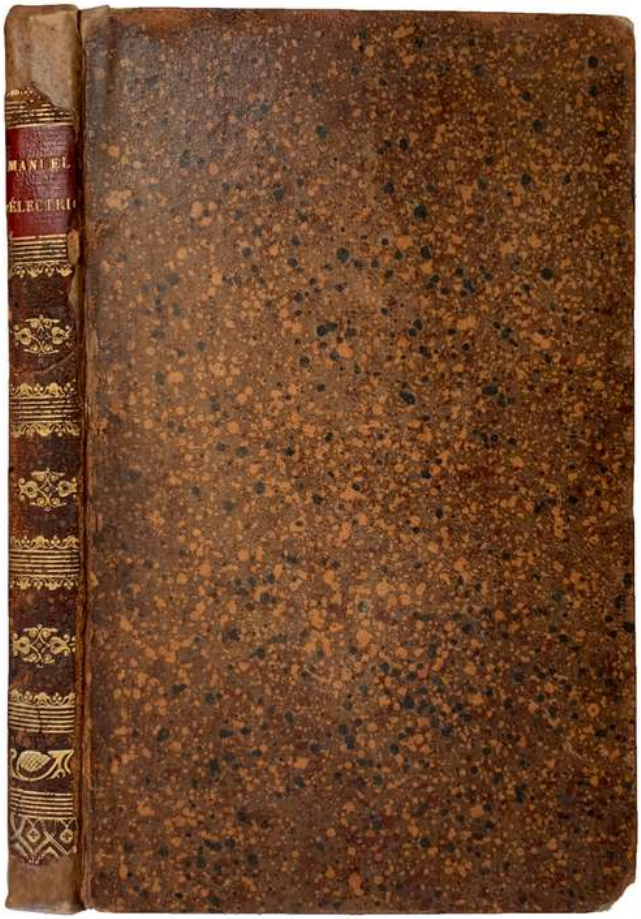
4. **DELEUZE, Joseph Philippe François** (1753-1835). *Histoire Critique du Magnetisme Animal*. Paris: Chez Belin-Leprieur, 1819. ¶ Second Edition. Two volumes. 8vo. [4], xiv, [2], 316; [4], 362 pp. Scattered foxing throughout, not diminishing legibility. Infrequent contemporary ink notations, noting a page of notes at p. 356, Vol. II, in an unknown hand. Quarter black leather over blue marbled paper-backed boards; bindings carefully repaired. Very good. [SS11081]

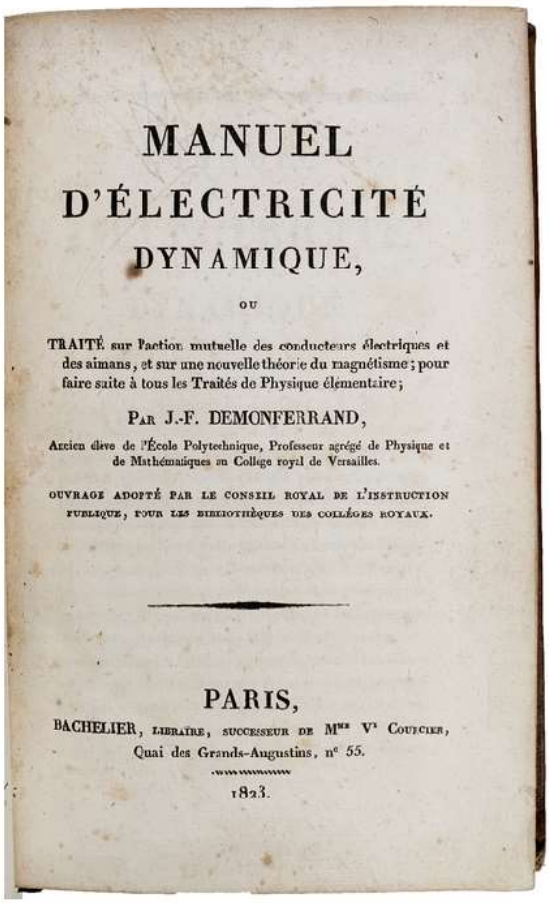
$ 175

Deleuze (1753-1835), a prominent member of the "Mesmer movement," discusses in this work "aspects such as the magnetic fluid, healing, problems and dangers of mesmerism, and personally observed phenomena" (Alvarado 116). "Deluze [sic] is a central figure in the history of animal magnetism. . . He was impressed with the demonstration (of somnambulism) and began to pursue his own study of animal magnetism. . . The *Histoire* is Deleuze's first work on animal magnetism and is one of the most important ever written on the subject. . . The *Histoire* is about as balanced a treatment as one could find from a man who was engaged in a daily practice of that art" (Crabtree 267). / An excerpt (trans.): "The magnetiser can

communicate his fluid to many objects, and these objects become either the conductors of his action, or proper instruments of its transmission, and produce magnetic effects upon persons with whom he is in communication" (Deleuze 212 in Alvarado 121).

□ Alvarado, Carlos S. "Mesmerism online: a bibliographic review." *Australian Journal of Clinical and Experimental Hypnosis.* 36.2 (2008): 115-29; Crabtree, Adam. *Animal Magnetism, Early Hypnotism and Psychical Research, 1766-1925*. White Plains, NY: Kraus International, 1988; Crabtree 243 (1818 edition); Caillet 2933; Tinterow, Maurice M., *Foundations of hypnosis From Mesmer to Freud*, (1970), p. 575.





MANUEL
D'ÉLECTRICITÉ
DYNAMIQUE,
OU
TRAITÉ sur l'action mutuelle des conducteurs électriques et des aimans, et sur une nouvelle théorie du magnétisme; pour faire suite à tous les Traités de Physique élémentaire;
PAR J.-F. DEMONFERRAND,
Ancien élève de l'École Polytechnique, Professeur agrégé de Physique et de Mathématiques au Collége royal de Versailles.
OUVRAGE ADOPTÉ PAR LE CONSEIL ROYAL DE L'INSTRUCTION PUBLIQUE, POUR LES BIBLIOTHÈQUES DES COLLÉGES ROYAUX.
PARIS,
BACHELIER, LIBRAIRE, SUCCESSEUR DE Mme Ve COURCIER,
Quai des Grands-Augustins, n° 55.
1823.

5. **DEMONFERRAND, Jean-Fermin.** *Manuel d'Electricité Dynamique, ou Traité sur l'action mutuelle des conducteurs électriques et des aimans, et sur une nouvelle théorie du magnétisme ; pour faire suite à tous les Traités de Physique élémentaire*. Paris: Bachelier, 1823. ¶ 8vo. 8.25 x 5.25 inches. [4], 210, [2] pp. It appears that this work was issued in two printings in 1823. There is no mention of two issues in any reference work, so we can only guess which issue is the first. Some institutional copies (such as the Wheeler copy) are numbered to page 210 (like ours) and in those copies the address of the

publisher given on the title page is "Quai des grands-Augustins, no. 55" (with the issue point of a lower case "g" in "grands"). ILLUSTRATIONS: Five folding engraved plates with light scattered foxing, but overall in very good plus condition. BINDING: Handsomely bound in modern calf over marbled boards with gilt-stamped spine label; corners rubbed, spine carefully repaired with ends missing small pieces. INTERIOR: Endpapers renewed. Some light foxing to half-title page and an occasional small, light brown spot scattered in the text, but overall the interior is in near fine condition. [SS11082]

$ 450

This work was translated into English by James Cumming in 1872 as *A Manual of Electro Dynamics, or, Treatise on the Mutual Action of Electric Conductors and Magnets*. Scarce first edition of the first textbook on electrodynamics to incorporate the newly made discoveries of Ampere and Oersted (Bakken 174; Poggendorff, 548). Demonferrand's *Manuel d'Electricité Dynamique* illuminates the "fundamental phenomena and laws of electro-dynamics" and represents a first, important, and comprehensive treatment (written in scientific and mathematical language) of Ampere's theory of electromagnetism (Wheeler 797).

"Demonferrand's account is more informative in some other respects than either of the previous written versions. . . The notion of an equilibrium is reported here for the first time, yet it agrees with a much later account given by Ampere himself in1833. Furthermore, Demonferrand indicated. . . that the object of [one of his] experiment[s] was to throw light on the question of whether electric currents already exist in iron when it is in the unmagnetized condition, or if they are brought into being as a result of magnetization. The result of the experiment did not settle this question. . . But once again we find Demonferrand anticipating a later statement (1833) by Ampere of his objective in performing the experiment. . . .Some years later, after the publication of Faraday's discovery, the history of this experiment suddenly acquired some importance" (Ross 92).

"Demonferrand's account of the Ampere-de La Rive experiment has a certain precision of description that suggests he may have derived it in part from Ampere himself; it is, at all events, a more explicit account than any previously published. . . Ampere, himself, promoted Demonferrand's work, sending many copies of Manuel d'Electricite Dynamique abroad, including one to Michael Faraday" (Ross 90). Demonferrand (1795-1844) was a pupil of Ampere and a professor of mathematics and physics at the Colege Royale in Versailles. In this work, he describes many of Ampere's theories, supplemented with experimental research and theories of his own.

□ Ronalds 132; Bakken 174; Poggendorff 548; *Catalogue of the Wheeler Gift of Books* 797; Ross, *Sydney in Nineteenth-century Attitudes: Men of Science.* 1991, pp. 92-94.

From the library of Bram Pais

6. **FERMI, Enrico** (1901-1954). [Group of 3 offprints]*: 1. Sui Momenti Magnetici dei Nuclei Atomici. – 2. Sul Calcolo Degli Spettri Degli Ioni. – 3. L'Effetto Raman Nelle Molecole e nei Cristalli.* Rome: Reale Accademia d'Italia, 1930; 1932. ¶ Series: Memorie Della Reale Accademia d'Italia, 1930, 1932. 8vo. 12; 10; 22 pp. Figs. Original printed wrappers. FINE. [S7698]

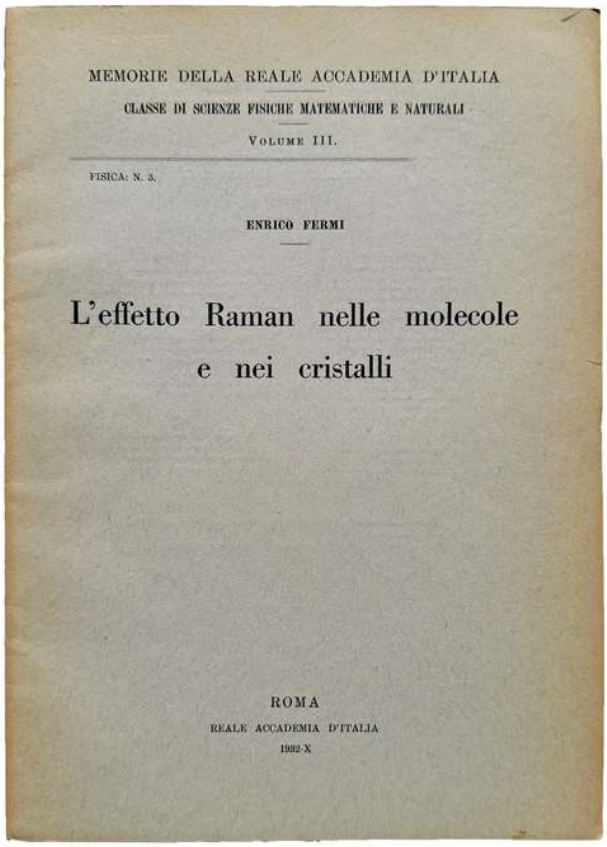
$ 650

Three papers: On the Magnetic Moments of Atomic Nuclei. 2. On the Calculation of the Ionic Spectra. 3. The Raman Effect in Molecules and Crystals. AN IMPORTANT GROUP OF ORIGINAL FERMI OFFPRINTS that includes the key work SUI MOMENTI MAGNETICI DEI NUCLEI ATOMICI, which forms an important step in the development of the theory of nuclear magnetism. This was "the first of five papers on nuclear physics, in which Fermi investigated the theory of the hyperfine structure of spectral lines (first proposed by Pauli in 1923) and the nuclear magnetic momenta demonstrating that the nuclear magnetic moment was not of the order of magnitude of the Bohr magneton, as had been previously supposed, but was only 1/1000 of the magnitude of the Bohr magneton." – Norman Library, no. 779.

Fermi was awarded the Nobel Prize for physics in 1938, and later (while working on the Manhattan Project) led the team that built the first atomic pile.

PROVENANCE: Abraham Pais (1918-2000) was a Dutch-American physicist and science historian. Pais earned his Ph.D. from University of Utrecht just prior to a Nazi ban on Jewish participation in Dutch universities during World War II. He was a physics professor at Rockefeller University until his retirement. His writings on the history of 20th century physics include his personal relationships with leading figures of physics: Einstein, Oppenheimer, Niels Bohr, Max Born, Paul Dirac, George Uhlenbeck, etc.

See: Gribbin, *Q is for Quantum*; *DSB* IV; Pais, *Inward Bound*; Norman Library, no. 779, 780, & 781. See: Samuel K. Allison, Enrico Fermi, *National Academy of Sciences*, 1957.


MEMORIE DELLA REALE ACCADEMIA D'ITALIA

CLASSE DI SCIENZE FISICHE MATEMATICHE E NATURALI

VOLUME III.

FISICA: N. 3.

ENRICO FERMI

L'effetto Raman nelle molecole e nei cristalli

ROMA

REALE ACCADEMIA D'ITALIA

1932-X


MEMORIE DELLA REALE ACCADEMIA D'ITALIA

CLASSE DI SCIENZE FISICHE MATEMATICHE E NATURALI

VOLUME I.

FISICA: N. 2.

ENRICO FERMI

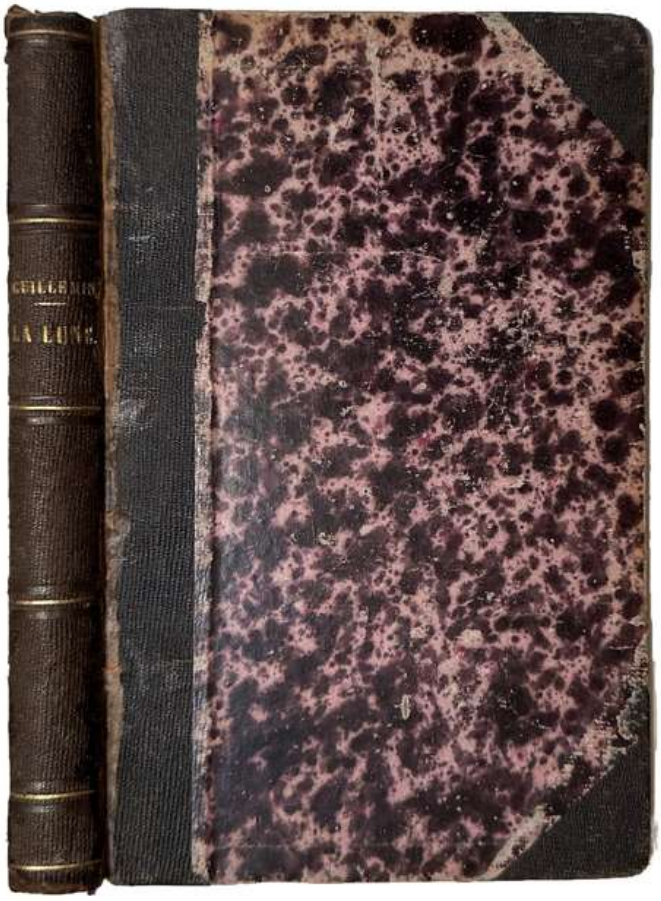
SUL CALCOLO DEGLI SPETTRI DEGLI IONI

ROMA

TIPOGRAFIA DEL SENATO

DR. DOTT. G. BARDI

1930-VIII



LA LUNE

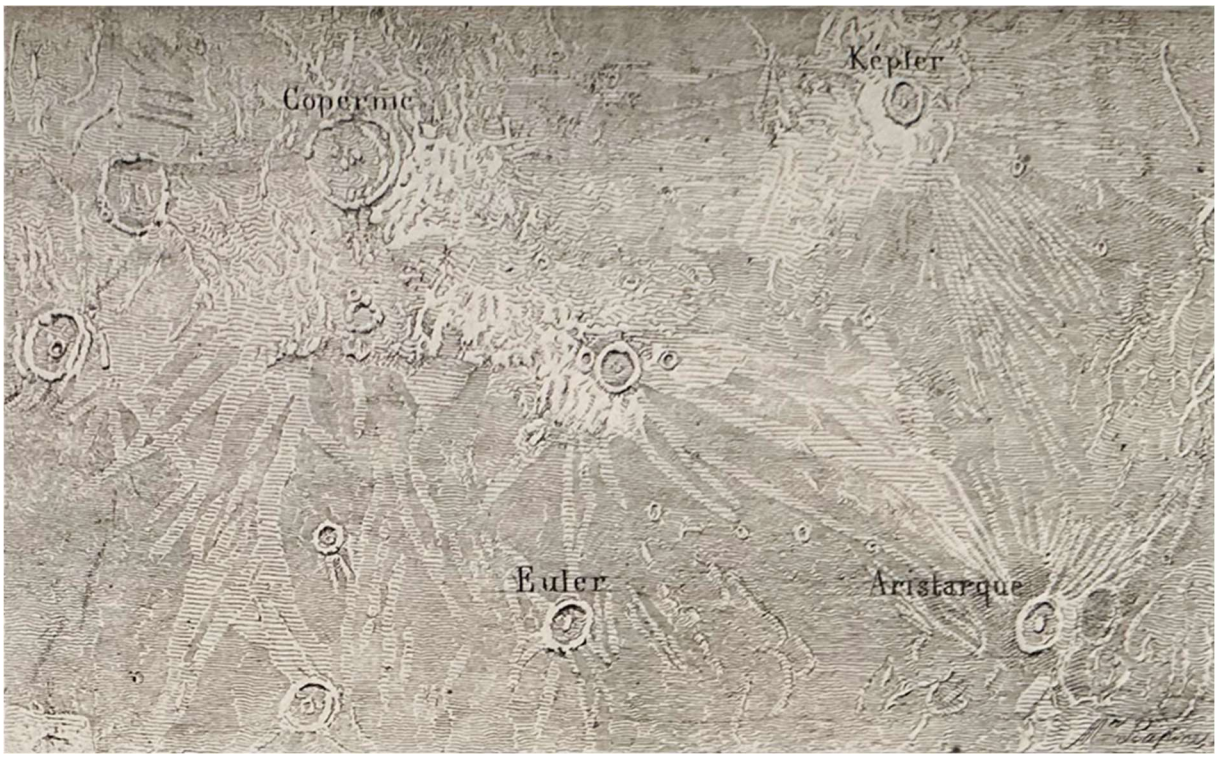
PAR

AMÉDÉE GUILLEMIN

OUVRAGE ILLUSTRÉ
de 2 grandes planches tirées hors texte
ET DE 41 VIGNETTES

PARIS
LIBRAIRIE DE L. HACHETTE ET C^ie^
BOULEVARD SAINT-GERMAIN, N° 77

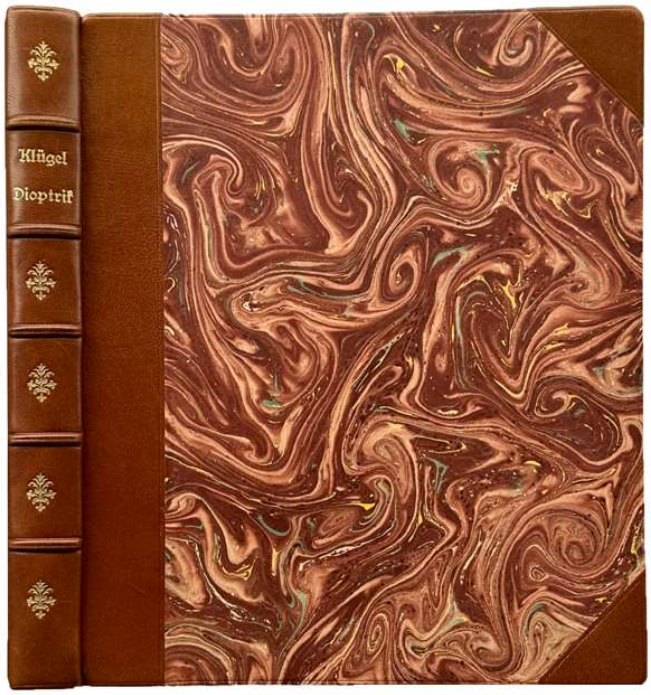
1866
Tous droits réservés



7. **GUILLEMIN, Amédée** (1826-1893). *La Lune*. Paris: Librairie de L. Hachette, 1866. ¶ Series: *Petite Encyclopédie Populaire*. Small 8vo. 215, [1] pp. 2 large illustrations, 46 figures. Quarter black gilt-stamped cloth, marbled purple boards; spine repaired with kozo. Nomdo Mulder bookplate. Very good. [RW1107]

$ 20

French astronomer Jacques Crovisier, from the Observatoire de Paris, suggested that Guillemin may have been a source of inspiration for Jules Verne's 1865 novel, *From the Earth to the Moon*.



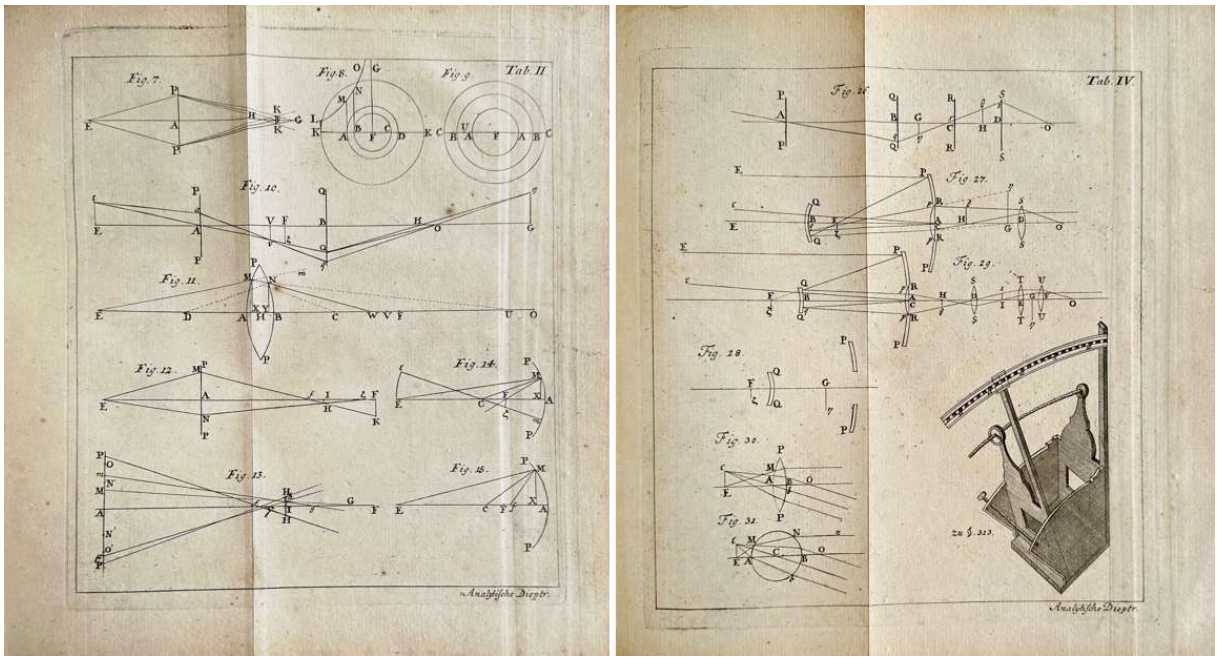

Analytische
Dioptrik
in zwey Theilen.
Der erste enthält
die allgemeine Theorie
der optischen Werkzeuge:
der zweyte
die besondere Theorie
und vortheilhafteste Einrichtung aller Gattungen von Fernröhren,
Spiegelteleskopen, und Mikroskopen.
Von
Georg Simon Klügel
Professor der Mathematik zu Helmstädt.
Leipzig,
bey Johann Friederich Junius. 1778.

8. **KLUGEL, Georg Simon** (1739-1812). *Analytische Dioptrik in zwey Theilen. Der erste enth lt die allgemeine Theorie der optischen Werkzeuge: der zweyte die besondere Theorie und vortheilhafteste Einrichtung aller Gattungen von Fernrohren, Spiegelteleskopen, und Mikroskopen*. Leipzig: Johann Friederich Junius, 1778. ¶ 2 parts in 1 vol. Sm. 4to. [xxiv], 303, [1] pp. Title vignette, 4 folding engraved plates (with 32 figs.), head and tail-pieces. Dedicated to Leonhard Euler (1707-1783). Modern half brown morocco, marbled boards, morocco corners, raised bands, gilt-stamped spine with ornaments and title within compartments, original 18th century marbled endleaves preserved. Title page signed by J. G. Kohler; bookplate of Ing. Dr. Edmund Neusser. Lovely copy. [S14188]

$ 750

First edition. Klugel based his writings on that of Leonhard Euler (1707-1783) (to whom the book is dedicated) dedicated and his famous work on optics. In his parts VII and VIII he deals with the telescope and especially the microscope.

Euler's own work on the theory of the achromatic microscope was written as early as 1762 and 1771, when he dealt with the subject more fully. In 1774, Euler's pupil and friend, Nicolas Fuss, wrote a little book on how to construct an achromatic microscope. Klugel translated that work in 1778 and then followed that with this more thorough treatment, being his Analytische Dioptrik [also 1778]. Due to the crudeness of design of the objective made in 1791by Francois Beeldsnyder (1755-1808), a colonel in the Amsterdam cavalry, Mayall asserts (and others uphold this view) that he feels the discussion of the dates of origin or this instrument are at best unclear. – Mayall. See also: S. Bradbury, The Evolution of the Microscope, pp. 179-180.

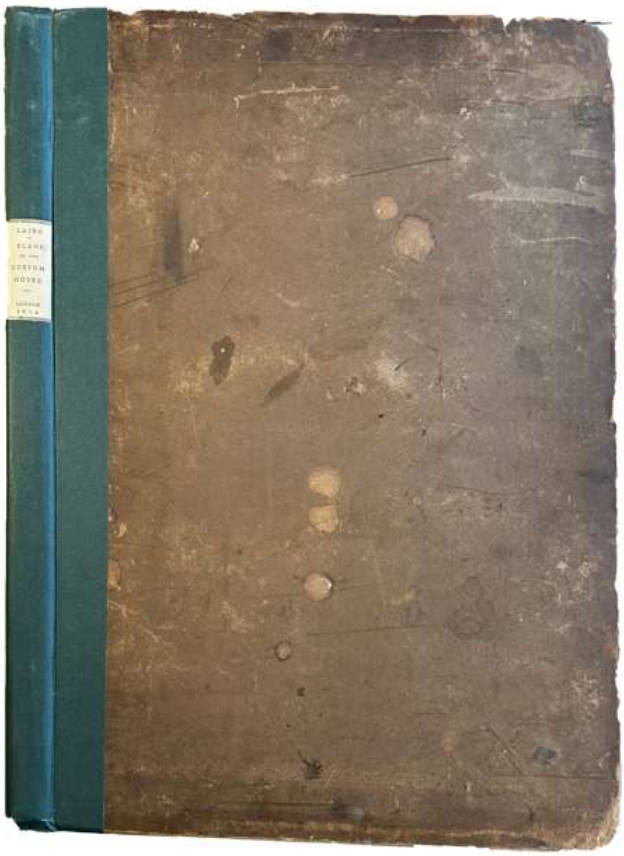


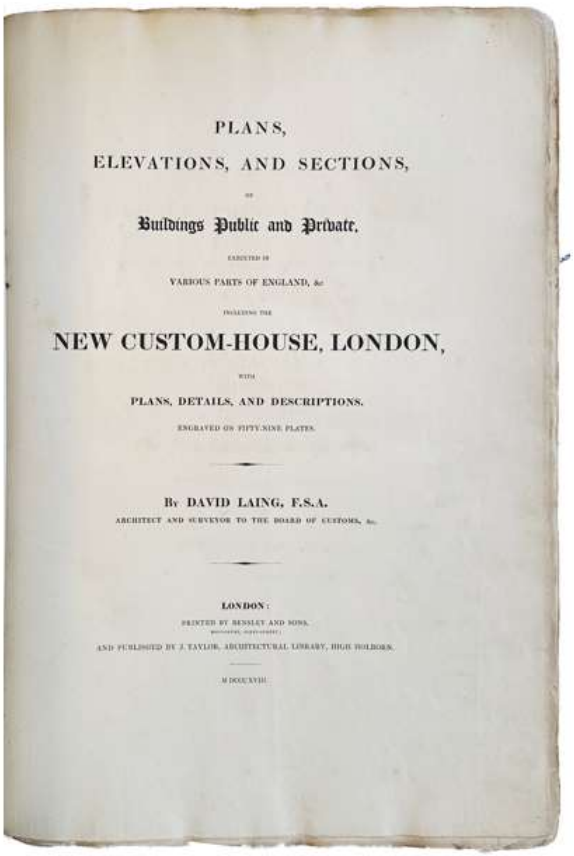
GEORG SIMON KLUGEL (1739-1812), German mathematician and physicist, born in Hamburg, studied under Abraham Kastner (1719-1800) ["the best teacher of mathematics in Germany" – Vincenzo De Risi, Gerolamo Saccheri (1667-1733), Euclid Vindicated from Every Blemish: Edited and Annotated . . . (2014), p.52] at the University of Gottingen. He was appointed professor of mathematics at the University of Helmstedt and then was chair of mathematics and physics at the University of Halle. In this compendious work he corrected some of Euler's results and expanded with his own findings. In 1803-31 he published his famous dictionary of mathematics, *Mathematisches Worterbuch* (5 vols.).

PROVENANCE [2]: [1] Johann Gottfried Kohler (1745-1801), German astronomer, known for discovering a number of nebulae, star clusters and galaxies. He was a colleague of Johann Elert Bode, another German astronomer of importance. In 1785 Kohler was appointed jointly director of the Dresden Mathematisch-Physikalischer Salon and the Kunstkammer. His catalogue of nebulae was published in 1780. He wrote a number of astronomical papers in German, and the following in the Philosophical Translations, "Observations on the transit of Mercury 1786, May 4, at Dresden", [1787]. See: Hockey, Thomas, *The Biographical Encyclopedia of Astronomers*, 2009; Poggendorff, pp. 1290-1.

[2] Ing. Dr. Edmund Neusser (1852-1912), born in Krakow, was appointed in 1893 a full professor and director of medicine in the University of Vienna. A highly respected clinician, he specialized in disorders of the blood and wrote about the circulatory system, liver and adrenal glands.

See: *Austrian Biographical Encyclopaedia. DSB* VII, pp. 404-05; Poggendorff I, 1277; John Mayall, *Cantor Lectures on the Microscope*, p. 61. See: Dieter Gerlach, *Geschichte der Mikroskopie*, (2009), p. 200.





PLANS,

ELEVATIONS, AND SECTIONS,

OF

Buildings Public and Private,

EXECUTED IN

VARIOUS PARTS OF ENGLAND, &c

INCLUDING THE

NEW CUSTOM-HOUSE, LONDON,

WITH

PLANS, DETAILS, AND DESCRIPTIONS,

ENGRAVED ON FIFTY-NINE PLATES.

By DAVID LAING, F.S.A.

ARCHITECT AND SURVEYOR TO THE BOARD OF CUSTOMS, &c.

LONDON:

PRINTED BY BENSLEY AND SONS,

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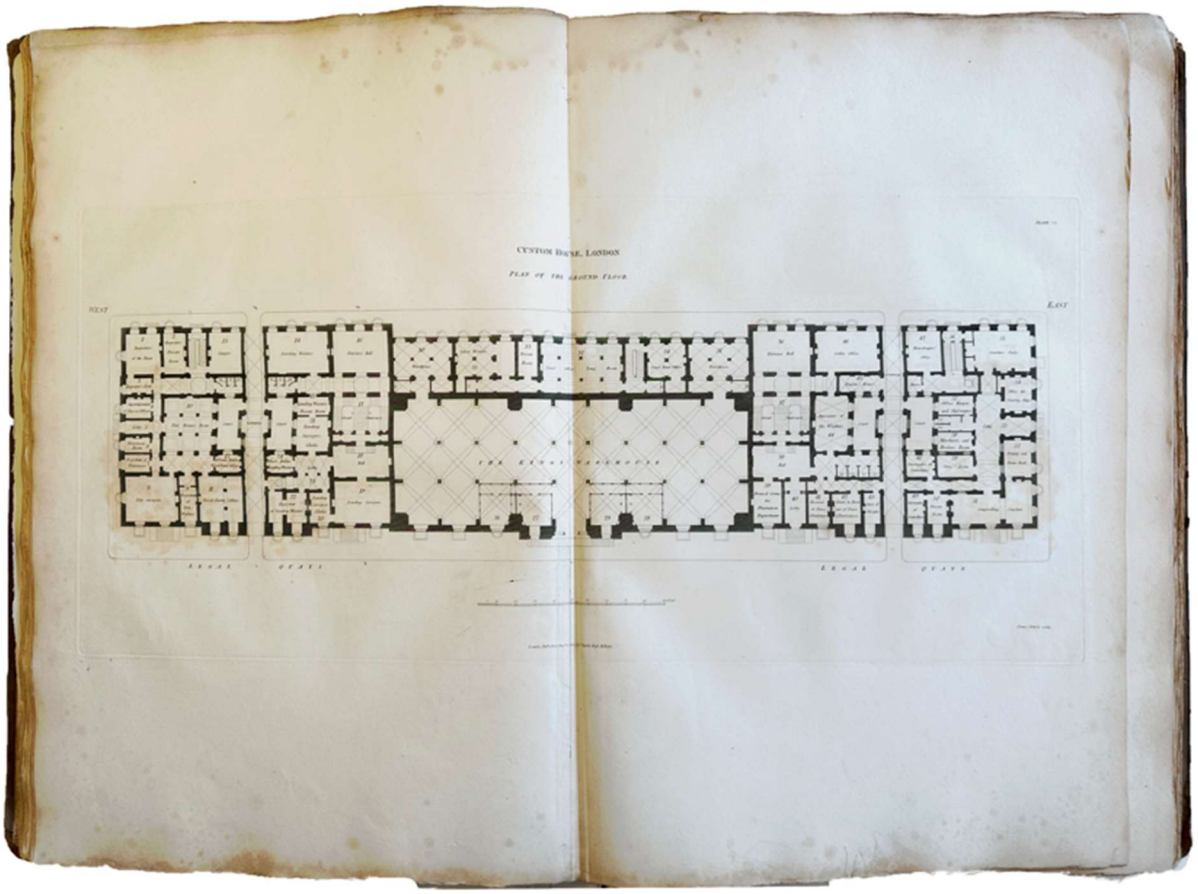
M DCCC XVIII.

[9]

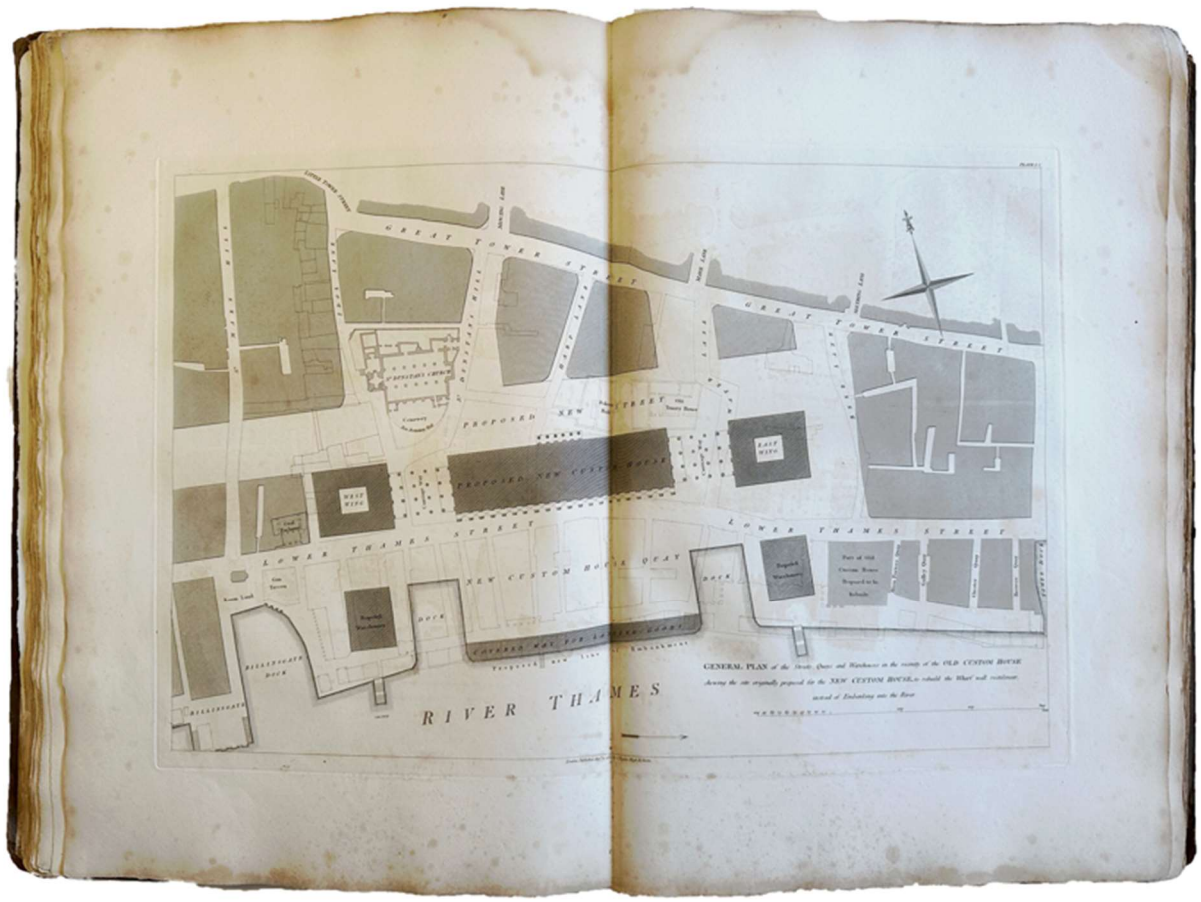


9. **LAING, David** (1774-1856). *Plans, Elevations, and Sections, of Buildings Public and Private, executed in various parts of England, &c including the New Custom-House, London, with plans, details, and descriptions. Engraved on fifty-nine plates.* London: Bensley & Sons, 1818. ¶ Imperial folio (560 x 380 mm) [10], xvi, [1, 1 blank], 44 pp. Subscriber's list, 2 etchings, 57 engraved plates (12 double-page), complete; occasional light foxing. Quarter green cloth over drab boards, modern printed spine label; rebacked. Bookplate and signature of George Aitchison, book-label of A. Russell, Pollock, Greenhill. Fine. RARE. [S14039]

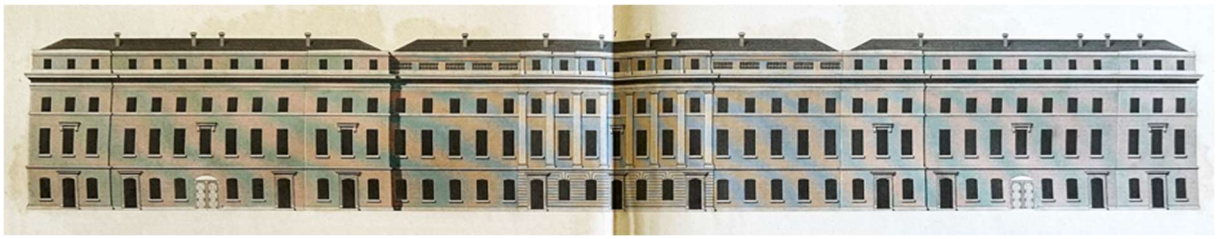
$ 1500

FIRST EDITION. This magnificent architectural folio primarily documents the structure of the New Custom House in Lower Thames Street, begun in 1813. Leading the list of subscribers is King George III, and the work is dedicated to the Prince of Wales (eventually George IV) who undoubtedly had provided royal patronage for this deluxe volume. The text describes the site preparation, including test bores of the soil, to a depth of 30 feet. Initially, the investigation indicated that the site was suitable to support the massive weight of the proposed building. However, when the actual trenching began, it was discovered that the underlying soil was of a quite variable nature and density, having been the result of centuries of

variation in the width of the adjacent Thames River. It was decided to insert beech pilings, at three-foot intervals, to support the river front of the building. The pilings eventually decayed, [contributing] to the collapse of that side of the building. The cost overruns in completing the foundation were considerable, and unfortunately insufficient, leading to the eventual collapse, necessitating its rebuilding. The remainder of the book documents the work performed on St. Dunstan's Church, public buildings and a few grand villas of the wealthy.



David Laing is principally known as the architect of the New Custom House in London, which was completed in 1817 and collapsed in 1825. Assisted by a young William Tite, he also rebuilt the church of St Dunstan-in-the-East between 1817 and 1821. In 1818 Laing published this book of plans and drawings which included details of the problems he had encountered in laying the foundations of the New Custom House. The subsidence of those foundations was later to cause the collapse of the building, which had to be rebuilt, under the direction of Sir Robert Smirke. After the collapse of the New Custom House Laing was suspended from his post as Architect & Surveyor of the Board of Customs, and his practice was ruined.



PROVENANCE: George Aitchison (1792–1861) and George Aitchison, Jr. (1825-1910) were both prominent English architects. An expert in interior design, the son's finest work is the house he designed for Frederic, Baron Leighton of Stretton, at Holland Park Road, Kensington, which includes the Arab Hall (added 1877–9, built to display the collection of glazed tiles Leighton had acquired during his visits to the East) and the artist's studio. Aitchison (junior) enjoyed a considerable reputation, being Professor of Architecture at the Royal Academy (1887–1905) and President of the Royal Institute of British Architects (1896–9).

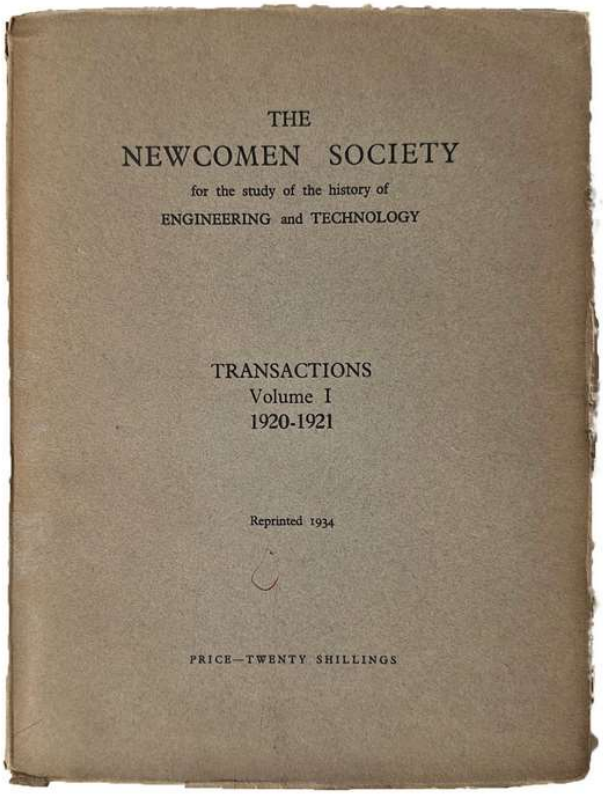
□ *DNB* Vol. XI, pp. 400-1.

[10]

10. **Newcomen Society**. *The Newcomen Society for the study of the history of engineering and technology. Transactions*. London: Newcomen Society, 1922-2006. ¶ 76 vols. in 50 [volumes], lacking vols. II and XLIX. 8vo. Vol. I is a 1934 reprint. Mixture of library cloth bindings, quarter vellum over cloth boards (40) and paper wrappers (9), hard bound volumes t.e.g. Burndy bookplates. Fine. S10054

$ 650

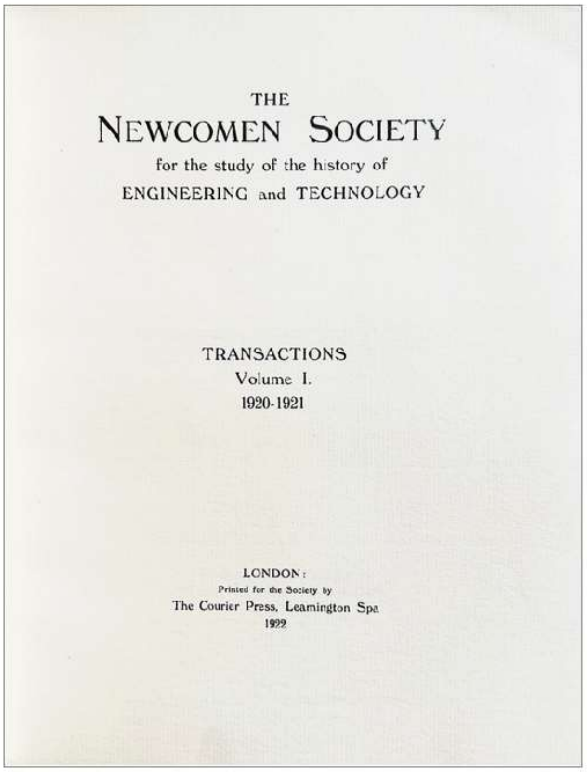
A long run of this journal devoted to studies in the history of engineering and technology. Named after Thomas Newcomen (1664-1729), the inventor of the "fire engine" or steam engine, the Newcomen Society presents and publishes historical articles on the invention and development of mechanical technology. The society is the world's oldest learned society devoted to the study of the history of engineering and technology, is based in London and is concerned with all branches of engineering: civil, mechanical, electrical, structural, aeronautical, marine, chemical and manufacturing. Invention of the steam engine is often considered the catalyst which enabled The Industrial Revolution, and is therefore of paramount importance.


THE
NEWCOMEN SOCIETY
for the study of the history of
ENGINEERING and TECHNOLOGY

TRANSACTIONS
Volume I
1920-1921

Reprinted 1934

PRICE—TWENTY SHILLINGS

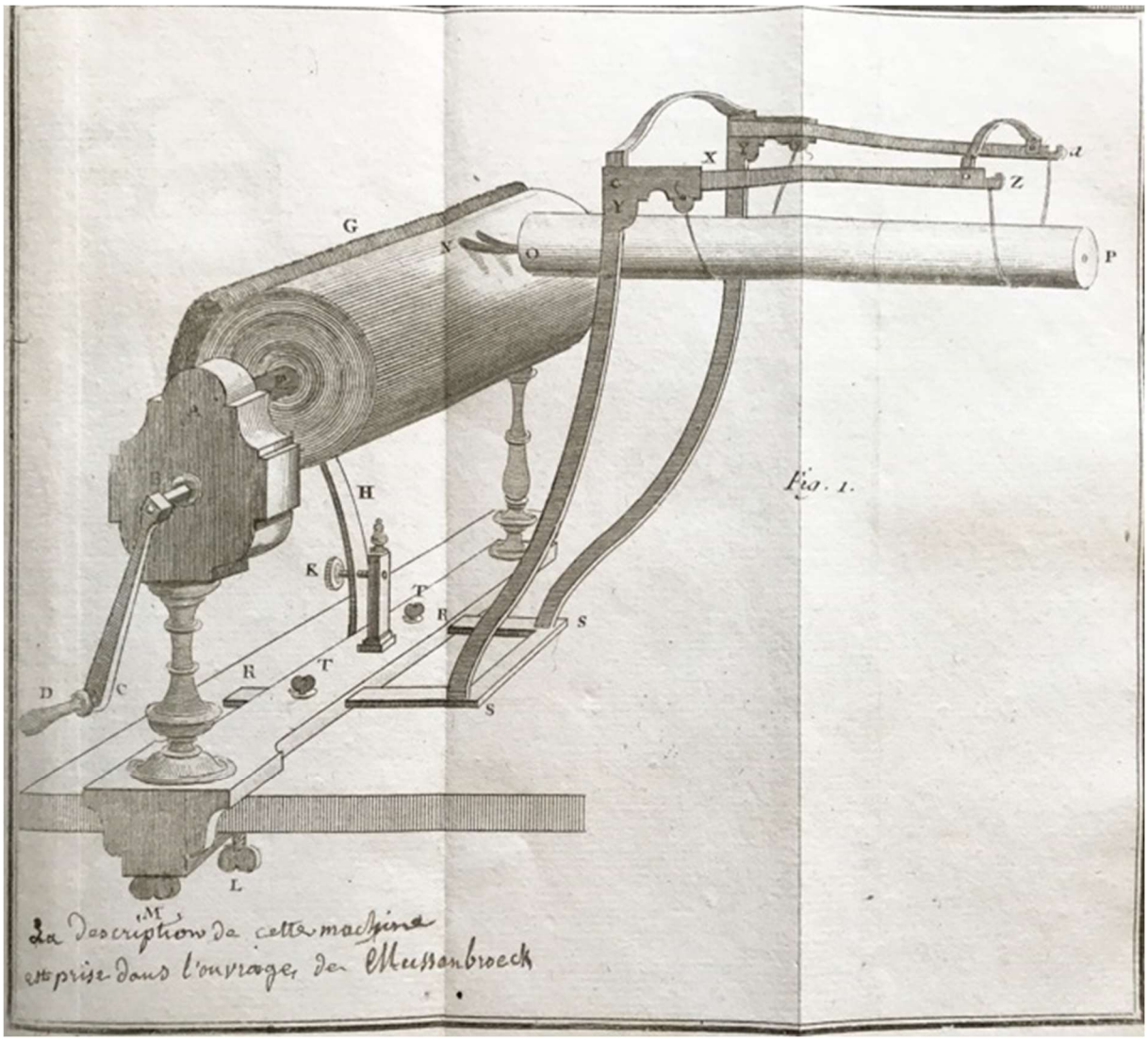

THE
NEWCOMEN SOCIETY
for the study of the history of
ENGINEERING and TECHNOLOGY

TRANSACTIONS
Volume I.
1920-1921

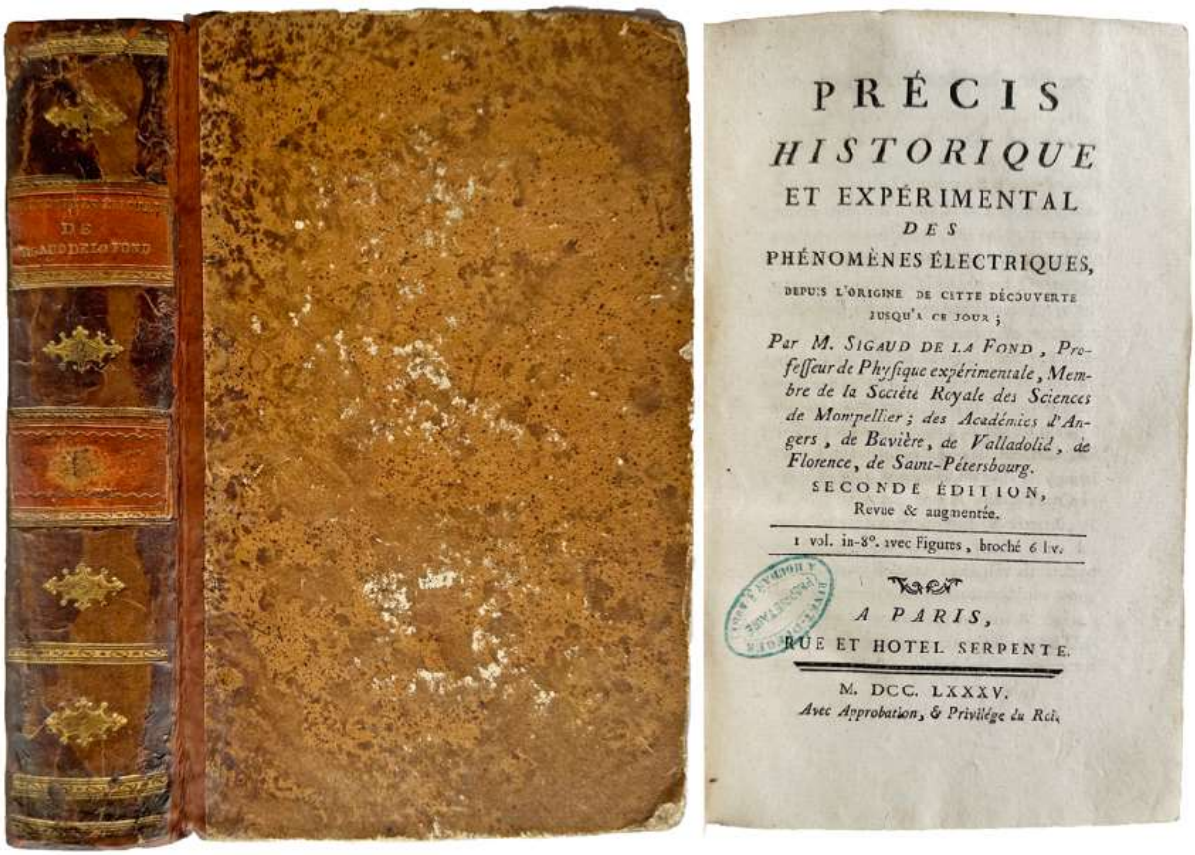
LONDON:
Printed for the Society by
The Courier Press, Leamington Spa
1922

There are examples of Newcomen engines in the Science Museum (London) and the Ford Museum, Dearborn amongst other places. Perhaps the last Newcomen-style engine to be used commercially and the last still remaining on its original site is at Elsecar, near Barnsley in South Yorkshire. The set consists of: Volumes I, III-

XLVIII, L-76. Every volume contains numerous plates of inventions and machines. Among the thousands of papers presented are ones on the topics of: Coal gas production for lighting, Diagrams for the "Stourbridge Lion" & a history of Richard Trevithick, inventor of the locomotive, Agricola's three-stage water pump, von Guericke's air pump, various steam engine designs, devices for raising water (pumps, windmills, screws, etc.), Early steam-powered vehicles, Mechanical refrigeration, Investigation of the Sutton Hoo burial site, Invention of viscose rayon, Development of postal franking machines, and the scientific basis for Leonardo da Vinci's work in technology.



[11]



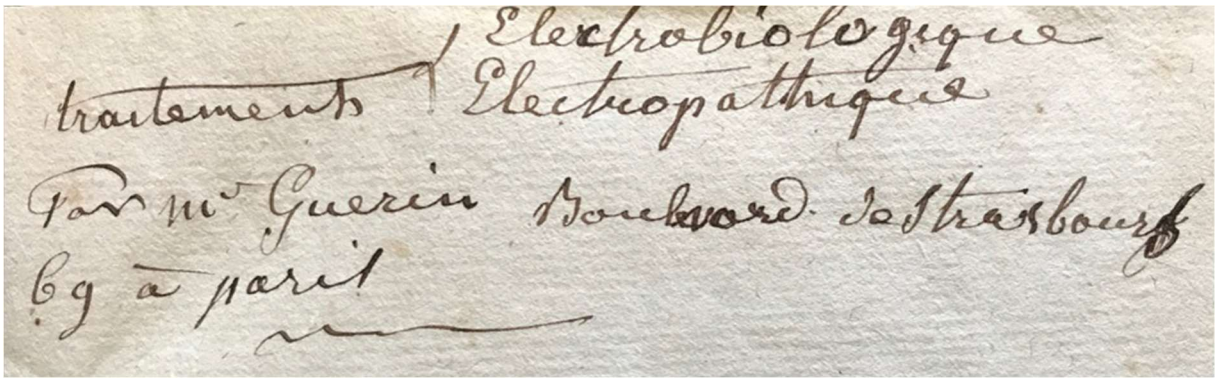
PRÉCIS
HISTORIQUE
ET EXPÉRIMENTAL
DES
PHÉNOMÈNES ÉLECTRIQUES,
DEPUIS L'ORIGINE DE CETTE DÉCOUVERTE
JUSQU'A CE JOUR ;
Par M. SIGAUD DE LA FOND, Professeur de Physique expérimentale, Membre de la Société Royale des Sciences de Montpellier ; des Académies d'Angers, de Bavière, de Valladolid, de Florence, de Saint-Pétersbourg.
SECONDE ÉDITION,
Revue & augmentée.
1 vol. in-8°. avec Figures, broché 6 liv.
A PARIS,
RUE ET HOTEL SERPENTE.
M. DCC. LXXXV.
Avec Approbation, & Privilége du Roi.

11. **SIGAUD DE LA FOND, Joseph-Aignan** (1730-1810). *Précis Historique et Expérimental des Phénomènes Electriques depuis l'Origine de cette Découverte jusqu'a ce Jour . . . Seconde édition, Revue et augmentée.* Paris: Rue et Hôtel Serpente, 1785. ¶ 200 x 125 mm. 8vo. xvi, [4], 624 pp. Half-title, 10 folding engraved copperplates (by Sellier), [pl. 3 has a manuscript annotation relating to the electrical machine of the author's design], errata; lacks the 2 privilege leaves at end. Contemporary calf-backed marbled boards; cover corners showing, newly rebacked with original spine mounted. 19th-century stamp on title and elsewhere of Binet Dufour; inscription "Electrobiologique Traitement Electropathique, Par M. Guerin, Boulevard de Strasbourg. . ." Occasional neat manuscript ink corrections or marginalia. Very good. [S14189]

$ 500

Second edition of a work on electricity and magnetism originally published in 1781. The work mentions a number of electrical devices used to make demonstrations and experiments. This period marks a stark contrast in instruments used for experiments and instruments used for demonstrations. See: Thomas L. Hankins, Robert J. Silverman, Instruments and the Imagination, 2014, p. 58.

"The final, greatly enlarged edition . . . of this comprehensive history of electricity and magnetism, and their development and applications, including use for curing diseases. Benjamin Franklin and his experiments are fully discussed as are those of Gilbert, Hauksbee, Ingenhousz, Nollet, [Volta] and others. Extensive accounts are given of atmospheric electricity and lightning conductors, with some original experiments of the author, who claims to have been the first to use glass plates with electrical machines in 1756. He also described an improved Leyden jar. "A work of merit" (Wheeler Gift). As with his other works on physics, this contains numerous references to chemical experiments and phenomena." :: Neville catalog.



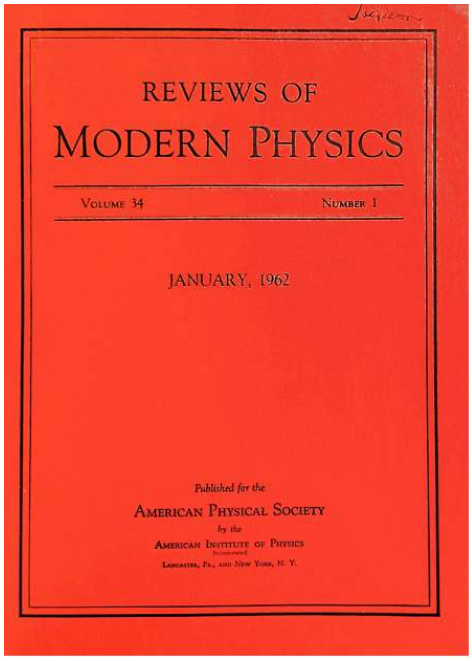
Arranged in five sections, the first offers a history of the origins and progress of electricity to the present period (c.1785) and the Leyden jar. Section II relates to "Leyde" (Leyden Jar invented by Pieter van Musschenbroek of Leiden, with Ewald Kleist also achieving the same invention) and the theories of Benjamin Franklin. Sec. III: Analyzing electricity and comparing it to thunder and magnetism. Within this section deals with meteorology as thunder applied to electrical phenomena, and also the means to divert lightning, the relationship between magnetism and electricity. Sec. IV: Applications made using electrical fluid. With electricity in a void, in electrical fish, electrical properties of tourmaline, "The electric stone." Also: using the electrophorus generator [invented by Johan Carl Wilcke in 1762], producing a static charge. Article V in this section offers more on two pocket-sized electric machines that produce 'some strange phenomena of electric commotion.' The volume finishes with four proposed problems. Adding to all this, the half-title bears an advertisement for his nephew* Rouland, a demonstrator of physics at the University of Paris, and also a course for electrical instruments. See: Rouland, Description des machines electriques a taffetas, de leurs effets et des divers avantages que presentent ces nouveaux appareils, 1785. * [Mottelay suggests "N." for Rouland's first name, though [WorldCat] and other sources do not have his first name]. See: Hankins & Silverman, p. 59.

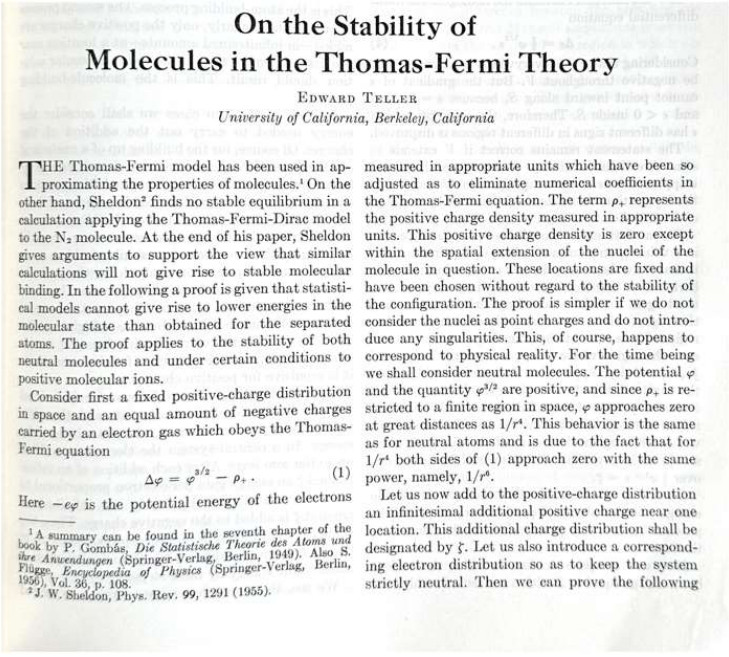
PROVENANCE: “Binet-Dufour á Houdan s soise proprietaire” :: a French instrument maker, known for their barometers.

Sigaud de la Fond (1730-1810) was a pupil of Nollet, and taught experimental physics in Paris, succeeding him in 1760 at the College Louis-le-Grand, following his mentor. “Sigaud was a prolific writer in the fields of experimental physics, chemistry, medicine, and (apparently as a consequence of his early Jesuit training) theology. Experimental science was a fashionable pursuit among the leisured classes in eighteenth-century France, and Sigaud was one of several illustrious popularizers who satisfied the intellectual appetites and curiosities of an ever-increasing number of amateurs of science. Popular interest tended toward the more spectacular examples of natural phenomenon: and lectures accompanied by demonstrations, especially on electricity and on the newly discovered gases, always attracted large and enthusiastic crowds.” :: *Encyclopedia.*

Bakken p.107; Blake p. 418; Ekelof, 497; Gartrell, 492; Mottelay, p. 280; Roy G. Neville II, pp. 475-76; Poggendorff, II, p. 927; Wellcome Library 48238/B; Wheeler Gift 505a. See: Thomas L. Hankins, Robert J. Silverman, Instruments and the Imagination, 2014, p. 59.

See: Isaac Benguigui, Nollet (Jean Antoine, Abbe), Jean Jallabert, *Theories electriques du XVIIIe siecle: Correspondance entre l’Abbe Nollet (1700-1770) et le physicien genevois Jean Jallabert (1712-1768),* Geneve, 1984, page 40.





On the Stability of Molecules in the Thomas-Fermi Theory

EDWARD TELLER

University of California, Berkeley, California

THE Thomas-Fermi model has been used in approximating the properties of molecules.[1] On the other hand, Sheldon[2] finds no stable equilibrium in a calculation applying the Thomas-Fermi-Dirac model to the N_2 molecule. At the end of his paper, Sheldon gives arguments to support the view that similar calculations will not give rise to stable molecular binding. In the following a proof is given that statistical models cannot give rise to lower energies in the molecular state than obtained for the separated atoms. The proof applies to the stability of both neutral molecules and under certain conditions to positive molecular ions.

Consider first a fixed positive-charge distribution in space and an equal amount of negative charges carried by an electron gas which obeys the Thomas-Fermi equation

$$\Delta\varphi = \varphi^{3/2} - \rho_+ . \qquad (1)$$

Here $-e\varphi$ is the potential energy of the electrons measured in appropriate units which have been so adjusted as to eliminate numerical coefficients in the Thomas-Fermi equation. The term ρ_+ represents the positive charge density measured in appropriate units. This positive charge density is zero except within the spatial extension of the nuclei of the molecule in question. These locations are fixed and have been chosen without regard to the stability of the configuration. The proof is simpler if we do not consider the nuclei as point charges and do not introduce any singularities. This, of course, happens to correspond to physical reality. For the time being we shall consider neutral molecules. The potential φ and the quantity $\varphi^{3/2}$ are positive, and since ρ_+ is restricted to a finite region in space, φ approaches zero at great distances as $1/r^4$. This behavior is the same as for neutral atoms and is due to the fact that for $1/r^4$ both sides of (1) approach zero with the same power, namely, $1/r^6$.

Let us now add to the positive-charge distribution an infinitesimal additional positive charge near one location. This additional charge distribution shall be designated by ζ. Let us also introduce a corresponding electron distribution so as to keep the system strictly neutral. Then we can prove the following

[1] A summary can be found in the seventh chapter of the book by P. Gombás, *Die Statistische Theorie des Atoms und ihre Anwendungen* (Springer-Verlag, Berlin, 1949). Also S. Flügge, *Encyclopedia of Physics* (Springer-Verlag, Berlin, 1956), Vol. 36, p. 108.

[2] J. W. Sheldon, Phys. Rev. 99, 1291 (1955).

[12]

12. **TELLER, Edward** (1908-2003). *"On the Stability of Molecules in the Thomas-Fermi Theory."* *Reviews of Modern Physics,* 1962. ¶ 4to. pp. 627-631. Reviews of Modern Physics, vol. 34, no. 4, Oct. 1962. Orange gilt-stamped buckram, original wrappers bound in. Ex-library copy. Very good. [S14190]

$ 75

"The Thomas-Fermi model has been used in approximating the properties of molecules. On the other hand, J.W. Sheldon finds no stable equilibrium in a calculation applying the Thomas-Fermi-Dirac model to the N2 molecule. At the end of his paper, Sheldon gives arguments to support the view that similar calculations will not give rise to stable molecular binding. In the following a proof is given that statistical models cannot give rise to lower energies in the molecular state than obtained for the separated atoms. The proof applies to the stability of both neutral molecules and under certain conditions to positive molecular ions." (Author).

"In 1962, Edward Teller showed that Thomas–Fermi theory cannot describe molecular bonding – the energy of any molecule calculated with TF theory is higher than the sum of the energies of the constituent atoms. More generally, the total energy of a molecule decreases when the bond lengths are uniformly increased. This can be overcome by improving the expression for the kinetic energy." – Wikip.; Lieb, Elliott H.; Simon, Barry (1977). "The Thomas–Fermi theory of atoms, molecules and solids". *Advances in Mathematics.* 23 (1): 22–116.

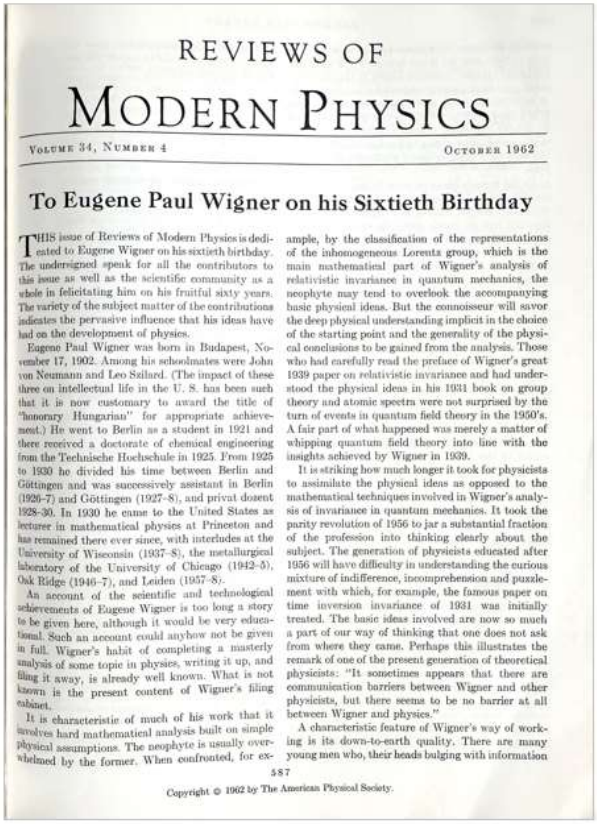
Edward Teller was a Hungarian-American theoretical physicist and chemical engineer who is known colloquially as "the father of the hydrogen bomb" and one of the creators of the Teller–Ulam design. Teller was one of Oppenheimer's first recruits at Los Alamos at the beginning of the Manhattan Project in the spring of 1943. "He was Director of the Lawrence Livermore National Laboratory, which he helped to found with Ernest O. Lawrence, from 1958 to 1960, and after that he continued as an associate director. He chaired the committee that founded the Space Sciences Laboratory at Berkeley. He also served concurrently as a professor of physics at the University of California, Berkeley."

With:

DIRAC, P.A.M. (1902-1984). *"The Conditions for a Quantum Field Theory to be Relativistic."* *Reviews of Modern Physics*, vol. 34, no. 4, October 1962.

"ONE can build up a quantum field theory by working from a classical action principle. If one takes the action to be Lorenta invariant, the classical theory must be relativistic. With much an action, by following a standard method, one can put

the classical equations of motion into the Hamiltonian form. They then refer to the concept of a state at a certain time, which is a nonrelativistic concept, so they are no longer manifestly relativistic Still, one knows that they must be relativistic in their content, since they follow entirely from Lorentz-invariant assumptions." – Author.



REVIEWS OF

MODERN PHYSICS

VOLUME 34, NUMBER 4 OCTOBER 1962

To Eugene Paul Wigner on his Sixtieth Birthday

THIS issue of Reviews of Modern Physics is dedicated to Eugene Wigner on his sixtieth birthday. The undersigned speak for all the contributors to this issue as well as the scientific community as a whole in felicitating him on his fruitful sixty years. The variety of the subject matter of the contributions indicates the pervasive influence that his ideas have had on the development of physics.

Eugene Paul Wigner was born in Budapest, November 17, 1902. Among his schoolmates were John von Neumann and Leo Szilard. (The impact of these three on intellectual life in the U. S. has been such that it is now customary to award the title of "honorary Hungarian" for appropriate achievement.) He went to Berlin as a student in 1921 and there received a doctorate of chemical engineering from the Technische Hochschule in 1925. From 1925 to 1930 he divided his time between Berlin and Göttingen and was successively assistant in Berlin (1926-7) and Göttingen (1927-8), and privat dozent 1928-30. In 1930 he came to the United States as lecturer in mathematical physics at Princeton and has remained there ever since, with interludes at the University of Wisconsin (1937-8), the metallurgical laboratory of the University of Chicago (1942-5), Oak Ridge (1946-7), and Leiden (1957-8).

An account of the scientific and technological achievements of Eugene Wigner is too long a story to be given here, although it would be very educational. Such an account could anyhow not be given in full. Wigner's habit of completing a masterly analysis of some topic in physics, writing it up, and filing it away, is already well known. What is not known is the present content of Wigner's filing cabinet.

It is characteristic of much of his work that it involves hard mathematical analysis built on simple physical assumptions. The neophyte is usually overwhelmed by the former. When confronted, for example, by the classification of the representations of the inhomogeneous Lorentz group, which is the main mathematical part of Wigner's analysis of relativistic invariance in quantum mechanics, the neophyte may tend to overlook the accompanying basic physical ideas. But the connoisseur will savor the deep physical understanding implicit in the choice of the starting point and the generality of the physical conclusions to be gained from the analysis. Those who had carefully read the preface of Wigner's great 1939 paper on relativistic invariance and had understood the physical ideas in his 1931 book on group theory and atomic spectra were not surprised by the turn of events in quantum field theory in the 1950's. A fair part of what happened was merely a matter of whipping quantum field theory into line with the insights achieved by Wigner in 1939.

It is striking how much longer it took for physicists to assimilate the physical ideas as opposed to the mathematical techniques involved in Wigner's analysis of invariance in quantum mechanics. It took the parity revolution of 1956 to jar a substantial fraction of the profession into thinking clearly about the subject. The generation of physicists educated after 1956 will have difficulty in understanding the curious mixture of indifference, incomprehension and puzzlement with which, for example, the famous paper on time inversion invariance of 1931 was initially treated. The basic ideas involved are now so much a part of our way of thinking that one does not ask from where they came. Perhaps this illustrates the remark of one of the present generation of theoretical physicists: "It sometimes appears that there are communication barriers between Wigner and other physicists, but there seems to be no barrier at all between Wigner and physics."

A characteristic feature of Wigner's way of working is its down-to-earth quality. There are many young men who, their heads bulging with information

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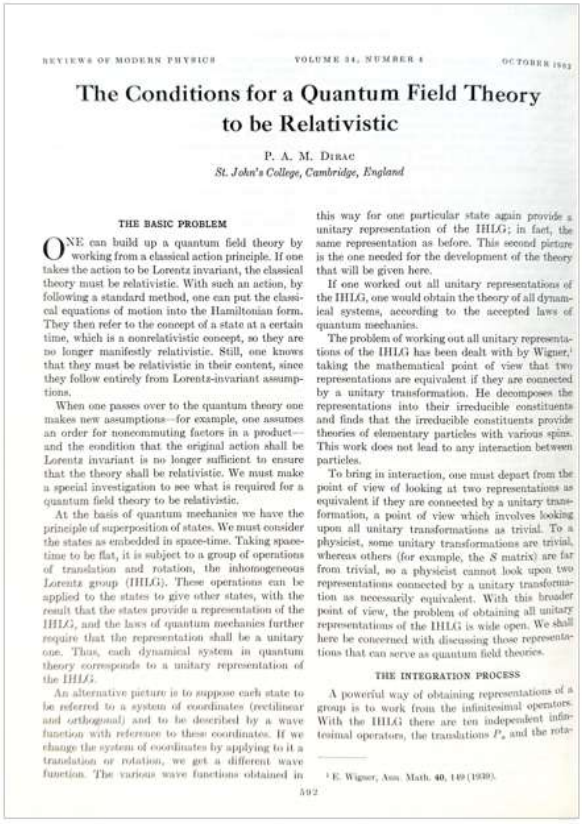

The Conditions for a Quantum Field Theory to be Relativistic

P. A. M. DIRAC
St. John's College, Cambridge, England

THE BASIC PROBLEM

ONE can build up a quantum field theory by working from a classical action principle. If one takes the action to be Lorentz invariant, the classical theory must be relativistic. With such an action, by following a standard method, one can put the classical equations of motion into the Hamiltonian form. They then refer to the concept of a state at a certain time, which is a nonrelativistic concept, so they are no longer manifestly relativistic. Still, one knows that they must be relativistic in their content, since they follow entirely from Lorentz-invariant assumptions.

When one passes over to the quantum theory one makes new assumptions—for example, one assumes an order for noncommuting factors in a product—and the condition that the original action shall be Lorentz invariant is no longer sufficient to ensure that the theory shall be relativistic. We must make a special investigation to see what is required for a quantum field theory to be relativistic.

At the basis of quantum mechanics we have the principle of superposition of states. We must consider the states as embedded in space-time. Taking space-time to be flat, it is subject to a group of operations of translation and rotation, the inhomogeneous Lorentz group (IHLG). These operations can be applied to the states to give other states, with the result that the states provide a representation of the IHLG, and the laws of quantum mechanics further require that the representation shall be a unitary one. Thus, each dynamical system in quantum theory corresponds to a unitary representation of the IHLG.

An alternative picture is to suppose each state to be referred to a system of coordinates (rectilinear and orthogonal) and to be described by a wave function with reference to these coordinates. If we change the system of coordinates by applying to it a translation or rotation, we get a different wave function. The various wave functions obtained in this way for one particular state again provide a unitary representation of the IHLG; in fact, the same representation as before. This second picture is the one needed for the development of the theory that will be given here.

If one worked out all unitary representations of the IHLG, one would obtain the theory of all dynamical systems, according to the accepted laws of quantum mechanics.

The problem of working out all unitary representations of the IHLG has been dealt with by Wigner,[1] taking the mathematical point of view that two representations are equivalent if they are connected by a unitary transformation. He decomposes the representations into their irreducible constituents and finds that the irreducible constituents provide theories of elementary particles with various spins. This work does not lead to any interaction between particles.

To bring in interaction, one must depart from the point of view of looking at two representations as equivalent if they are connected by a unitary transformation, a point of view which involves looking upon all unitary transformations as trivial. To a physicist, some unitary transformations are trivial, whereas others (for example, the S matrix) are far from trivial, so a physicist cannot look upon two representations connected by a unitary transformation as necessarily equivalent. With this broader point of view, the problem of obtaining all unitary representations of the IHLG is wide open. We shall here be concerned with discussing those representations that can serve as quantum field theories.

THE INTEGRATION PROCESS

A powerful way of obtaining representations of a group is to work from the infinitesimal operators. With the IHLG there are ten independent infinitesimal operators, the translations P_μ and the rota-

[1] E. Wigner, Ann. Math. 40, 149 (1939).

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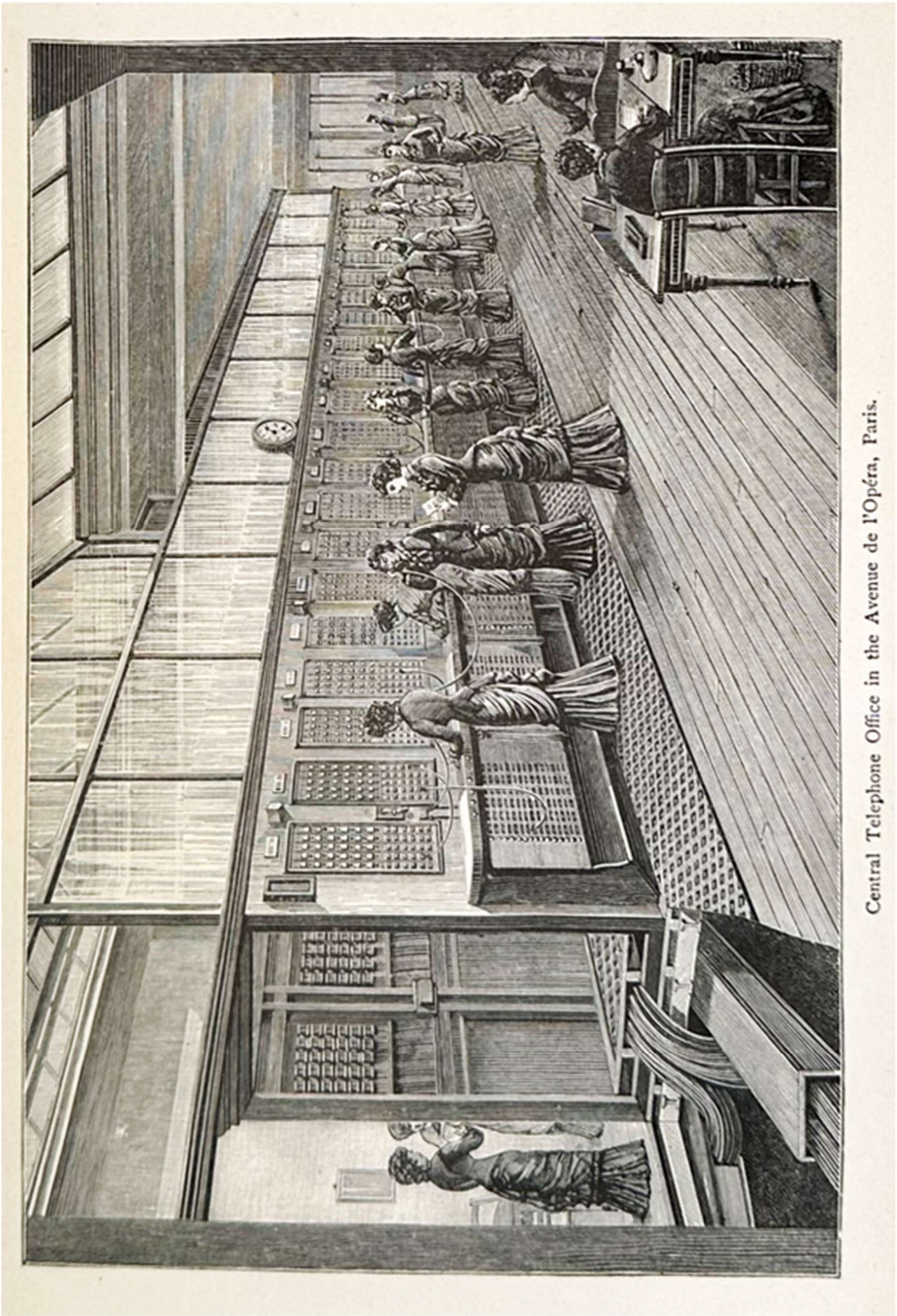
WITH:

WIGNER, Eugene Paul (1902-1995). **Valentine Bargmann** (1908-1989); **Marvin Leonard Goldberger** (1922-2014); **Sam Bard Treiman** (1925-1999); **John Archibald Wheeler** (1911-2008); **Arthur Wightman** (1922-2013). *"To Eugene Paul Wigner on his Sixtieth Birthday."* pp. 587-591. *Reviews of Modern Physics*, vol. 34, no. 4, Oct. 1962.



Central Telephone Office in the Avenue de l'Opéra, Paris.

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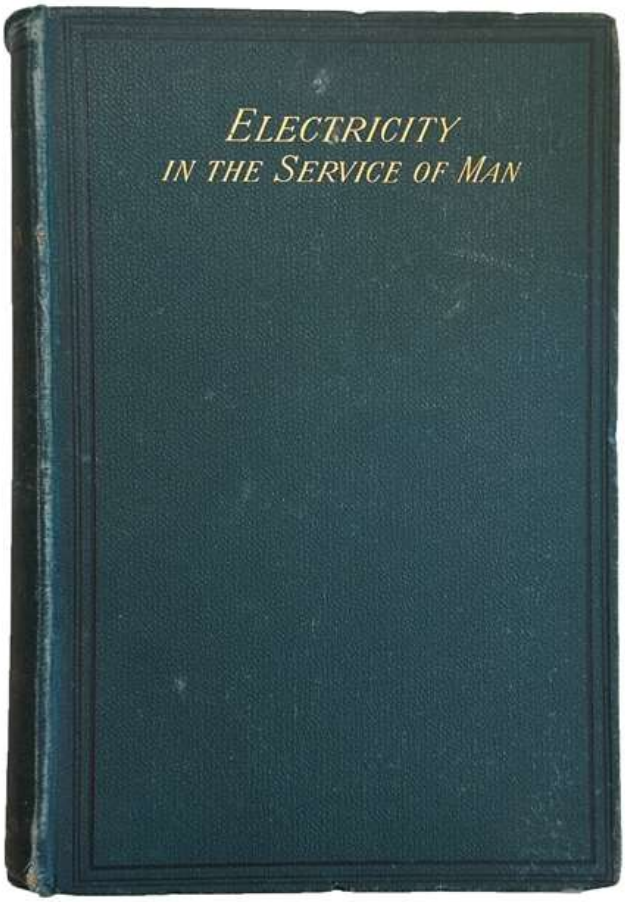

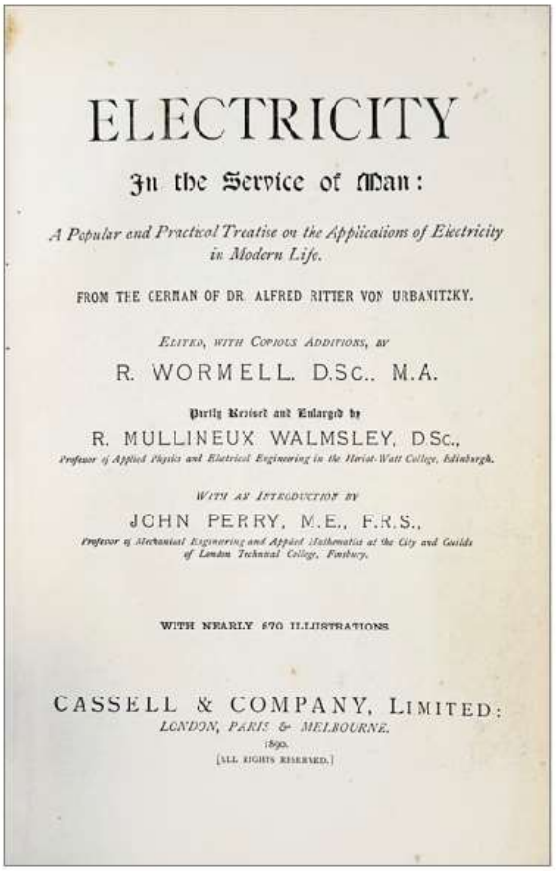
ELECTRICITY

In the Service of Man:

A Popular and Practical Treatise on the Applications of Electricity in Modern Life.

FROM THE GERMAN OF DR. ALFRED RITTER VON URBANITZKY.

Edited, with Copious Additions, by

R. WORMELL, D.Sc., M.A.

Partly Revised and Enlarged by

R. MULLINEUX WALMSLEY, D.Sc.,

Professor of Applied Physics and Electrical Engineering in the Heriot-Watt College, Edinburgh.

With an Introduction by

JOHN PERRY, M.E., F.R.S.,

Professor of Mechanical Engineering and Applied Mathematics at the City and Guilds of London Technical College, Finsbury.

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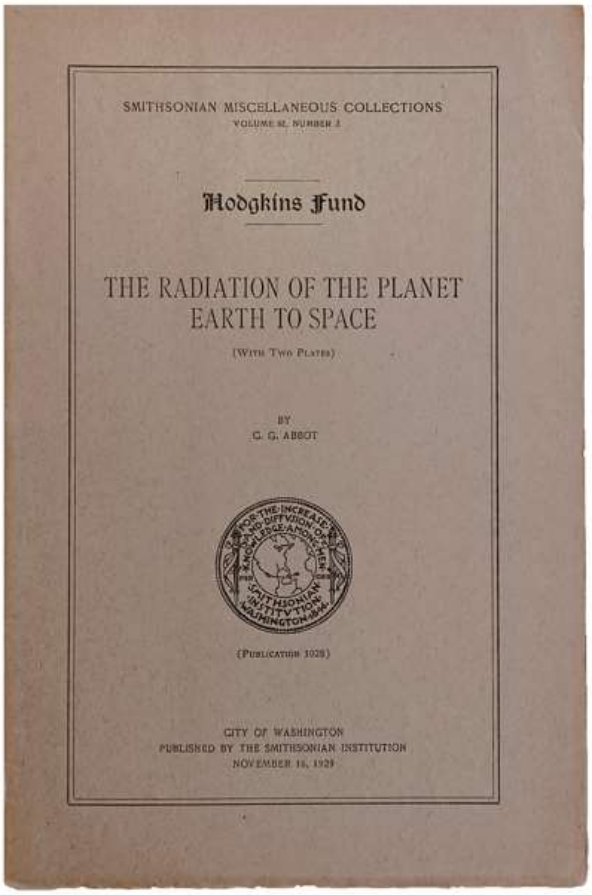
13. **URBANITZKY, Alfred Ritter von** (1852-1906). *Electricity in the Service of Man; A Popular and Practical Treatise on the Applications of Electricity in Modern Life. Edited, with Copious Additions, by R. Wormell; Partly Revised and Enlarged by R. Mullineaux Walmsley; With an Introduction by John Perry*. London: Cassell, 1890. ¶ Thick 8vo. xxxii, 891, [1] pp. Frontis., 836 figs., index. Original dark green blind-, gilt-, and black-stamped cloth, bound by H. Chanell, Surrey; extremities rubbed. Very good. [RW1270]

$ 105

Second edition in English. Divided into two parts, “The Principles of Electrical Science” and “The Technology of Electricity, the latter of which is divided again, into “Generation and Conduction of Electricity” and “Practical Applications of Electricity”. Chapters include “Statical Electricity”, “The Galvanic Current”, “Alternate Current Machines”, “Galvanic Batteries”, “Thermo-piles”, “Secondary Batteries (Accumulators)”, “The Electric Light”, “electro-Chemistry and Metallurgy”, “Electricity as a Motive-Power”, “The Telephone”, “Photophone, Pherope, and Phonograph”, “The Electric Telegraph”.

Part II: *What is in an A?*


SMITHSONIAN MISCELLANEOUS COLLECTIONS

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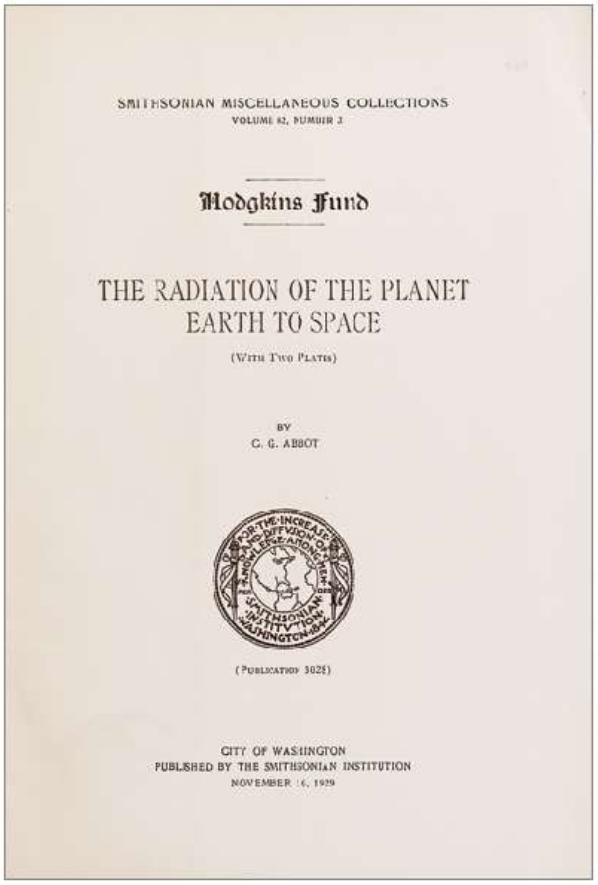
THE RADIATION OF THE PLANET EARTH TO SPACE

(With Two Plates)

BY
C. G. ABBOT

(Publication 3025)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
NOVEMBER 16, 1929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14. **ABBOT, Charles Greeley** (b. 1872). *The radiation of the planet Earth to space*. Washington: Smithsonian Institution, 1929. ¶ At head of title: Smithsonian Miscellaneous Collections, Vol. 82, No. 3, November 16, 1929. Hodgkins Fund. 242 x 162 mm. 8vo. [ii], 12 pp. 7 tables, 2 large folding plates (i.e.: printed on both sides). Printed wrappers. Fine. [SS5880]

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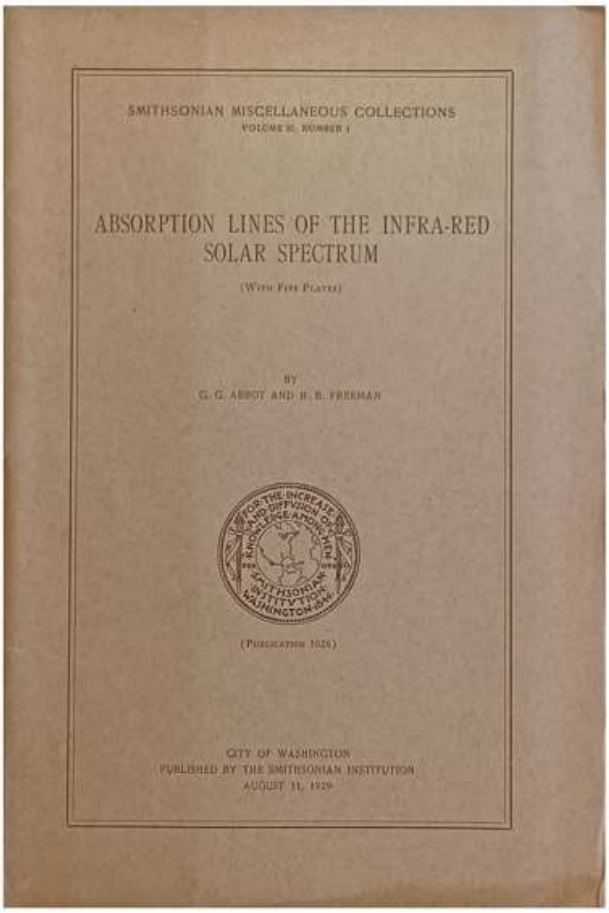
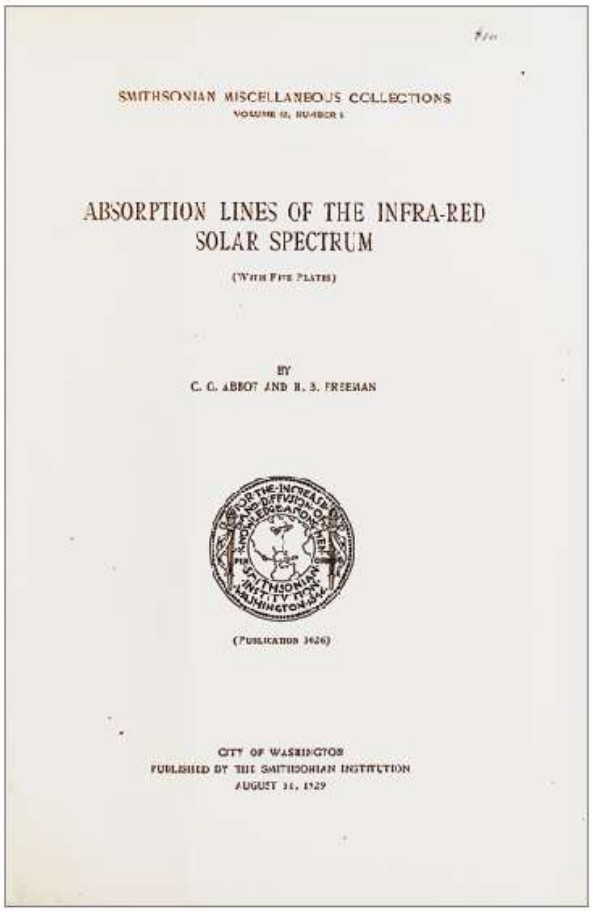
In 1907 Charles Abbot determined the solar constant (the quantity of ray energy crossing one square centimeter of surface set perpendicular to the solar rays outside the earth's atmosphere or one astronomical unit from the sun).





15. **ABBOT, Charles Greeley** (b.1872); **H.B. [Hugh] FREEMAN**. *Absorption Lines of the Infra-Red Solar Spectrum*. Washington: Smithsonian, 1929. ¶ At head of title: Smithsonian Miscellaneous Collections, Vol. 82, No. 1, August 31, 1929. 245 x 163 mm. 8vo. [ii], 17 pp. 1 fig., 3 tables, 5 large folding plates (i.e.: 2 plates printed on both sides). Printed wrappers. Fine. [SS5881]

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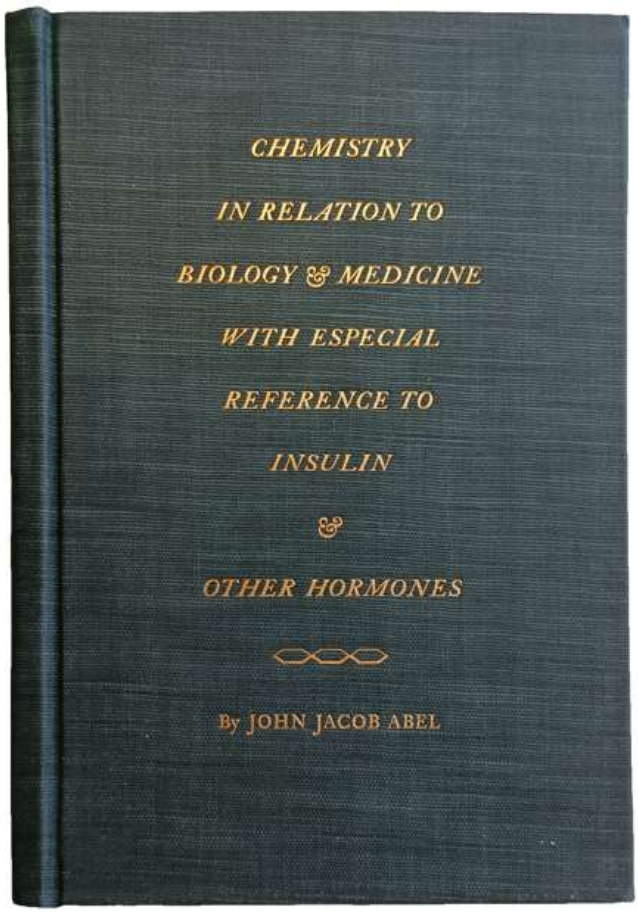
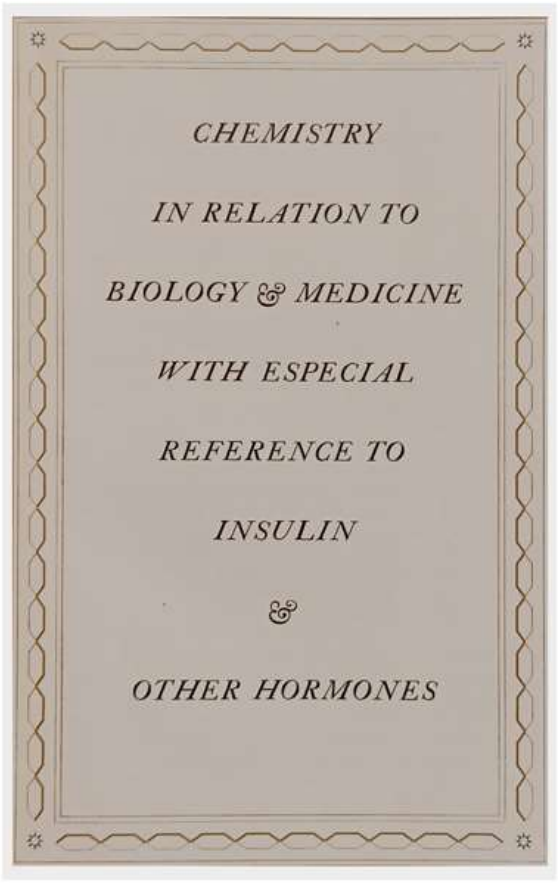
Freeman was with the Langley Memorial Aeronautical Laboratory.





Insulin

16. **ABEL, John Jacob** (1857-1938) *Chemistry in relation to biology & medicine with especial reference to insulin & other hormones*.
Baltimore: Williams & Wilkins, 1939. ¶ *The Willard Gibbs Lecture*. Thin 8vo. 79 pp. Portrait of Abel, 1 fig. Original dark green cloth, gilt-stamped cover title. Fine. S9383

$ 10

LIMITED EDITION of 825 copies. A tribute to John J. Abel. He established the pharmacology department at Johns Hopkins University School of Medicine in 1893, and then became America's first full-time professor of pharmacology.

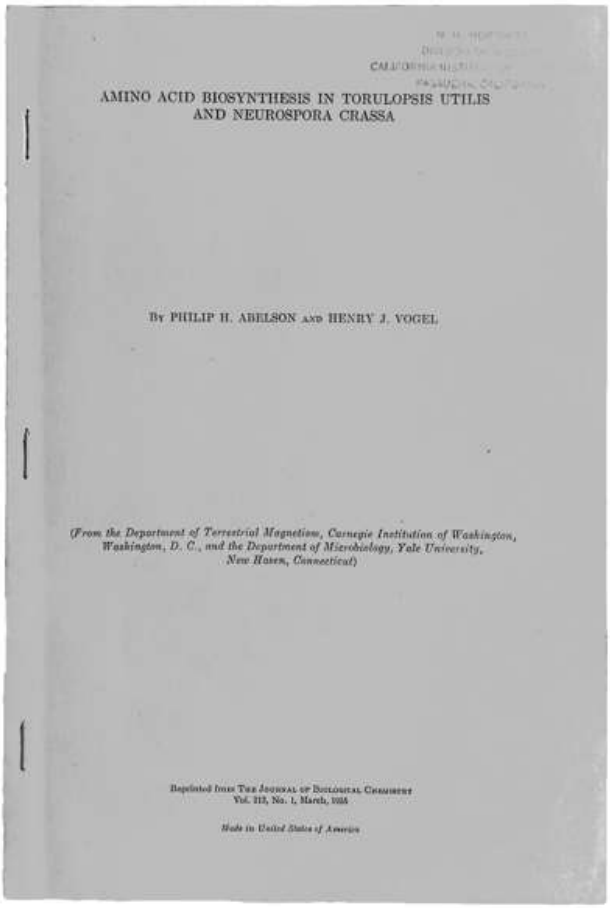
"Abel embarked on what many might have regarded as an even more difficult and unpromising enterprise, aiming at the isolation of insulin. His instinct was justified, and his scientific courage rewarded, by an achievement which will probably be one of those most permanently associated with his name. In 1926 he described the first preparation of insulin in the form of well-defined crystals. His observation was soon confirmed by others, and, with improved methods, the crystallization and

recrystallization of insulin has now become applicable to the large-scale purification of the hormone, and has furnished an ultimate and invariable standard for its quantitative determination." – Royal Society, by H.H. Dale.

"Abel's work on insulin started with an invitation from his old friend Arthur A. Noyes at California Institute of Technology. Noyes had just received a grant from the Carnegie Corporation for research on insulin, and he thought that Abel would be the right person to lead that research. After some preliminary experiments on the subject, Abel decided to take on the research, and replied to his friend, "Will attack insulin. Writing. J. J. Abel." Abel invested the next few years on purifying insulin. While he was trying various means to purify insulin, he had the idea to measure sulfur content of his extracts and found that the higher the sulfur content, the greater the activity. The discovery not only significantly precipitated progress on extracting active fractions but also offered the very first concrete information on the structure of insulin—sulfur is an integral part of insulin molecules. Continuing with his research on extracting insulin, in November 1925, Abel finally was able to witness one of the most beautiful sights of his life, "glistening crystals of insulin forming on the sides of a test tube"." – Wikip.

"By a sad coincidence, the official notification to Professor Abel of his election to the Foreign Membership of the Royal Society was delivered on the day of his death, 26 May 1938."

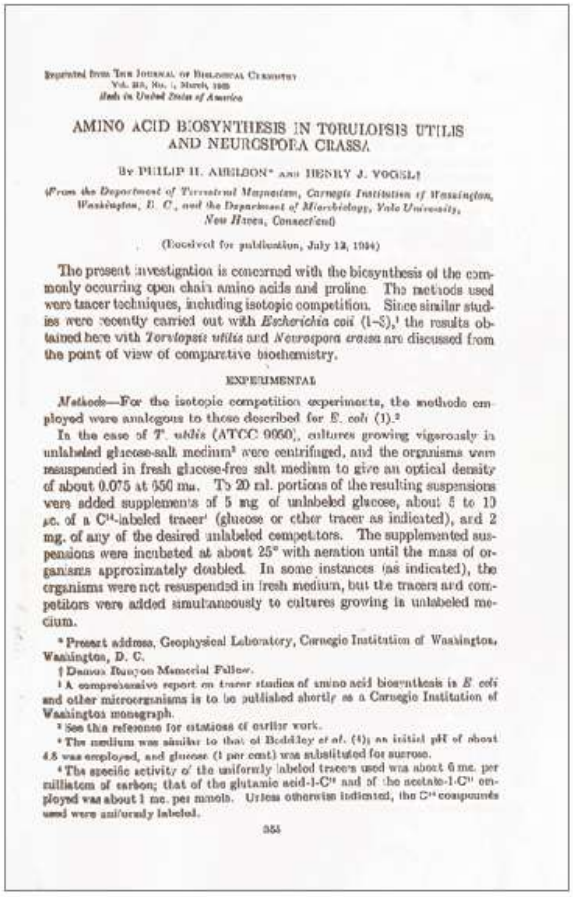
DSB Vol. I, p.12; cf. Garrison & Morton 1206; Gedeon, Science and technology in medicine, #77.1 (pp. 396-398).


AMINO ACID BIOSYNTHESIS IN TORULOPSIS UTILIS
AND NEUROSPORA CRASSA

By PHILIP H. ABELSON and HENRY J. VOGEL

(From the Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, D. C., and the Department of Microbiology, Yale University, New Haven, Connecticut)

Reprinted from THE JOURNAL OF BIOLOGICAL CHEMISTRY
Vol. 213, No. 1, March, 1955
Made in United States of America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(From the Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, D. C., and the Department of Microbiology, Yale University, New Haven, Connecticut)

(Received for publication, July 12, 1954)

The present investigation is concerned with the biosynthesis of the commonly occurring open chain amino acids and proline. The methods used were tracer techniques, including isotopic competition. Since similar studies were recently carried out with *Escherichia coli* (1–3),[1] the results obtained here with *Torulopsis utilis* and *Neurospora crassa* are discussed from the point of view of comparative biochemistry.

EXPERIMENTAL

Methods—For the isotopic competition experiments, the methods employed were analogous to those described for *E. coli* (1).[2]

In the case of *T. utilis* (ATCC 9950), cultures growing vigorously in unlabeled glucose-salt medium[3] were centrifuged, and the organisms were resuspended in fresh glucose-free salt medium to give an optical density of about 0.075 at 550 mμ. To 20 ml. portions of the resulting suspensions were added supplements of 5 mg of unlabeled glucose, about 5 to 10 μc. of a C^{14}-labeled tracer[4] (glucose or other tracer as indicated), and 2 mg. of any of the desired unlabeled competitors. The supplemented suspensions were incubated at about 25° with aeration until the mass of organisms approximately doubled. In some instances (as indicated), the organisms were not resuspended in fresh medium, but the tracers and competitors were added simultaneously to cultures growing in unlabeled medium.

* Present address, Geophysical Laboratory, Carnegie Institution of Washington, Washington, D. C.

† Damon Runyon Memorial Fellow.

[1] A comprehensive report on tracer studies of amino acid biosynthesis in *E. coli* and other microorganisms is to be published shortly as a Carnegie Institution of Washington monograph.

[2] See the references for citations of earlier work.

[3] The medium was similar to that of Beckley *et al.* (4), an initial pH of about 4.5 was employed, and glucose (1 per cent) was substituted for sucrose.

[4] The specific activity of the uniformly labeled tracers used was about 6 mc. per millimol of carbon; that of the glutamic acid-1-C^{14} and of the acetate-1-C^{14} employed was about 1 mc. per mmol. Unless otherwise indicated, the C^{14} compounds used were uniformly labeled.

355

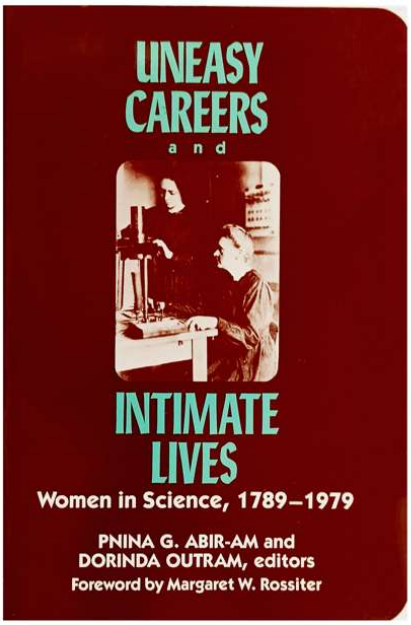
17. **ABELSON, Philip H**. (1913-2004); **Henry J. VOGEL**. *"Amino Acid Biosynthesis in Torulopsis Utilis and Neurospora Crassa."* Offprint from: *Journal of Biological Chemistry*, vol. 213, no. 1. No place: Journal of Biological Chemistry, 1955. ¶ 8vo. 355-364 pp. Tables. Printed wrappers. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine. S7620

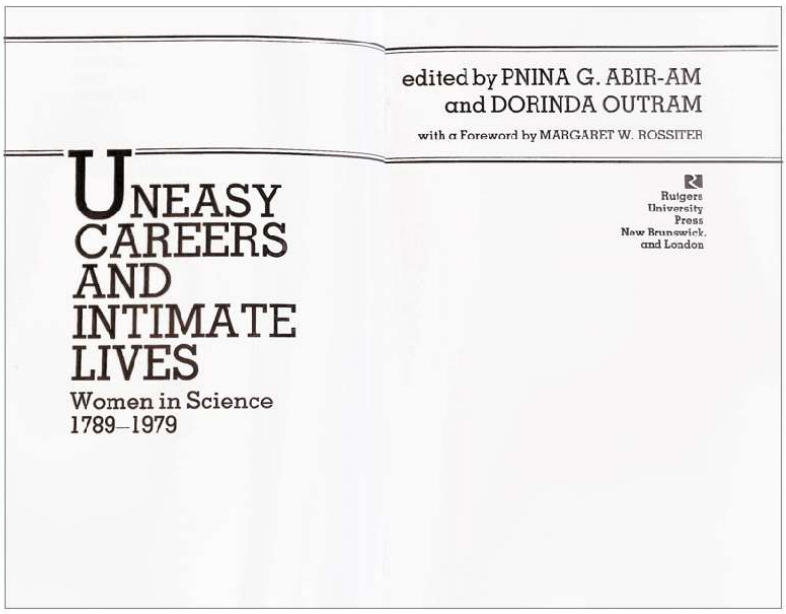
$ 35

Abelson was a remarkable scientist with a wide range of areas in which he was expert. In 1939 he and Edwin McMillan discovered the first transuranic element (Neptunium), and Abelson went on to develop a liquid thermal diffusion process which was used to enrich uranium for the first atomic bomb. During the 1950's he discovered that amino acids can survive in fossils, a finding that would greatly influence biochemists and the study of paleontology. He later became editor of *Science*.

PROVENANCE: Norman Harold Horowitz (1915-2005) was a geneticist at Caltech who achieved national fame as the scientist who devised experiments to determine whether life might exist on Mars. His experiments were carried out by the Viking Lander of 1976, the first U.S. mission to successfully land an unmanned

probe on the surface of Mars. He completed his PhD at Caltech in 1939 under embryologist Albert Tyler, and then became a postdoctoral researcher at Stanford University in the laboratory of George W. Beadle. As a scientist, Horowitz is best known for his discovery and demonstration in 1944 that a metabolic pathway is a series of steps, each catalyzed by a single enzyme. Working with Neurospora crassa, Horowitz demonstrated that each step in the metabolism of arginine from its precursors depends on the intactness of a single gene. His discovery helped to clinch the case for George Beadle and Edward Tatum's "one gene-one enzyme hypothesis" (a term Horowitz coined for their concept).





Inscribed by the Author (Abir-Am) to Roger Hahn

18. **ABIR-AM, Pnina G.**; **Dorinda OUTRAM** (editors). *Uneasy Careers and Intimate Lives; Women in Science, 1789-1979.* New Brunswick & London: Rutgers University Press, 1987. ¶ 8vo. xii, 365 pp. Illus., index. Brown printed wrappers. PRESENTATION INSCRIPTION to Roger Hahn from Pnina G. Abir-Am on half-title. Very good. RH1000

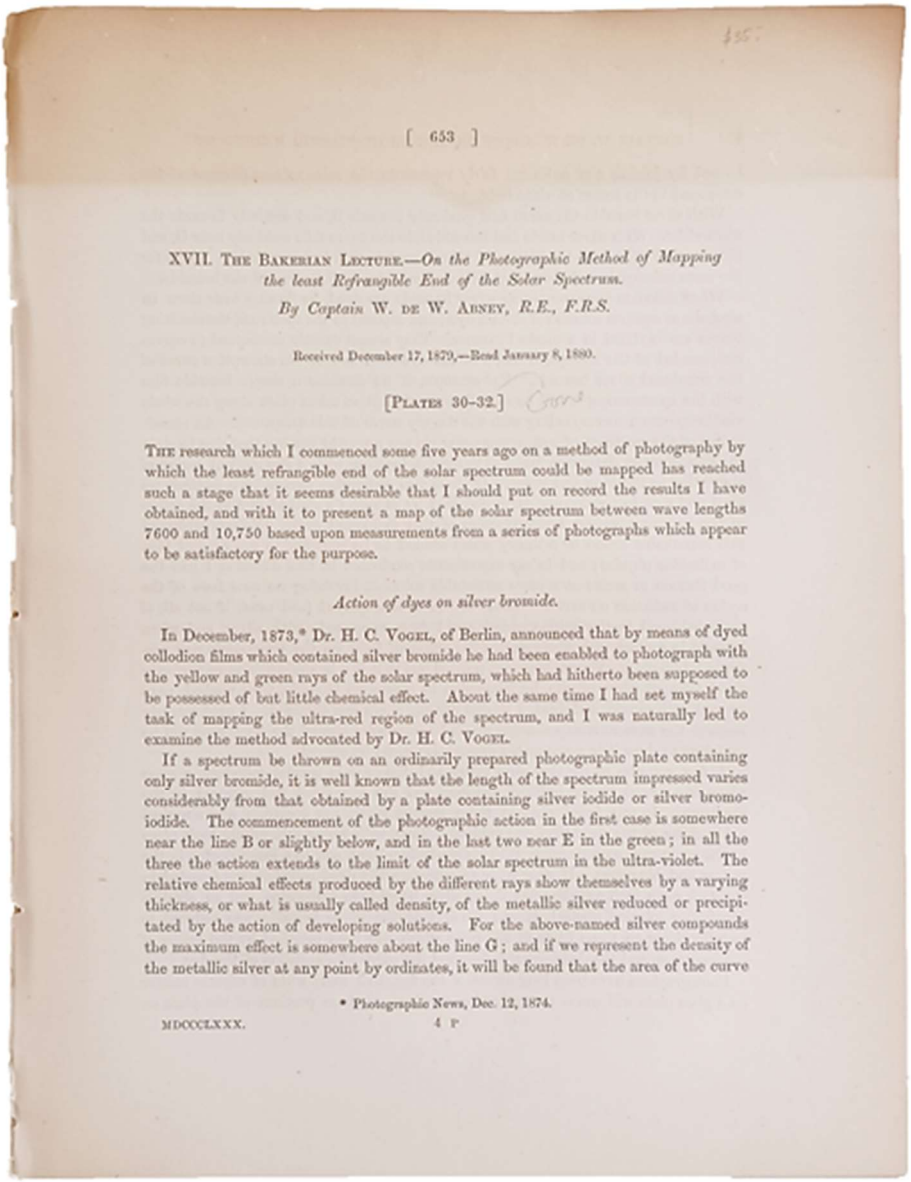
$ 25

These pioneering studies of women in science pay special attention to the mutual impact of family life and scientific career. The contributors address five key themes: historical changes in such concepts as scientific career, profession, patronage, and family; differences in gender image associated with various branches of sciences; consequences of national differences and emigration; opportunities for scientific work opened or closed by marriage; and levels of women's awareness about the role of gender in science.

An international group of historians of science discuss a wide range of European and American women scientists, from early nineteenth-century English botanists to Marie Curie to the twentieth-century theoretical biologist, Dorinda Outram. – Author.

CONTENTS: [1] Before Objectivity: Wives, Patronage, and Cultural Reproduction in Early Nineteenth-Century French Science (Dorinda Outram); [2] Botany in the Breakfast Room: Women and Early Nineteenth-Century British Plant Study (Ann B. Shteir); [3] The Many Faces of Intimacy: Professional Options and Personal Choices Among Nineteenth- and Twentieth-Century Women Physicians (Regina M. Morantz-Sanchez); [4] Field Work and Family: North American Women Ornithologists, 1900-1950 (Marianne Gosztonyi Ainley); [5] Nineteenth-Century American Women Botanists: Wives, Widows, and Work (Nancy G. Slack); [6] Marital Collaboration: An Approach to Science (Marilyn Bailey Ogilvie); [7] Maria Mitchell and the Advancement of Women in Science (Sally Gregory Kohlstedt); [8] "Strangers to Each Other": Male and Female Relationships in the Life and Work of Clemence Royer (Joy Harvey); [9] Career and Home Life in the 1880s: The Choices of Mathematician Sofia Kovalevskaia (Ann Hibner Koblitz); [10] Marie Curie's "Anti-natural Path": Time Only for Science and Family (Helena M. Pycior); [11] Payne-Gaposchkin: Astronomy in the Family (Peggy A. Kidwell); [12] Synergy or Clash: Disciplinary and Marital Strategies in the Career of Mathematical Biologist Dorothy Wrinch (Pnina G. Abir-Am).

PROVENANCE: Roger Hahn (1932-2011), emeritus professor of history at the University of California, Berkeley, and a leader in shaping the academic field of the history of science. "One of his most notable and influential works, *The Anatomy of a Scientific Institution. The Paris Academy of Sciences 1666-1803*, (1971) provides a comprehensive account of the elite Paris Academy of Sciences from its founding to its dissolution as a royal institution during the French Revolution, and its subsequent revision in the Napoleonic era. Hahn described the Academy as "the anvil on which the often-conflicting values of science and society are shaped into a visible form."



[653]

XVII. The Bakerian Lecture.—*On the Photographic Method of Mapping the least Refrangible End of the Solar Spectrum.*

By Captain W. de W. Abney, *R.E., F.R.S.*

Received December 17, 1879,—Read January 8, 1880.

[Plates 30-32.]

The research which I commenced some five years ago on a method of photography by which the least refrangible end of the solar spectrum could be mapped has reached such a stage that it seems desirable that I should put on record the results I have obtained, and with it to present a map of the solar spectrum between wave lengths 7600 and 10,750 based upon measurements from a series of photographs which appear to be satisfactory for the purpose.

Action of dyes on silver bromide.

In December, 1873,* Dr. H. C. Vogel, of Berlin, announced that by means of dyed collodion films which contained silver bromide he had been enabled to photograph with the yellow and green rays of the solar spectrum, which had hitherto been supposed to be possessed of but little chemical effect. About the same time I had set myself the task of mapping the ultra-red region of the spectrum, and I was naturally led to examine the method advocated by Dr. H. C. Vogel.

If a spectrum be thrown on an ordinarily prepared photographic plate containing only silver bromide, it is well known that the length of the spectrum impressed varies considerably from that obtained by a plate containing silver iodide or silver bromo-iodide. The commencement of the photographic action in the first case is somewhere near the line B or slightly below, and in the last two near E in the green; in all the three the action extends to the limit of the solar spectrum in the ultra-violet. The relative chemical effects produced by the different rays show themselves by a varying thickness, or what is usually called density, of the metallic silver reduced or precipitated by the action of developing solutions. For the above-named silver compounds the maximum effect is somewhere about the line G; and if we represent the density of the metallic silver at any point by ordinates, it will be found that the area of the curve

* Photographic News, Dec. 12, 1874.

19. **ABNEY, William de Wiveleslie** (1843-1920). *The Bakerian Lecture. On the photographic method of mapping the least refrangible end of the solar spectrum*. Extract from: Philosophical Transactions of the Royal Society of London. For the year MDCCCLXXX, Vol. 171. London: Harrison and Sons, 1881. ¶ 296 x 229 mm. 4to. Pages 653-667. 1 fig.; LACKS 3 PLATES. Dis-bound. S4103

$ 10

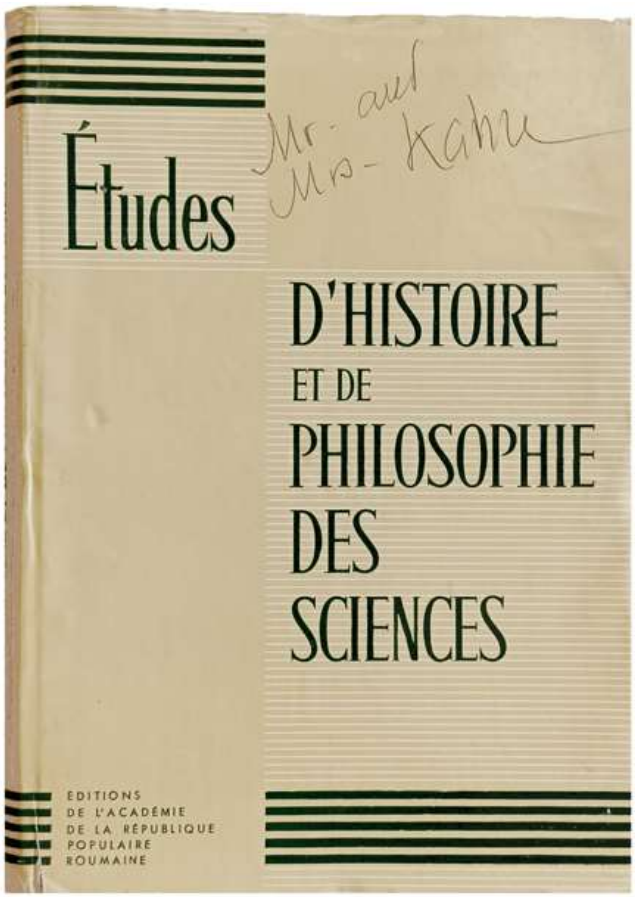
Abney was one of the first to utilize photographic techniques in the study of spectroscopy. *DSB*, I, pp. 21-22.

20. **Accademia Nazionale dei Lincei, Fondazione Alessandro Volta**. *Convegno di scienze fisiche matematiche e naturali, 14-19 Settembre 1952. Tema: Problemi della fisica solare*. Rome: Accademia Nazionale dei Lincei, 1953. ¶ Series: *Fondazione Alessandro Volta*, 11. 8vo. 332 pp. Printed wrappers; corners bent. Ink signature of H.A. Bruck on ffep. Very good. Scarce. S10221

$ 30

PROVENANCE: Dr. Hermann A. Bruck (1905-2000), seventh Astronomer Royal for Scotland. Upon graduation from Munich, Bruck followed his friend Albrecht Unsold to the Potsdam Astrophysical Observatory. With growing difficulties under National Socialism, Bruck left Germany in 1936 to take a temporary research assistantship at the Vatican Observatory. In 1937 he moved to the University of

Cambridge to join the circle of the modern astrophysicists around Arthur Eddington. In time, Bruck became Assistant Director of the Observatories and John Couch Adams Astronomer, specializing in solar spectroscopy.



21. **Academia Republicii Socialiste Romania** (various authors). *Etudes d'histoire et de philosophie des sciences*. Bucharest: Ed. de l'Académie de la République populaire Roumaine, 1962. ¶ At head of title : *Académie de la république populaire roumaine*. 8vo. 311, [1] pp. Dark green-stamped on light green cloth, dust jacket; jacket edges frayed with some tears. Ownership signature of Mr. and Ms. [Roger] Hahn on jacket. Good. RH1001

$ 20

Contains papers on Philosophy, Mathematics, Physics, Chemistry, Technology, Biology, Medicine, Economics, history of philosophy, history of psychology, history of logic, and linguistics. Numerous contributors wrote the specialist papers. See Weber Rare Books online for the list of contents (pictured).

A highly distinguished group of contributors, all Romanian: Valeriu Bologa (1892-1971), Nicolae Botnariuc (1915-2011), D. Dumitrescu, C. I. Gulian (1914-2011), Iorgu Iordan (1988-1986), Athanase Joja (1904-1972), Crizantema Joja, A. Kreindler (1900-1988), Manea Manescu (1916-2009), Stefan Milcou (1903-1997),

Grigore Constantin Moisil (1906-1973), Costin D. Nenitzesco (1902-1970), Valer Novacu, Ilie Popa (1907-1983), Mihai Dumitru Ralea (1896-1964), I. Toth.

Institut de France
ACADÉMIE DES SCIENCES

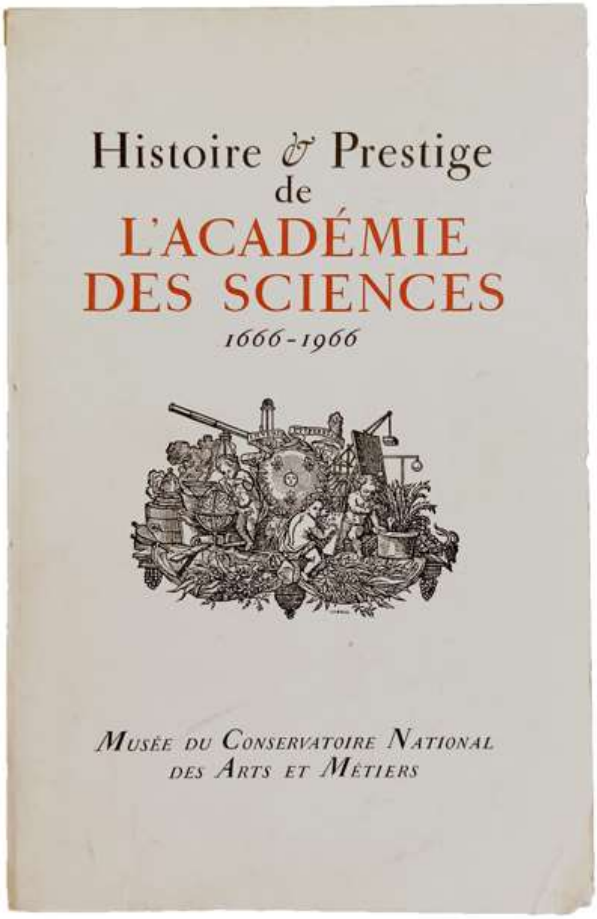
TROISIÈME CENTENAIRE
1666-1966

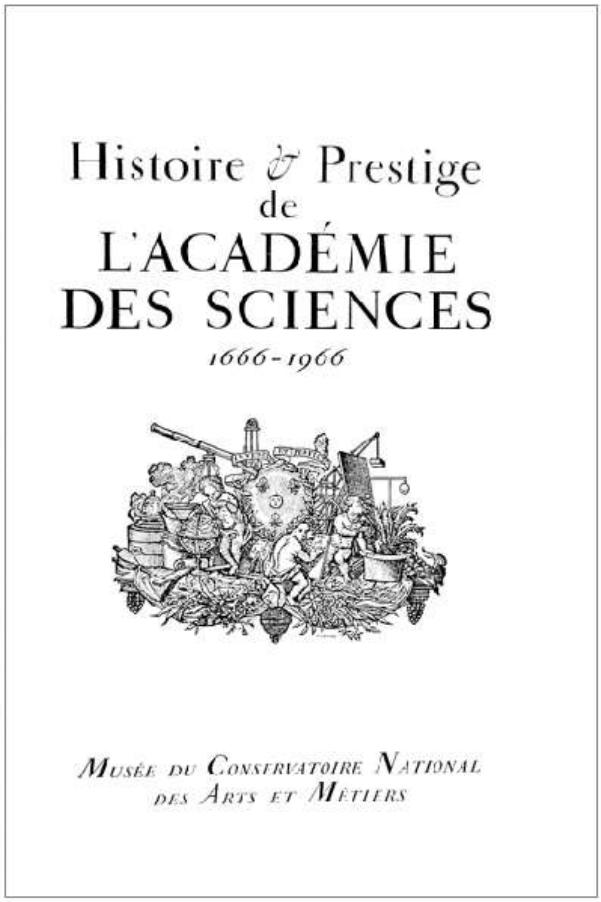
QUELQUES SOUVENIRS
rassemblés et dévits
par Madame Pierre GAUJA
aidé
par Mademoiselle Marie-Thérèse DELOM
des Archives de l'Académie des Sciences

OBSERVATOIRE DE PARIS
7-12 JUIN 1966

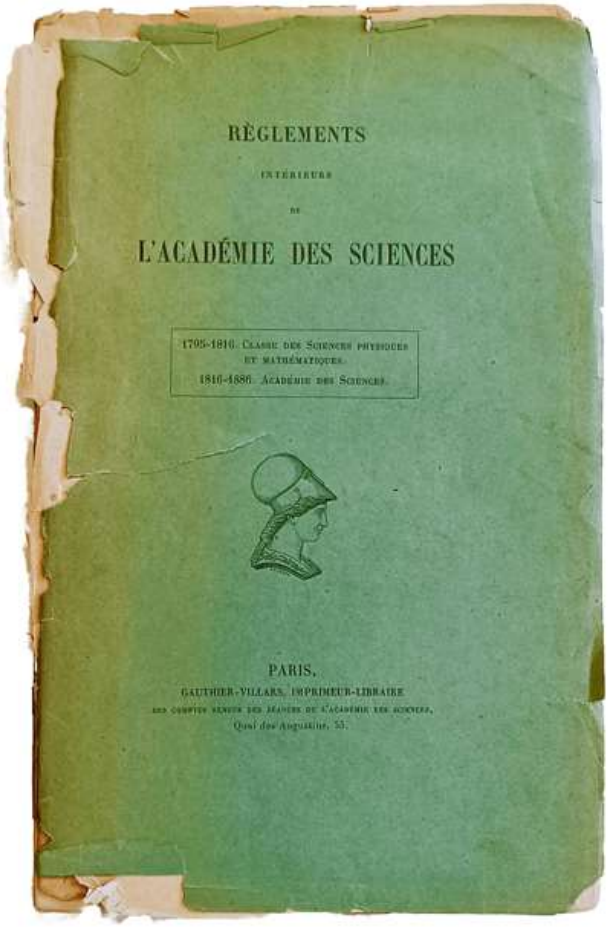
[22]

22. **Académie des Sciences** (**France**) ; **Juliette Boue GAUJA**; **Marie-Thérèse DELOM**; **Observatoire de Paris**. *Troisième Centenaire, 1666-1966, quelques souvenirs rassemblés et décrits*. Paris: Observatoire de Paris, 1966. ¶ At head of title: *Institut de France, Académie des Sciences.* 8vo. viii, 66 pp. [With the final supplemental inserted sheet]. Facs., illus. Printed wrappers. Very good. RARE. [RH1554] $ 15





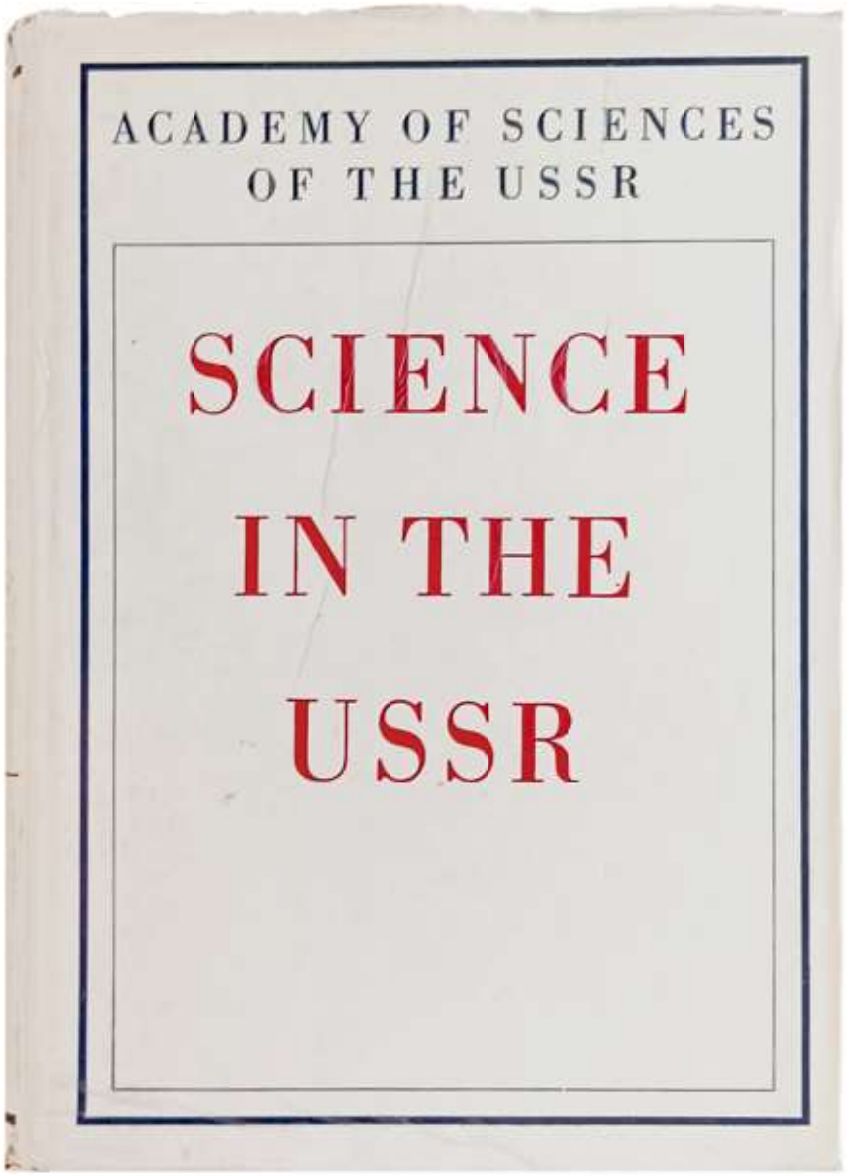
23. **Académie des Sciences** (**France**). *Histoire & Prestige de l'Académie des Sciences 1666-1966*. Paris: Musée du Conservatoire National des Arts et Métiers, 1966. ¶ 8vo. 262 pp. Figs. Printed wrappers. Good. RH1555 $ 11



24. [**Académie of Sciences, Paris**]. *Règlements intérieurs de l'Académie des Sciences [1795-1886].* Paris: Gauthier-Villars, [1890]. ¶ 8vo. 230 pp. [pages 15-16 torn without loss]. Original green printed wrappers; covers off. Poor – a working copy. Signature of Roger Hahn. Rare. RH1434

$ 10

Cited in Roger Hahn's classic, *The Anatomy of a Scientific Institution; The Paris Academy of Science, 1666-1803*, (1971), p. 409.

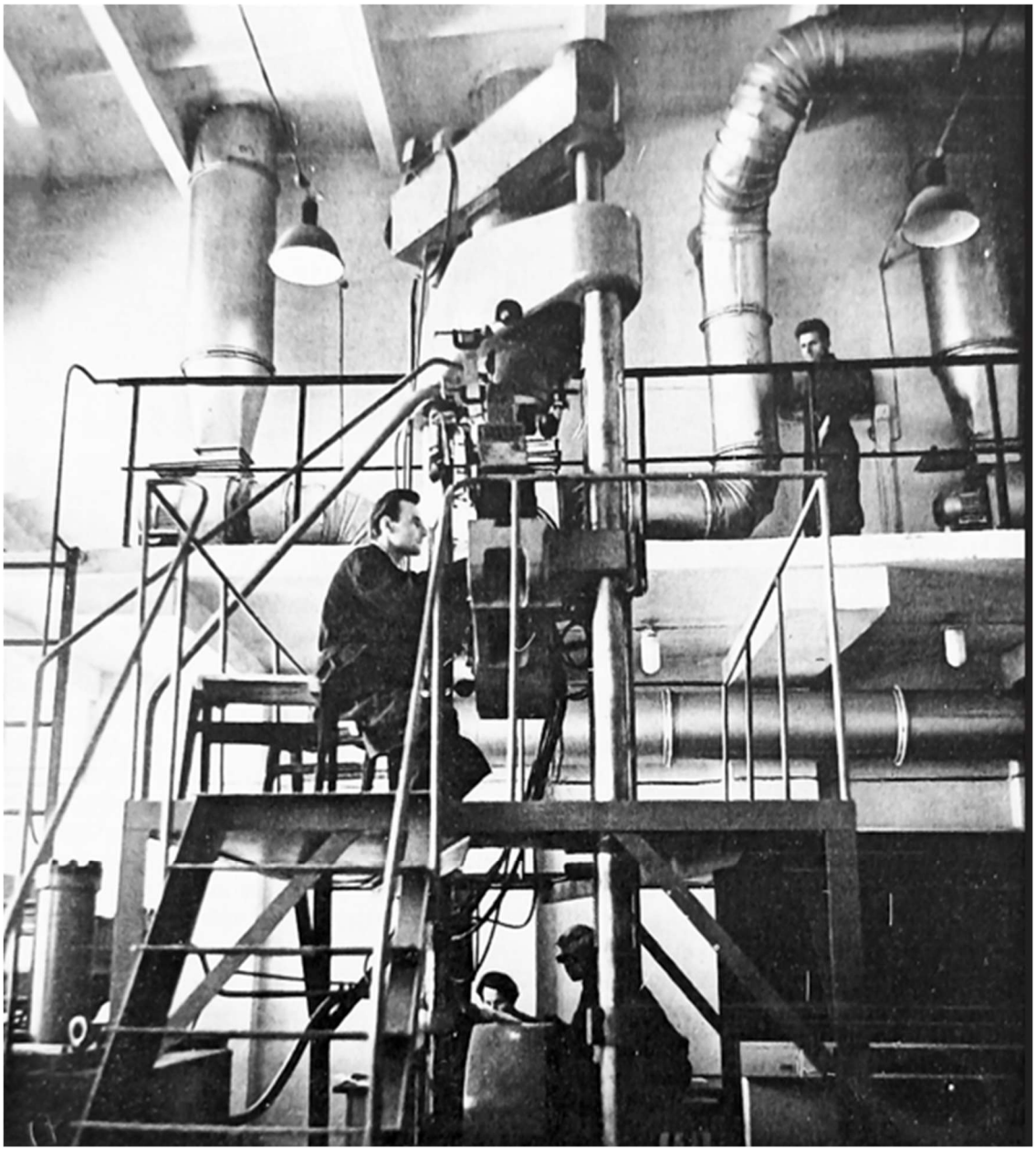


ACADEMY OF SCIENCES
OF THE USSR

SCIENCE IN THE USSR

To the 50th Anniversary
of the Formation of the Union
of Soviet Socialist Republics
1922–1972

PROGRESS PUBLISHERS
MOSCOW



Soviet Science on Display

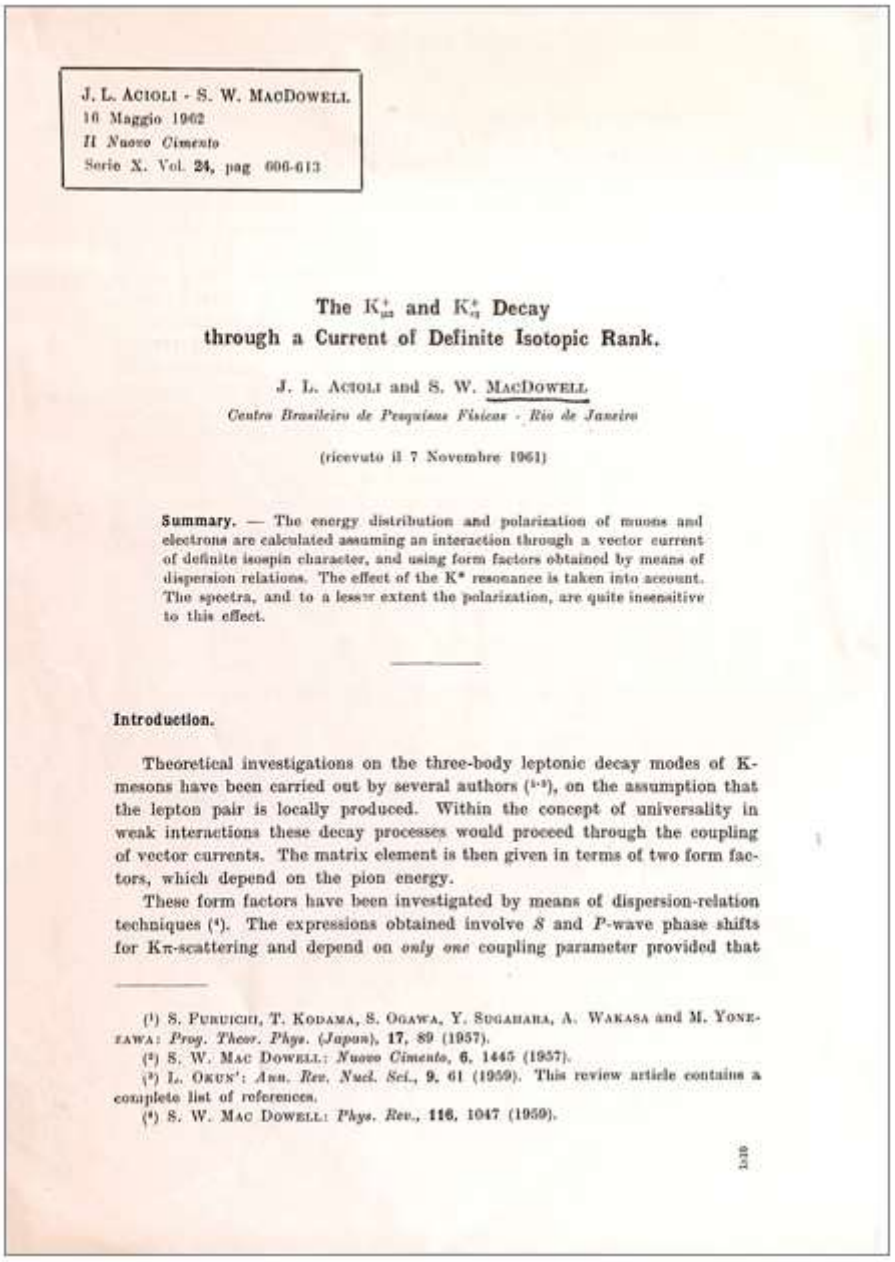
25. **Academy of Sciences of the USSR**. *Science in the USSR, To the 50th Anniversary of the Formation of the Union of Soviet Socialist Republics 1922-1972*. Moscow: Progress Publishers, [1972]. ¶ 8vo. 364 pp. Illus. Red gilt-stamped fabrikoid cover, dust-jacket; jacket worn, ffep rubbed. Very good. [br] S12391

$ 15

The contents of this work offers statements, in English, from many leaders in Soviet science:

[1] **M. V. Keldysh**, The multinational union of Soviet Socialist Republics and the development of science. [M. V. Keldysh was president of the Academy of Sciences, USSR]. [2] **Pyotr Nikolaevich Fedoseyev** (1908-1990), The social and ideological foundations for drawing together of nations and nationalities – [Fedoseyev, Soviet philosopher, sociologist, was vice-president of the Academy of Sciences, USSR]. [3] **Mikhail D. Millionshchikov** (1913-1973), New scientific centres of the Russian Federation. – [Mikhail Dmitrievich Millionshchikov was vice-president of the Academy of Sciences, USSR]. [3] **Borys Yevhenovych Paton** (1918-2020), The progress of Ukrainian science. – Paton was a Ukrainian scientist and a long-time chairman of the National Academy of Sciences of Ukraine. [5] **Nikolai Aleksandrovich Borisevich** (1923-2015), Science in Byelorussia. – Borisevich was a Soviet and Belarusian physicist, best known for his 1955 discovery of the stabilization and labilization phenomenon of electronically excited polyatomic molecules, but also developed the first optical filters to demonstrate infrared radiation. [6] **A. S. Sadykov**, Science in Soviet Uzbekistan: its roots and its development. [7] **Sh. E. Yesenov**, Science and the productive forces of Kazakhstan. – Shakhmardan Yessenov (1927-1994) had a long and distinguished career including twice being Minister of Geology in the Kazakh SSR (1961-1967) and (1974-1976), vice-chairman of the Council of Ministers of the Kazakh SSR (1965), a doctor of geological and mineralogical sciences, a member of the Kazakh SSR Academy of Sciences, receiving the State Award of the Kazakh SSR, and winning the Lenin Award. [8] **Ilia N. Vekua** (1907-1977), Science in Soviet Georgia. – Vekua was a distinguished Georgian mathematician and engineer, specializing in partial differential equations, singular integral equations, generalized analytic functions and the mathematical theory of elastic shells. [9] **G. B. Abdullayev**, Towards the summits of science (Azerbaijan). [10] J**. J. Matúlis**, Soviet Lithuania and its science. [11] **Iachim Sergheevici Grosul** (1912-1976), Science in Soviet Moldavia. – Grosul was a Moldovan scientist, and the first president of the Academy of Science of the Moldavian SSR in the Soviet Union (1961-1976). [12] **Aleksandr Kristapovich Malmeister** (1911-1996), Science in Soviet Latvia. [13] **K. K. Karakeyev**, Science in Soviet Kyrgyzia. [14] **M. S. Asimov**, Science in Soviet Tajikistan. [15] **Viktor Amazaspovich Ambartsumyan** [**Ambartsumian**] (1908-1996), Growing co-operation (Armenia). – [Ambartsumyan was one of the 20th century's top astronomers, he is widely regarded as the founder of theoretical astrophysics in the Soviet Union.]. [16] **P. A. Azimov**, Science in Soviet Turkmenia and the assistance rendered by the fraternal nations in its development. [17] **A. T. Veimer**, Science in soviet Estonia on the upswing.

26. **Accademia Nazionale delle Scienze detta dei XL**. *Catalogo delle Mostre del Bicentenario: Verona – Modena – Roma*. Rome: Accademia Naziolae delle Scienze detta dei XL, 1982. ¶ Series: *Scritti e Documenti* IV. 8vo. 138 pp. Numerous plates. Original printed wrappers. Exhibition catalogue of books and manuscripts curated by Daniela Fattori. Very good. Scarce. S11527 $ 16



J. L. ACIOLI - S. W. MACDOWELL
16 Maggio 1962
Il Nuovo Cimento
Serie X. Vol. **24**, pag 606-613

The $K^{+}_{\mu 3}$ and K^{+}_{e3} Decay through a Current of Definite Isotopic Rank.

J. L. ACIOLI and S. W. MACDOWELL
Centro Brasileiro de Pesquisas Físicas - Rio de Janeiro

(ricevuto il 7 Novembre 1961)

Summary. — The energy distribution and polarization of muons and electrons are calculated assuming an interaction through a vector current of definite isospin character, and using form factors obtained by means of dispersion relations. The effect of the K* resonance is taken into account. The spectra, and to a lesser extent the polarization, are quite insensitive to this effect.

Introduction.

Theoretical investigations on the three-body leptonic decay modes of K-mesons have been carried out by several authors [1-3], on the assumption that the lepton pair is locally produced. Within the concept of universality in weak interactions these decay processes would proceed through the coupling of vector currents. The matrix element is then given in terms of two form factors, which depend on the pion energy.

These form factors have been investigated by means of dispersion-relation techniques [4]. The expressions obtained involve *S* and *P*-wave phase shifts for Kπ-scattering and depend on *only one* coupling parameter provided that

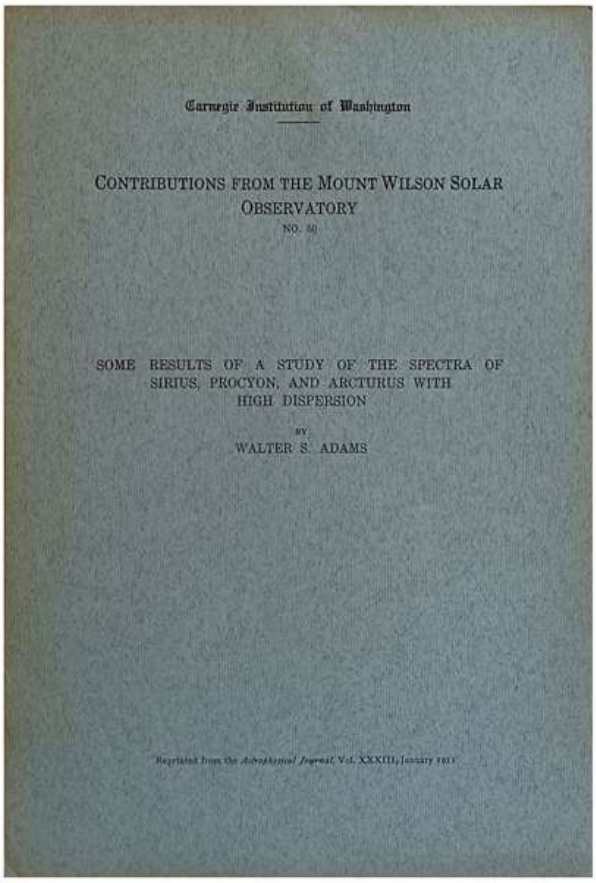
(1) S. FURUICHI, T. KODAMA, S. OGAWA, Y. SUGAHARA, A. WAKASA and M. YONEZAWA: *Prog. Theor. Phys. (Japan)*, **17**, 89 (1957).
(2) S. W. MAC DOWELL: *Nuovo Cimento*, **6**, 1445 (1957).
(3) L. OKUN': *Ann. Rev. Nucl. Sci.*, **9**, 61 (1959). This review article contains a complete list of references.
(4) S. W. MAC DOWELL: *Phys. Rev.*, **116**, 1047 (1959).

1530

27. **ACIOLI, J.L.; S.W. MacDOWELL**. *"The K+ μ3 and K+e3 Decay through a Current of Definite Isotopic Rank."* Offprint from: *Il Nuovo Cimento*, Serie X, Vol. 24, 16 Maggio 1962. ¶ pp. 606-613. (240 x 170 mm). 8 pp. 4 figs. Stapled pages. Very good. S9359

$ 12.50

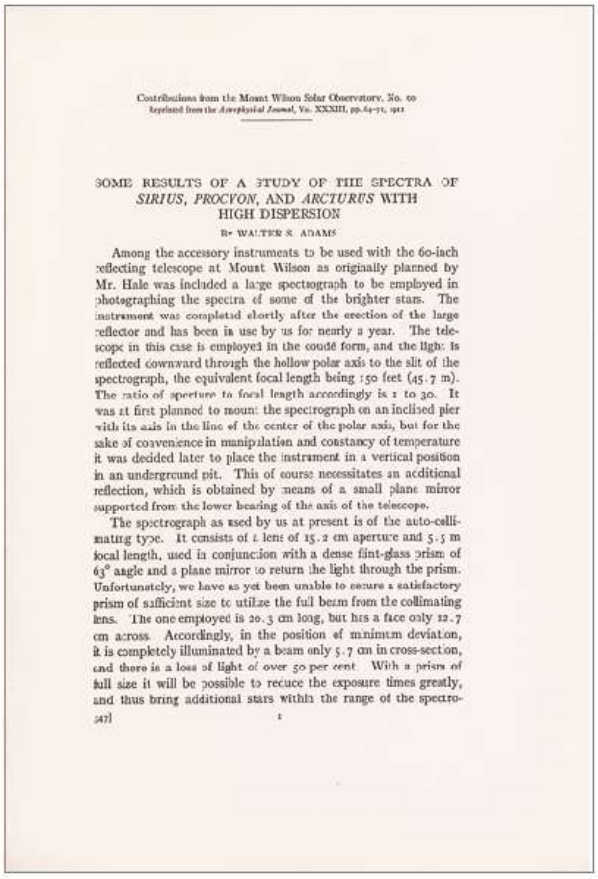
Summary: The energy distribution and polarization of muons and electrons are calculated assuming an interaction through a vector current of definite isospin character, and using form factors obtained by means of dispersion relations. The effect of the K* resonance is taken into account. The spectra, and to a lesser extent the polarization, are quite insensitive to this effect.


Carnegie Institution of Washington

CONTRIBUTIONS FROM THE MOUNT WILSON SOLAR OBSERVATORY
NO. 50

SOME RESULTS OF A STUDY OF THE SPECTRA OF SIRIUS, PROCYON, AND ARCTURUS WITH HIGH DISPERSION

BY
WALTER S. ADAMS


Contributions from the Mount Wilson Solar Observatory, No. 50

SOME RESULTS OF A STUDY OF THE SPECTRA OF *SIRIUS, PROCYON,* AND *ARCTURUS* WITH HIGH DISPERSION

By WALTER S. ADAMS

Among the accessory instruments to be used with the 60-inch reflecting telescope at Mount Wilson as originally planned by Mr. Hale was included a large spectrograph to be employed in photographing the spectra of some of the brighter stars. The instrument was completed shortly after the erection of the large reflector and has been in use by us for nearly a year. The telescope in this case is employed in the coudé form, and the light is reflected downward through the hollow polar axis to the slit of the spectrograph, the equivalent focal length being 150 feet (45.7 m). The ratio of aperture to focal length accordingly is 1 to 30. It was at first planned to mount the spectrograph on an inclined pier with its axis in the line of the center of the polar axis, but for the sake of convenience in manipulation and constancy of temperature it was decided later to place the instrument in a vertical position in an underground pit. This of course necessitates an additional reflection, which is obtained by means of a small plane mirror supported from the lower bearing of the axis of the telescope.

The spectrograph as used by us at present is of the auto-collimating type. It consists of a lens of 15.2 cm aperture and 5.5 m focal length, used in conjunction with a dense flint-glass prism of 63° angle and a plane mirror to return the light through the prism. Unfortunately, we have as yet been unable to secure a satisfactory prism of sufficient size to utilize the full beam from the collimating lens. The one employed is 20.3 cm long, but has a face only 12.7 cm across. Accordingly, in the position of minimum deviation, it is completely illuminated by a beam only 5.7 cm in cross-section, and there is a loss of light of over 50 per cent. With a prism of full size it will be possible to reduce the exposure times greatly, and thus bring additional stars within the range of the spectro-

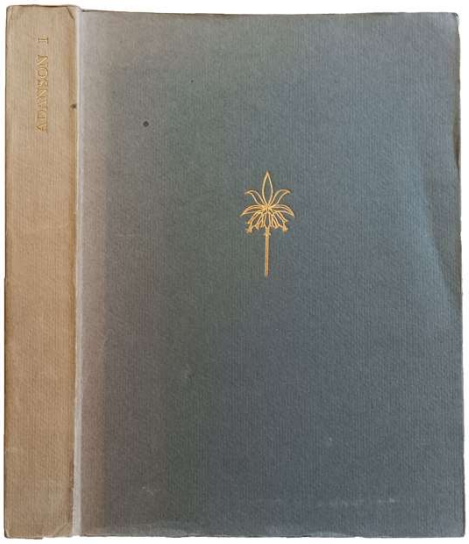
[471] 1

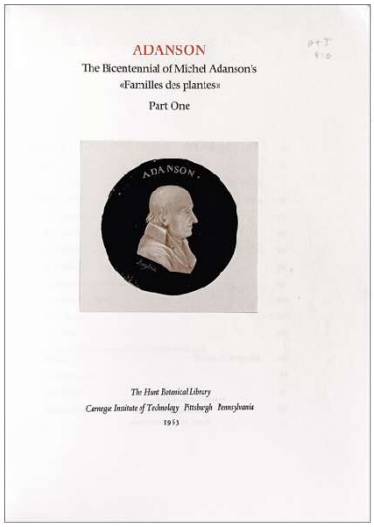
28. **ADAMS, Walter Sydney** (1876-1956). *"Some results of a study of the spectra of Sirius, Procyon, and Arcturus with high dispersion."* Offprint from: *Astrophysical Journal*, Vol. XXXIII, 1911. ¶ Series: *Contributions from the Mount Wilson Solar Observatory*, No. 50. 256 x 173 mm. 8vo. 8 pp. 2 tables. Printed wrappers. Fine. S3622

$ 18

FIRST SEPARATE EDITION. Walter Adams turned from studies of the sun to other, larger stars. He later wrote "The study attained its primary objectives, but in addition it provided in the field of physics the first clues to the analysis of complex spectra according to energy levels in the atom, in solar physics the discovery of magnetism in the sun, and in astro-physics a new and fundamental method for determining the distances of the stars." Adams, *Cooperation in solar research*, pp. 135-137. *DSB*, I, pp. 55-58.

Walter Sydney Adams, born in Turkey, was an American astronomer, renowned for his pioneering work in spectroscopy.




ADANSON

The Bicentennial of Michel Adanson's «Familles des plantes»

Part One

The Hunt Botanical Library

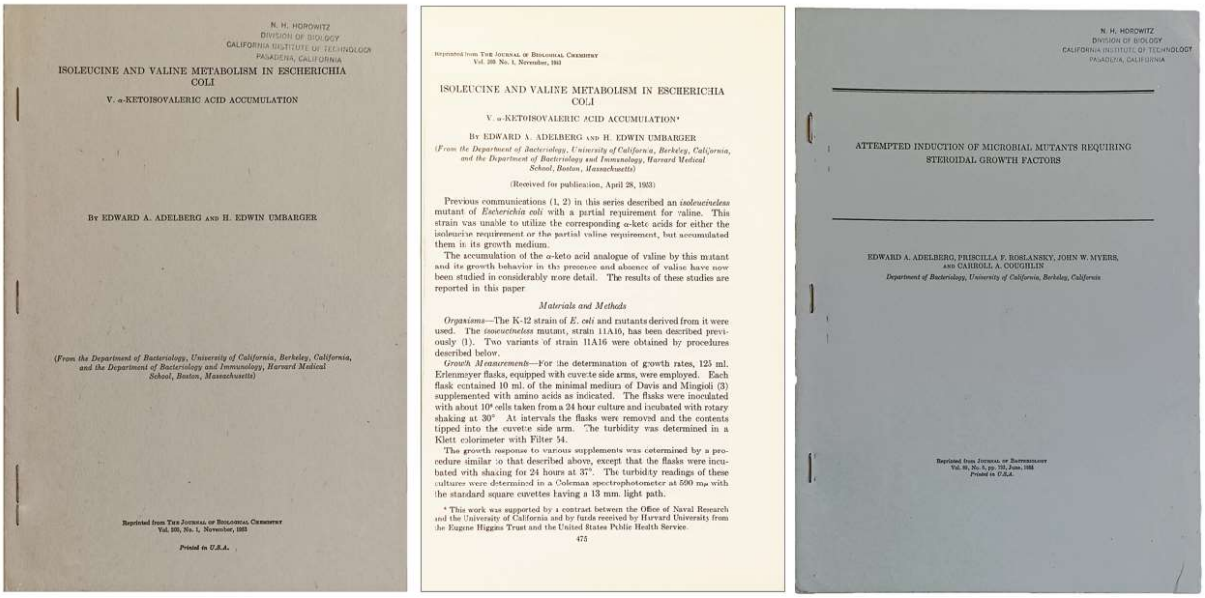
Carnegie Institute of Technology Pittsburgh Pennsylvania

1963

29. **ADANSON, Michel** (1727-1806). *The Bicentennial of Michel Adanson's "Familles de Plantes"*, Part One. Pittsburgh: Hunt Botanical Library, 1963. ¶ *Hunt Monograph Series*, no. 1. 8vo. xi, 391 pp. Illus., index. Light teal gilt-stamped printed wrappers; faded spine, rubbed extremities, cover creased. Very good. RH1003

$ 10

Michel Adanson was an 18th-century French botanist and naturalist who traveled to Senegal to study flora and fauna. He proposed a "natural system" of taxonomy distinct from the binomial system forwarded by Linnaeus. In 1763 he published his Familles naturelles des plantes. In this work he developed the principle of arrangement above mentioned, which, in its adherence to natural botanical relations, was based on the system of Joseph Pitton de Tournefort, and had been anticipated to some extent nearly a century before by John Ray. The success of this work was hindered by its innovations in the use of terms, which were ridiculed by the defenders of the popular sexual system of Linnaeus; but it did much to open the way for the establishment, by means principally of Antoine Laurent de Jussieu's Genera Plantarum (1789), of the natural method of the classification of plants. – Wikip.



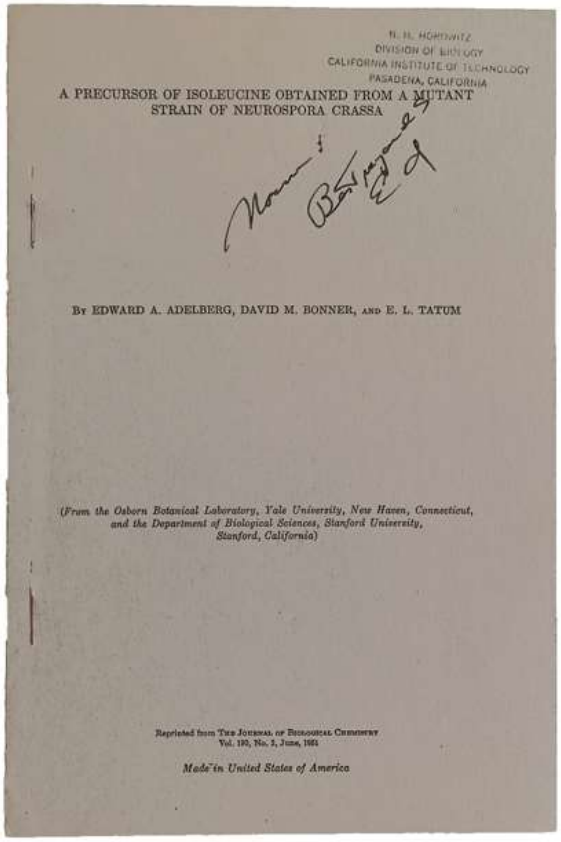
30. **ADELBERG, Edward A**. (1920–2009). Group of 2 offprints. Includes: **ADELBERG**, & **H. Edwin UMBARGER** (1921-1999). *"Isoleucine and Valine Metabolism in Escherichia Coli. V. a-Ketoisovaleric Acid Accumulation."* Offprint from: *Journal of Biological Chemistry*, vol. 205, no. 1, 1953. No place: Journal of Biological Chemistry, 1953. ¶ 8vo. 475-482 pp. Figs. Printed wrappers.

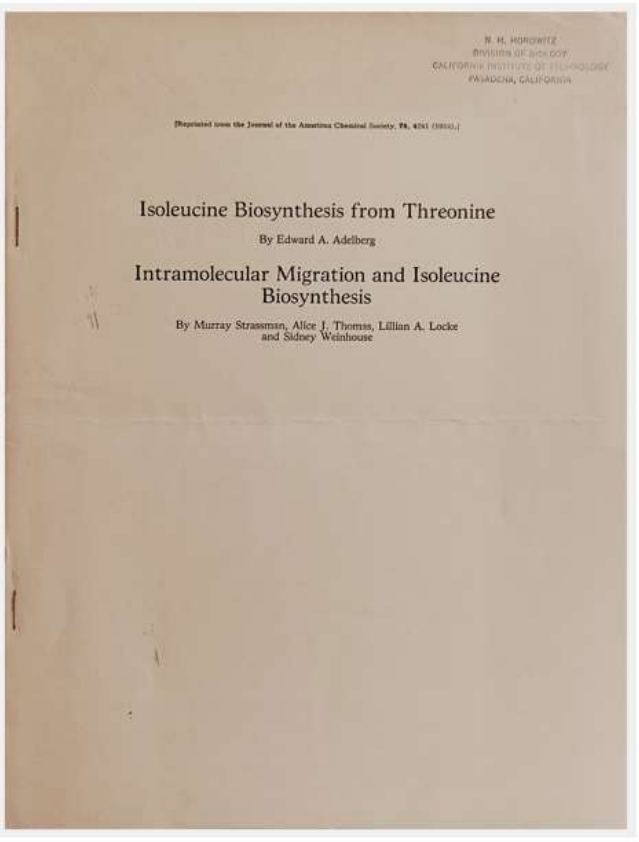
WITH: **ADELBERG**, et al. *"Attempted Induction of Microbial Mutants Requiring Steroidal Growth Factors."* Offprint from: Journal of Bacteriology, vol. 69, no. 6, 1955. 8vo. p. 733. Printed wrappers. Ownership rubber stamp of Horowitz.

Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine. S7419

$ 15

Edward Allen Adelberg was a founder of microbial genetics and biochemist who spent much of his career at Yale University. Adelberg was associated with the Dept. of Bacteriology, University of California, Berkeley. His writing partner, Harold Edwin Umbarger, was an American bacteriologist and biochemist. In 1960 he joined the Cold Spring Harbor Laboratory in Cold Spring Harbor, New York. In 1964 he took a professorship at Purdue University in West Lafayette, Indiana.





31. **ADELBERG, Edward A**. (1920–2009). [Group of 6 offprints, includes]: **ADELBERG**; **David M. BONNER** (1916-1964); **Edward L. TATUM** (1909-1975). *"A Precursor of Isoleucine Obtained from a Mutant Strain of Neurospora Crassa."* Offprint from: *Journal of Biological Chemistry*, vol. 190, no. 2. No place: *Journal of Biological Chemistry*, 1951. ¶ 8vo. 837-841 pp. Printed wrappers. INSCRIBED BY ADELBERG to Norman Horowitz.

WITH: **ADELBERG**. *"Isoleucine Biosynthesis from Threonine."* Offprint from: *Journal of the American Chemical Society*, 76, 1954. 4to. 4241 pp. Printed wrappers; creased along middle, else fine. Ownership rubber stamp of Norman Horowitz, California Institute of Technology.

WITH: **ADELBERG**; **John W. MYERS**. *"The Biosynthesis of Isoleucine and Valine. I. Enzymatic Transformation of the Dihydroxy Acid Precursors to the Keto Acid Precursors."* Offprint from: *Proceedings of the National Academy of Sciences*, vol. 40, no. 6, 1954. 8vo. 493-499 pp. Self-wraps. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine.

WITH: **ADELBERG**. *"The Use of Metabolically Blocked Organisms for the Analysis of Biosynthetic Pathways."* Offprint from: *Bacteriological Reviews*, vol. 17, no. 4, 1953. 8vo. 253-267 pp. Printed wrappers. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine.

WITH: **ADELBERG**. *"Studies on the Isoleucine Precursor a, β-Dihydroxy-β-Ethylbutyric Acid."* Offprint from: *Journal of Bacteriology*, vol. 61, no. 3, 1951. 8vo. 365-373 pp. Tables. Self-wraps. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine.

WITH: **ADELBERG**; **Edward L. TATUM**. *"Characterization of a Valine Analog Accumulated by a Mutant Strain of Neurospora Crassa."* Offprint from: *Archives of Biochemistry*, vol. 29, no. 1, 1950. 8vo. Single leaf. 235-236 pp. Self-wraps. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine.

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SIX PAPERS:
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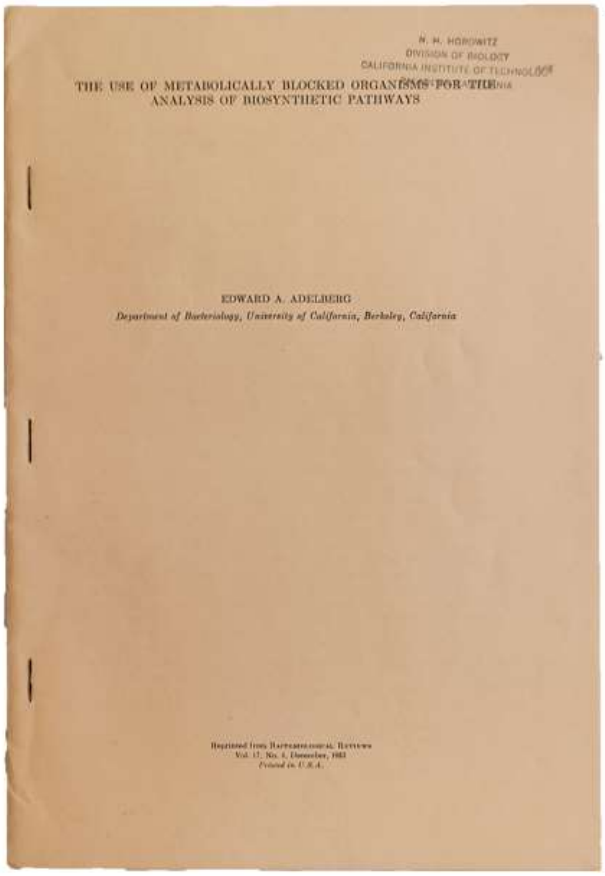
Adelberg was an influential early geneticist who was associated with the Dept. of Bacteriology, University of California, Berkeley & the Osborn Botanical Laboratory, Yale University. Tatum (1909-1975) was one of the fathers of modern genetics and worked extensively with George W. Beadle on drosophila and Neurospora. This work culminated in the 1958 Nobel Prize for physiology or medicine, which Tatum shared with Beadle and Joshua Lederberg.

Author: Edward Lawrie Tatum was an American geneticist. He shared half of the Nobel Prize in Physiology or Medicine in 1958 with George Beadle for showing that genes control individual steps in metabolism. The other half of that year's award went to Joshua Lederberg.



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THE USE OF METABOLICALLY BLOCKED ORGANISMS FOR THE ANALYSIS OF BIOSYNTHETIC PATHWAYS

EDWARD A. ADELBERG
Department of Bacteriology, University of California, Berkeley, California

Reprinted from BACTERIOLOGICAL REVIEWS
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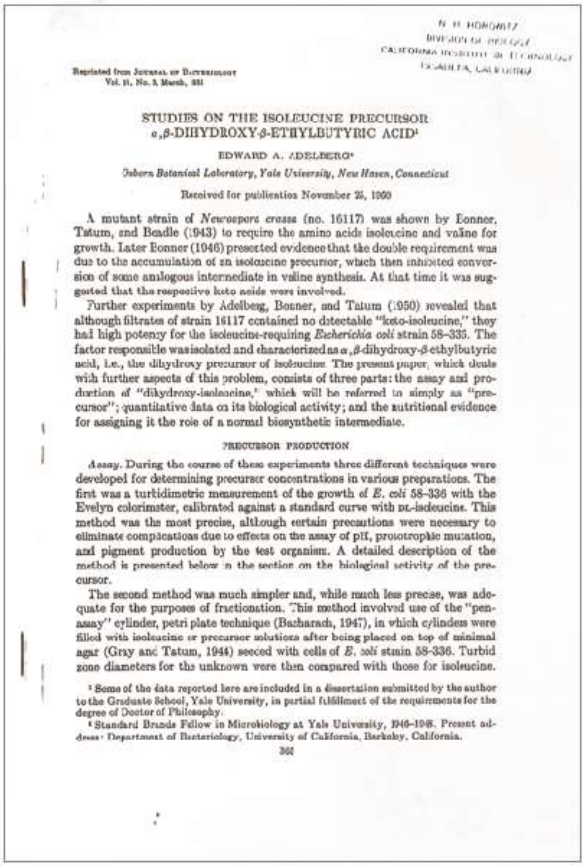

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Vol. 61, No. 3, March, 1951

STUDIES ON THE ISOLEUCINE PRECURSOR
α,β-DIHYDROXY-β-ETHYLBUTYRIC ACID[1]

EDWARD A. ADELBERG[2]
Osborn Botanical Laboratory, Yale University, New Haven, Connecticut

Received for publication November 25, 1950

A mutant strain of *Neurospora crassa* (no. 16117) was shown by Bonner, Tatum, and Beadle (1943) to require the amino acids isoleucine and valine for growth. Later Bonner (1946) presented evidence that the double requirement was due to the accumulation of an isoleucine precursor, which then inhibited conversion of some analogous intermediate in valine synthesis. At that time it was suggested that the respective keto acids were involved.

Further experiments by Adelberg, Bonner, and Tatum (1950) revealed that although filtrates of strain 16117 contained no detectable "keto-isoleucine," they had high potency for the isoleucine-requiring *Escherichia coli* strain 58-335. The factor responsible was isolated and characterized as α,β-dihydroxy-β-ethylbutyric acid, i.e., the dihydroxy precursor of isoleucine. The present paper, which deals with further aspects of this problem, consists of three parts: the assay and production of "dihydroxy-isoleucine," which will be referred to simply as "precursor"; quantitative data on its biological activity; and the nutritional evidence for assigning it the role of a normal biosynthetic intermediate.

PRECURSOR PRODUCTION

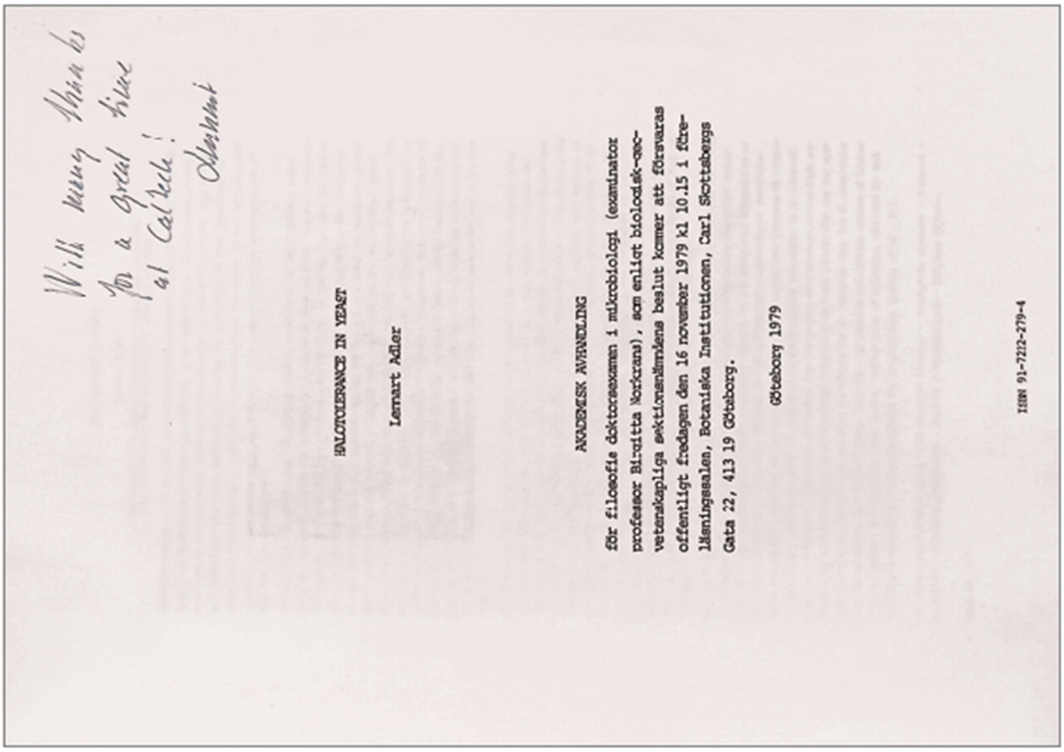
Assay. During the course of these experiments three different techniques were developed for determining precursor concentrations in various preparations. The first was a turbidimetric measurement of the growth of *E. coli* 58-336 with the Evelyn colorimeter, calibrated against a standard curve with DL-isoleucine. This method was the most precise, although certain precautions were necessary to eliminate complications due to effects on the assay of pH, prototrophic mutation, and pigment production by the test organism. A detailed description of the method is presented below in the section on the biological activity of the precursor.

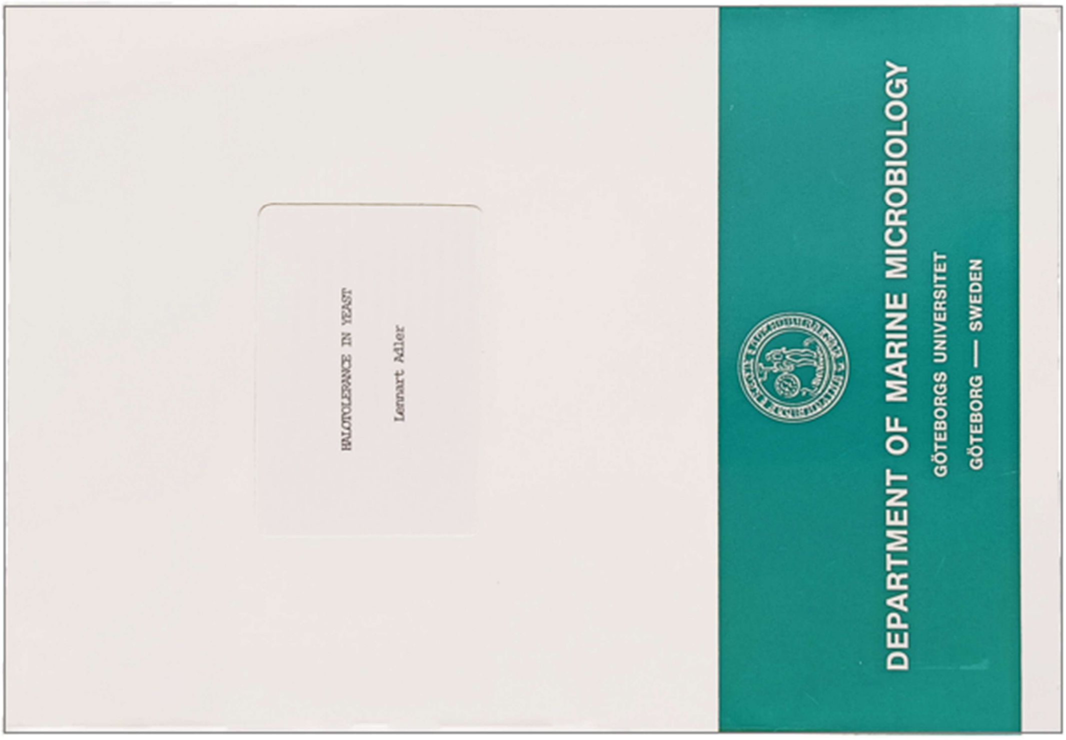
The second method was much simpler and, while much less precise, was adequate for the purposes of fractionation. This method involved use of the "pen-assay" cylinder, petri plate technique (Bacharach, 1947), in which cylinders were filled with isoleucine or precursor solutions after being placed on top of minimal agar (Gray and Tatum, 1944) seeded with cells of *E. coli* strain 58-336. Turbid zone diameters for the unknown were then compared with those for isoleucine.

[1] Some of the data reported here are included in a dissertation submitted by the author to the Graduate School, Yale University, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

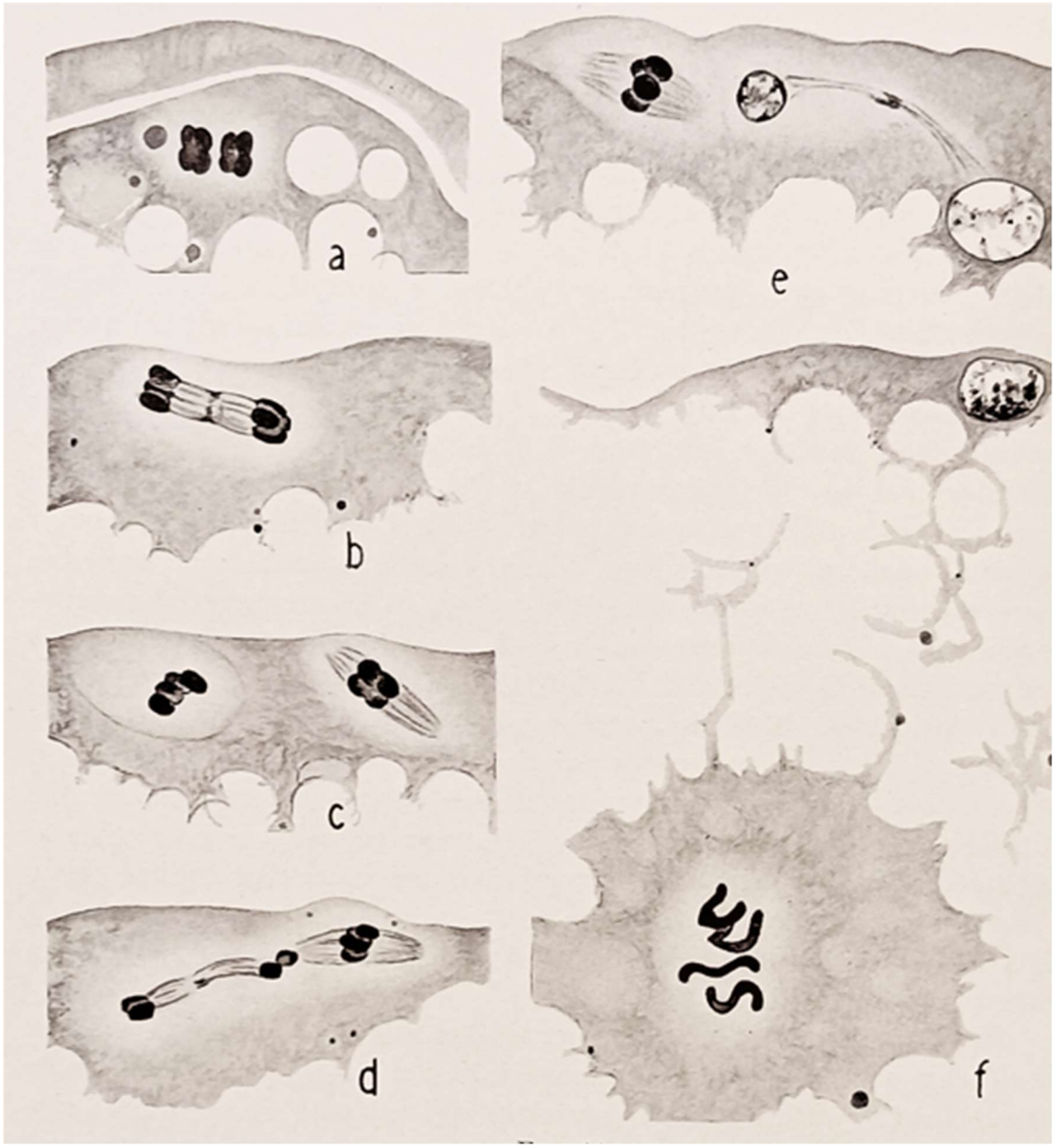
[2] Standard Brands Fellow in Microbiology at Yale University, 1946-1948. Present address: Department of Bacteriology, University of California, Berkeley, California.

Author: "David Mahlon Bonner's short scientific career—he died at the age of 48—spanned the bloom period of Neurospora biochemical genetics and he was one of its main practitioners and contributors. He started life as a plant physiologist and became a biochemical geneticist working with Neurospora crassa after joining the group of George Beadle and Edward Tatum as a postdoctoral researcher at Stanford University. Initially he explored the use of Neurospora for biochemical investigations and identified intermediary steps in biochemical pathways. Finding that mutations that affect one enzyme are located on the same small segment of genetic material, he provided support for the "one gene, one enzyme" theory proposed by Beadle and Tatum in 1941. The nature of the genetic unit fascinated him . . ." See: [Obituary, NAP] by Maarten J. Chrispeels – National Academies of Sciences, Engineering, and Medicine. 2006. *Biographical Memoirs*: Volume 88. Washington, DC: The National Academies Press.





32. **ADLER, Lennart**. "Halotolerance in Yeast." Goteborg: Akademisk Avhandling, 1979. ¶ 4to. Many pages of papers by Adler, figs. Printed wrappers; spine head rubbed. INSCRIBED BY ADLER to Norman Horowitz. Very good. S7853 $ 20



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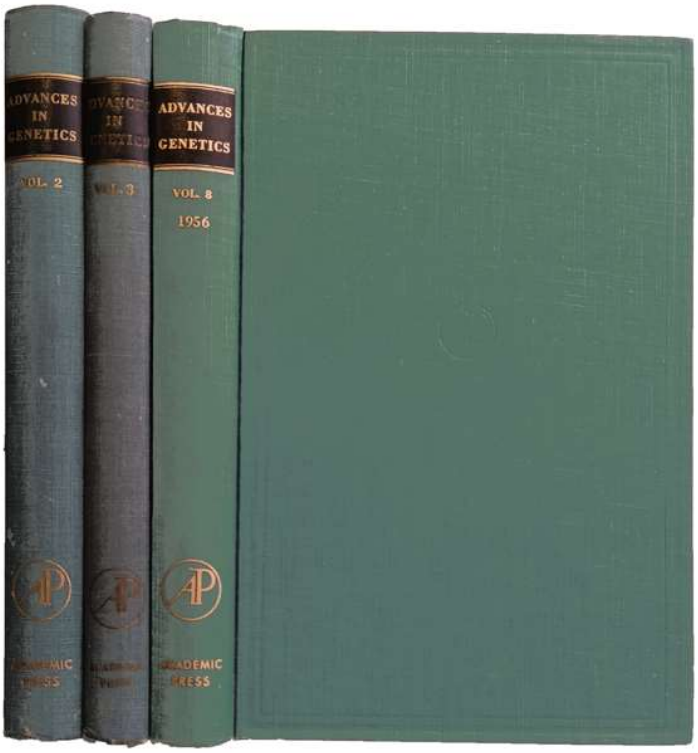

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VOLUME II

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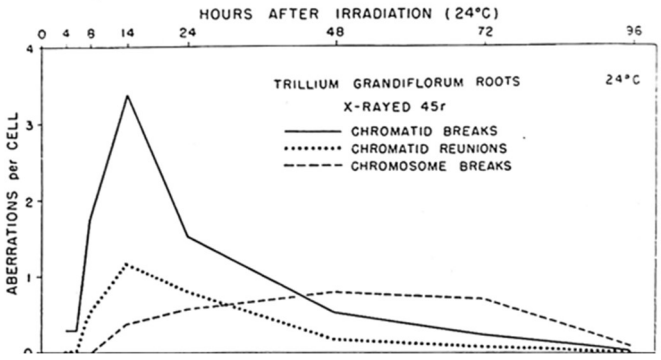
33. [**Advances in Genetics**] **DEMEREC, Milislav** (1895-1966) (ed.). *Advances in Genetics* (vols. 2, 3, & 8). New York: Academic Press, 1948; 1950; 1956. ¶ 3 volumes. 8vo. viii, 373; viii, 267; ix, 402 pp. Articles, figs., photos, index. Green cloth, gilt & black spines. Ownership rubber stamps of contributing author Norman Horowitz, California Institute of Technology. FINE. [S7854]

$ 25

FIRST EDITION. Articles include: "The bearing of the New Systematics on Genetical Problems. The Nature of Species." Ernst Mayr; "Genetic Effects of Radiation." D. G. Catcheside.

Milislav Demerec was a Croatian-American geneticist, and the director of the Department of Genetics, Carnegie Institution of Washington [CIW], now Cold Spring Harbor Laboratory from 1941 to 1960, recruiting Barbara McClintock and Alfred Hershey. Demerec was born and raised in Kostajnica. "In the 1940s the direction of Demerec's research changed to the genetics of bacteria and their viruses after a symposium given by Max Delbrück. During World War II he used his knowledge of bacterial genetics to increase the yield from the Penicillium. Following the war he continued to work on bacterial genetics and the problem of antibiotic resistance in E. coli, Salmonella, and Staphylococcus. In 1946 he was elected to the National Academy of Sciences, and in 1947 became the founding editor of Advances in Genetics, the first journal to review the finding of modern genetics. In the 1950s he served on the genetics panel of the National Academy of

Sciences' Committee on the Biological Effects of Atomic Radiation. In 1952 he was elected to the American Philosophical Society."



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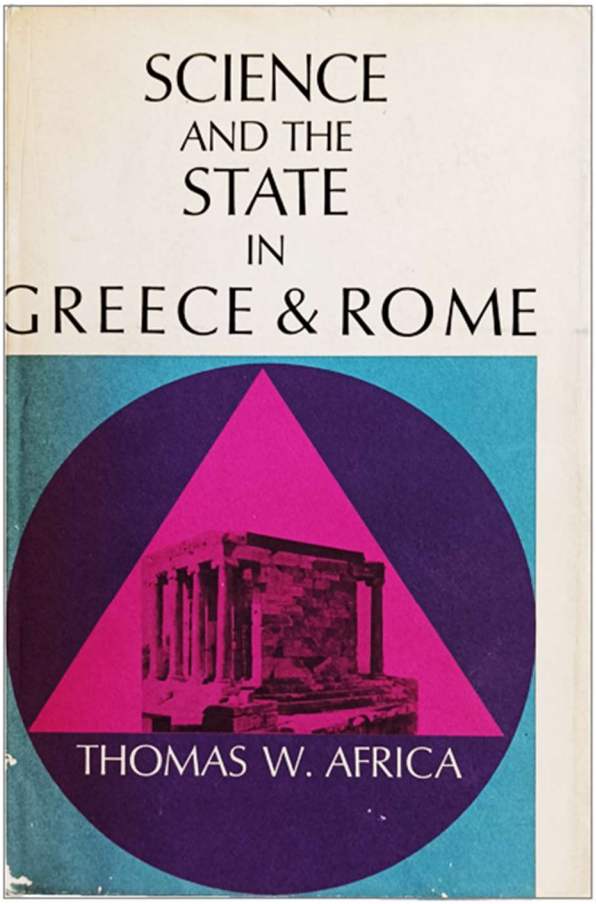

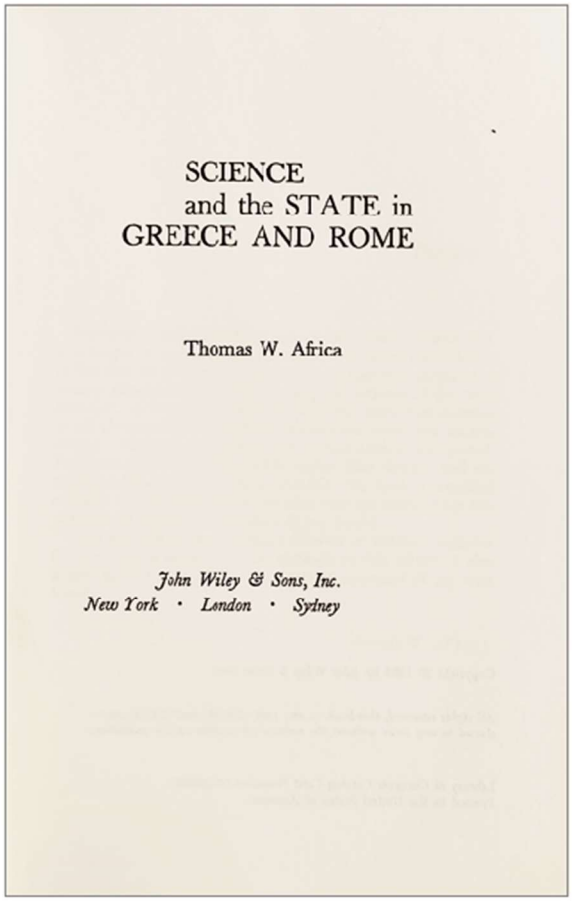
SCIENCE
and the STATE in
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Thomas W. Africa

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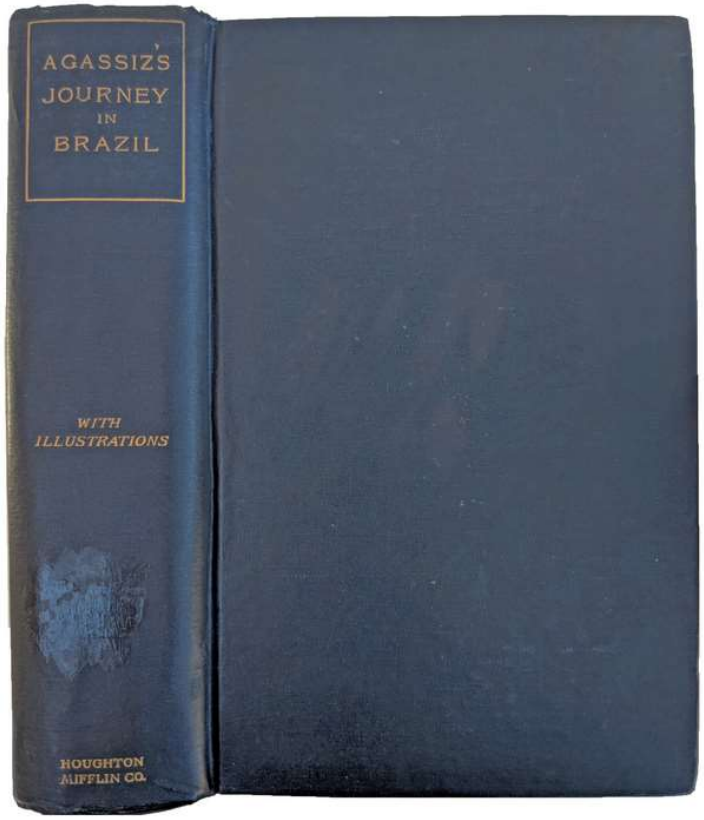
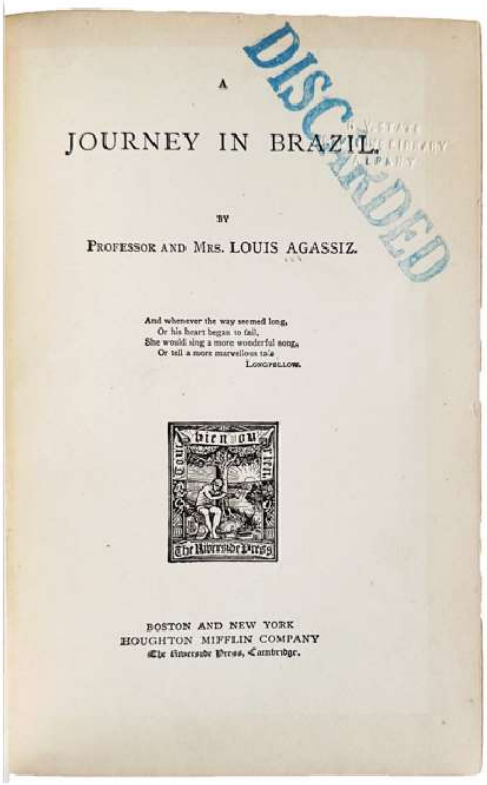
34. **AFRICA, Thomas W**. *Science and the State in Greece and Rome*. New York: John Wiley & Sons, (1968). ¶ Sm. 8vo. 128 pp. Index. Cloth, dust-jacket; light wear to jacket. Roger Hahn's copy (no sig.) with his pencil marginalia (minor). [RH1515] $ 7.50



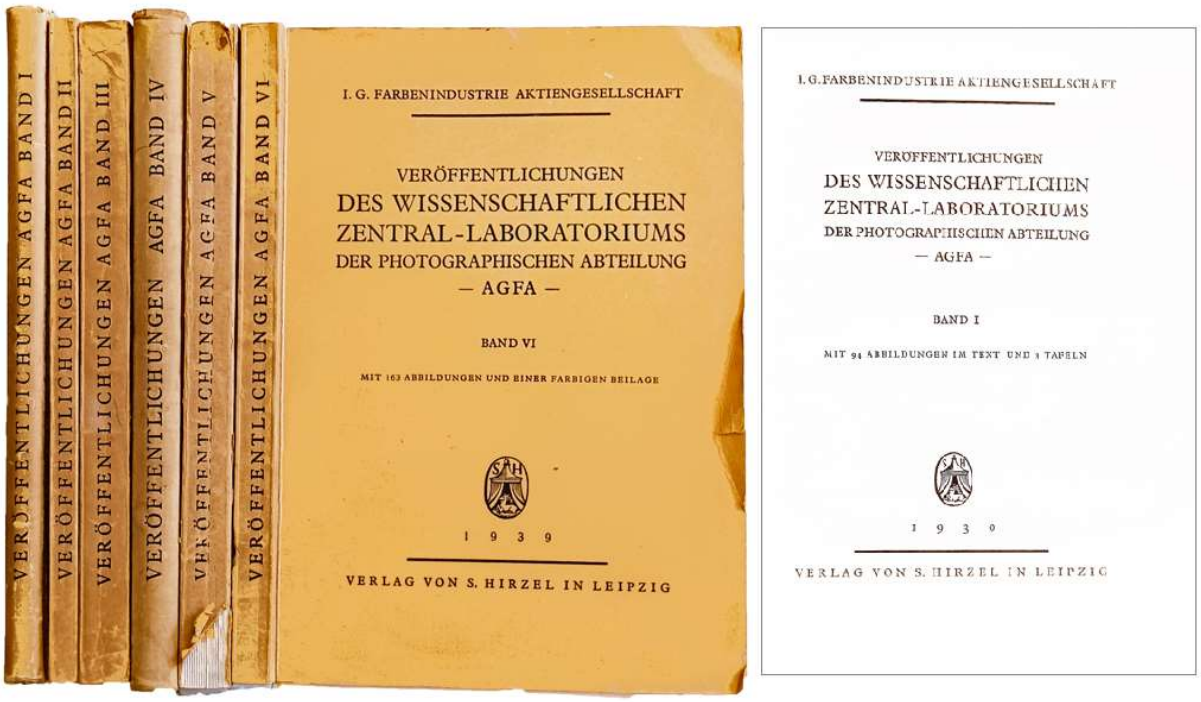


35. **AGASSIZ, Jean Louis Rodolphe** (1807-1873); **Elizabeth Cabot AGASSIZ** (nee **CARY**) (1822-1907). *A Journey in Brazil*. Boston: Houghton Mifflin, 1909. ¶ 8vo. [2], xix, [3], 540 pp. Frontis., plate, maps, figs. Original navy gilt-stamped cloth, top edge gilt; library markings, rear pocket, rubbed. Ownership label of Richard A. Weiss; bookplate of Albany, NY, Traveling Library. Good. [RW1001]

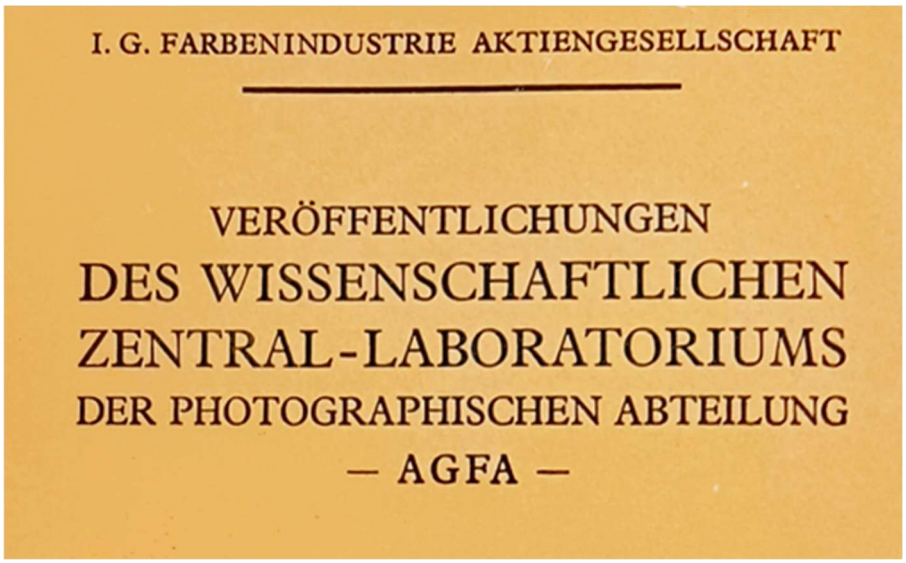
$ 25

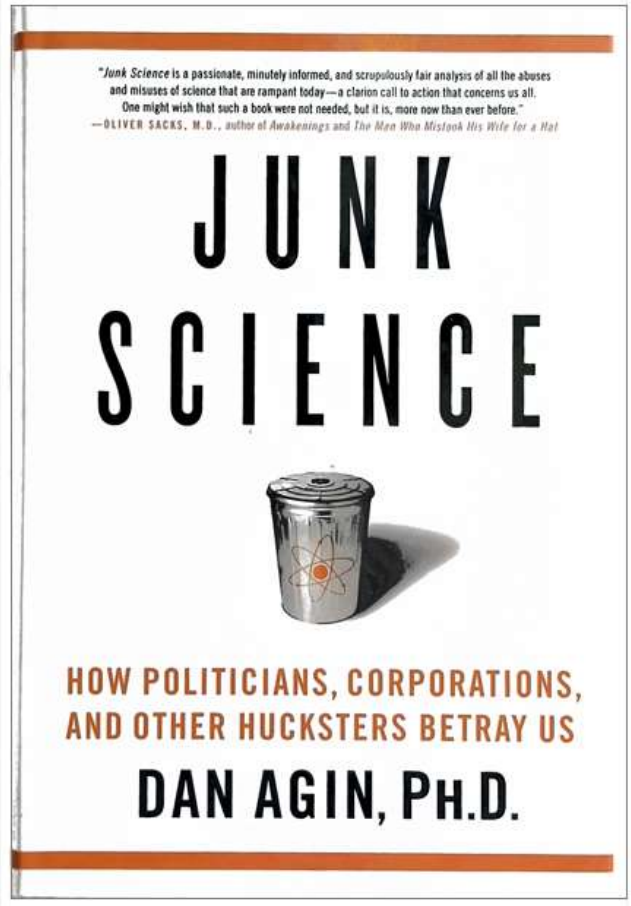
Dedicated to Nathaniel Thayer. In 1865 Louis Agassiz, already a famed naturalist and explorer, traveled to Brazil both to research fish and in hopes of recovering his health. He was accompanied by a number of assistants, as well as his wife. This volume describes in detail their experiences in the country, focusing principally on the experiences with Brazilian societies, and including descriptions of both urban and rural environs.

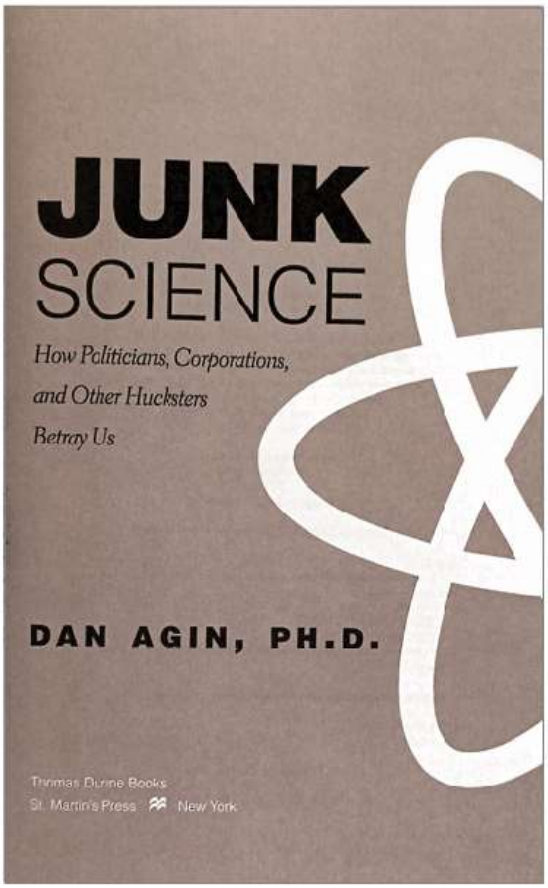
Subjects of interest include chapters Physical History of the Amazons, Life in Tefee, Life at Manaos. — Voyage from Manaos to Tabatinga., Public Institutions of Rio. — Organ Mountains.



36. [**AGFA**] *Veroffentlichungen des wissenschaftlichen zentral – laboratoriums der photographischen abteilung. AGFA [Aktiengesellschaft fur Anilinfabrikation].* Leipzig: S. Hirzel, 1930-39. ¶ I.G. Farbenindustrie Aktiengesellschaft. Six volumes, complete. 8vo. 155; 178; 313; 262; viii, 309; 272 pp. 898 text figs., 11 plates, two mounted photo samples of color and b/w photo stock. Vols. I & IV in mustard cloth, Vols. II, III, V & VI in printed wrappers; wrappers have minor chipping. Former ownership signatures on front endpapers. Very good. S9464 $ 65







37. **AGIN, Dan**. *Junk Science. How Politicians, Corporation, and Other Hucksters Betray Us*. New York: St. Martin's Press, (2006). ¶ 8vo. ix, 323 pp. Orange cloth, gilt-stamped spine title, dust jacket. Fine. S9761 $ 7

38. [**AGRICOLA, Georgius** (1494-1555)] **Marie-Claude DÉPREZ-MASSON**. *Technique, Mot et Image: Le De Re Metallica d'Agricola*. (Turnhout, Belgium): Brepolis, (2006). ¶ Series: *De Diversis Artibus: Collection de Travaux de l'Academie Internationale d'Histoire des Sciences*, Tome 75, N.S. 38. 8vo. 519 pp. 53 illustrations, bibliography, index. Printed boards. Near fine. [S11020]

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M.-C. Déprez-Masson, "by courageously taking up the examination of a considerable work, has added to an immense bibliography a title which offers a new reading of one of the texts the most famous in the history of technology."

"It is through this notion of utility that the work of M.-C. Déprez-Masson opens a new field of reflection and the vision which imposes itself on the reader places the work of Agricola in its context, from two manners. The first clearly defines the position of a humanist, who addresses the honest man, reading Latin, ready to

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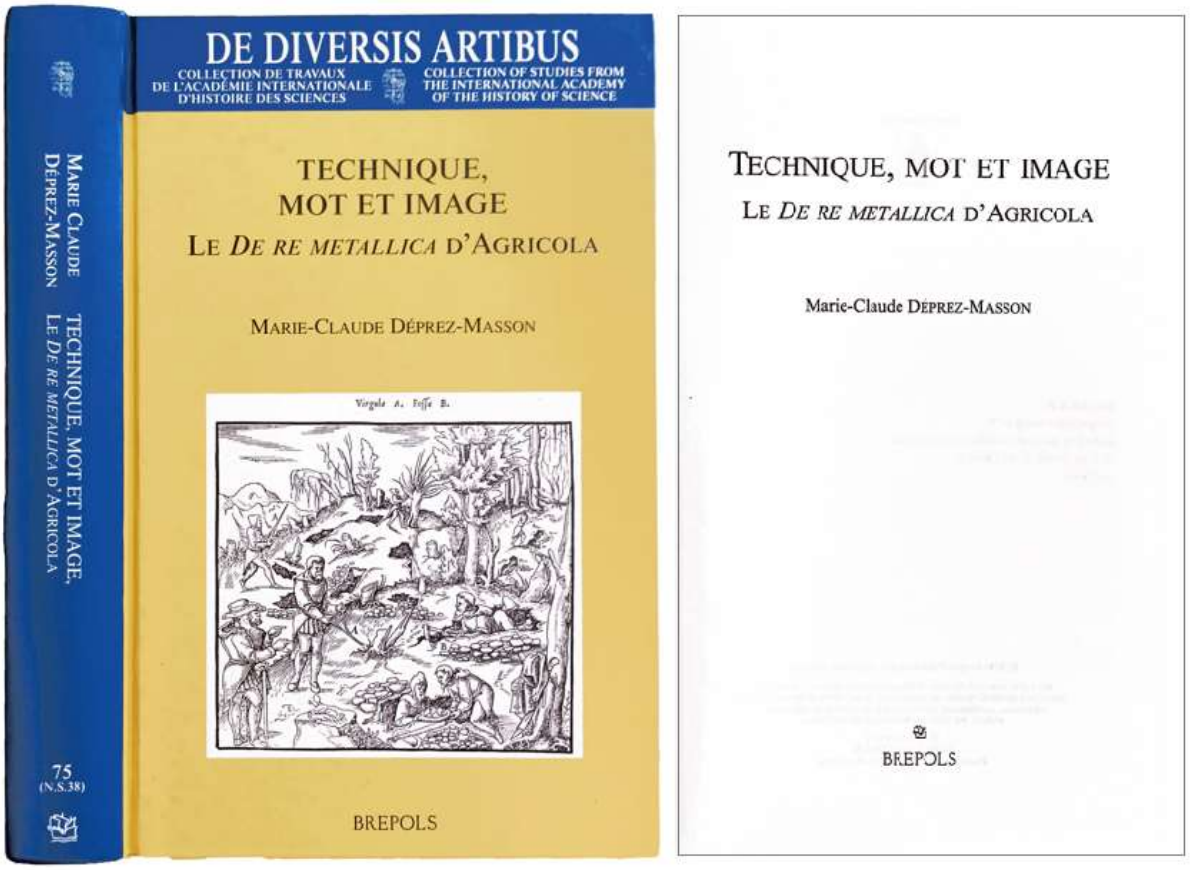
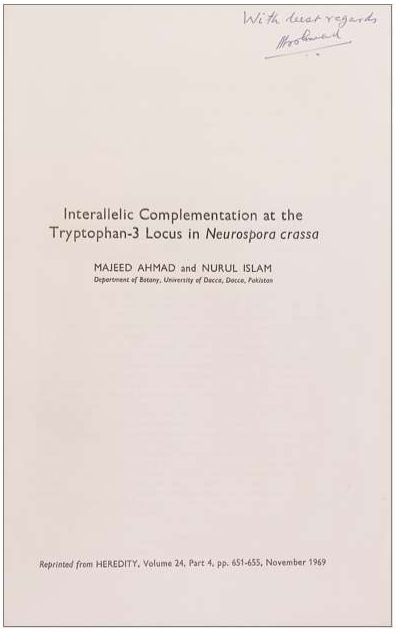


"A second contribution is no less remarkable: the book sheds convincing light on the scientific biography of the author by placing the *De re metallica* in the whole of a work and in the perspective which could have been that of a doctor, nourished by

ancient authors and anxious, if possible, to complete Aristotle. M..C. Déprez Masson emphasizes the fact that *De re metallica* was not the crowning achievement of a long enterprise; the traditional error is to forget that Agricola intended to complete two other works, one on mining law, the other on the medicinal use of metals." – Reviewed by Philippe Braunstein.

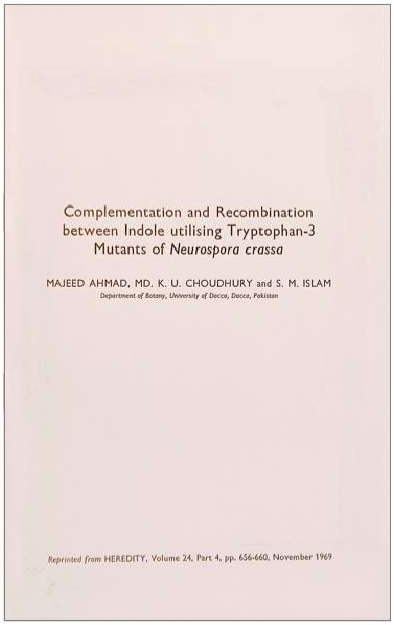

With best regards

Interallelic Complementation at the Tryptophan-3 Locus in *Neurospora crassa*

MAJEED AHMAD and NURUL ISLAM

Department of Botany, University of Dacca, Dacca, Pakistan

Reprinted from HEREDITY, Volume 24, Part 4, pp. 651-655, November 1969


Complementation and Recombination between Indole utilising Tryptophan-3 Mutants of *Neurospora crassa*

MAJEED AHMAD, MD. K. U. CHOUDHURY and S. M. ISLAM

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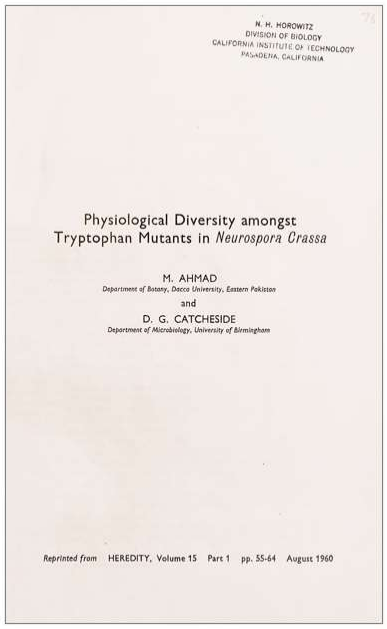
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Physiological Diversity amongst Tryptophan Mutants in *Neurospora Crassa*

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Department of Botany, Dacca University, Eastern Pakistan

and

D. G. CATCHESIDE

Department of Microbiology, University of Birmingham

Reprinted from HEREDITY, Volume 15 Part 1 pp. 55-64 August 1960

39. **AHMAD, Majeed** (1916-1987). Group of 4 offprints. Includes: **AHMAD**, & **Nurul ISLAM**. *"Interallelic Complementation at the Tryptophan-3 Locus in Neurospora Crassa."* Offprint from: Heredity, vol. 24, part 4. No place: *Heredity*, 1969. ¶ 8vo. 651-655 pp. Tables. Self-wraps. INSCRIBED BY AHMAD. Fine.

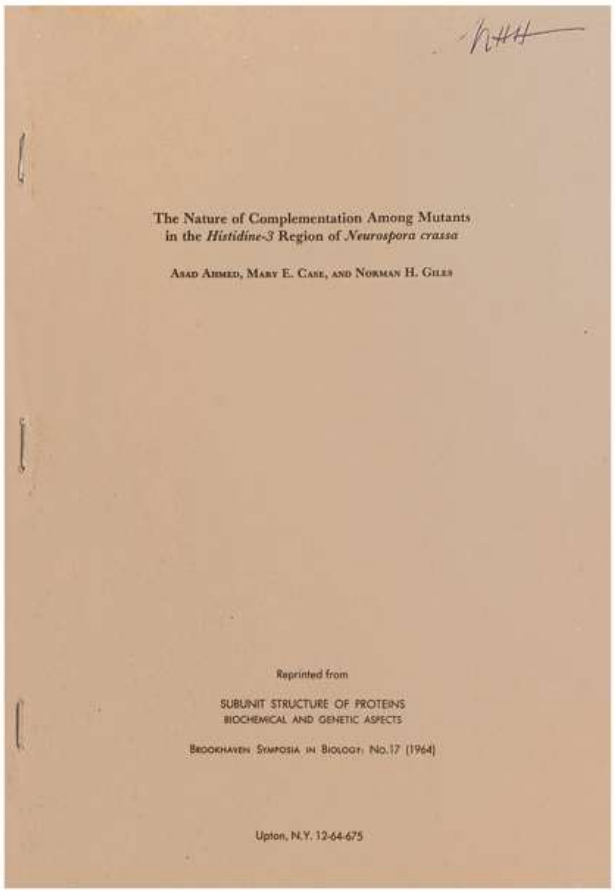
WITH: **AHMAD**, **K. U. CHOUDHURY**, & **S. M. ISLAM**. *"Complementation and Recombination Between Indole Utilising Tryptophan-3 Mutants of Neurospora Crassa."* Offprint from: *Heredity*, vol. 24, part 4, 1969. 8vo. 656-660 pp. Tables. Self-wraps. Fine.

WITH: **AHMAD**, **A. MOZMADAR**., & **Sheldon HENDLER**. *"A New Locus in the Tryptophan Pathway of Neurospora Crassa."* Offprint from: *Genet. Res.*, Camb., 12, 1968. 8vo. 103-107 pp. Self-wraps. Ownership signature of Norman Horowitz. Fine.

WITH: **AHMAD**, & **D. G. CATCHESIDE**. *"Physiological Diversity Amongst Tryptophan Mutants in Neurospora Crassa."* Offprint from: *Heredity*, vol. 15, part 1, 1960. 8vo. 55-64 pp. Figs., tables. Printed wrappers. Ownership rubber stamp of Norman Horowitz, California Institute of Technology. Fine. S7624

$ 40

Ahmad was professor in the Dept. of Botany, University of Dacca, Pakistan. He was widely respected for his extensive research in genetics with a particular focus on revealing the action of the gene.



The Nature of Complementation Among Mutants in the *Histidine-3* Region of *Neurospora crassa*

ASAD AHMED, MARY E. CASE, AND NORMAN H. GILES

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SUBUNIT STRUCTURE OF PROTEINS
BIOCHEMICAL AND GENETIC ASPECTS

BROOKHAVEN SYMPOSIA IN BIOLOGY, No. 17 (1964)

Upton, N.Y. 12-64-675

The Nature of Complementation Among Mutants in the *Histidine-3* Region of *Neurospora crassa*

ASAD AHMED,* MARY E. CASE, AND NORMAN H. GILES
Department of Biology, Yale University, New Haven, Connecticut

The subject of this paper is an unusual situation of complementation that has become apparent as a result of integrated biochemical and genetic studies of mutants in the *histidine-3* (*his-3*) region of *Neurospora crassa*. These results form part of a more extensive study of regulation and gene-enzyme relationships in the biosynthesis of histidine in *Neurospora*.[1] Elsewhere in this symposium, Loper et al.[2] have indicated that the genes specifying the structures of enzymes in the histidine biosynthetic pathway of *Salmonella* are clustered together on the chromosome, constituting an operon, a polarized unit of coordinated transcription whose activity is controlled by an operator.[3,4] It is interesting that in *Neurospora* the structural genes for most of these enzymes, although catalyzing identical biosynthetic steps, are widely dispersed over different chromosomes (Figure 1). However, the present studies have resulted in the identification of a small polycistronic unit of genetic expression which appears to be partly analogous with the more extensive histidine operon of *Salmonella*. These experiments are described in the succeeding sections as complementation studies, genetic mapping, and biochemical studies, and an interpretative discussion follows.

COMPLEMENTATION STUDIES

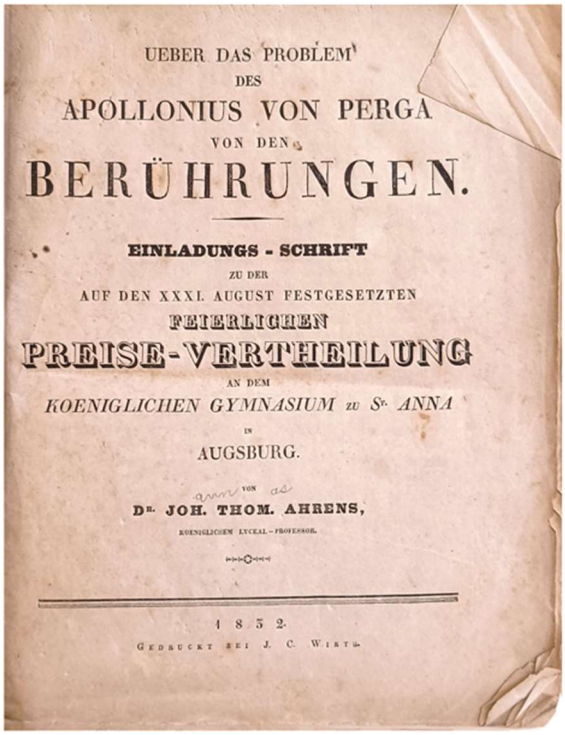
The first indications of a functional diversity among *his-3* mutants came from the studies of Haas, Mitchell, Ames, and Mitchell[5] and Ames,[6] who found that this region controls at least two enzymes, namely, the last enzyme (histidinol dehydrogenase) and an early unidentified enzyme in the histidine biosynthetic pathway. Subsequent complementation and genetic studies by Webber[7,8] and Catchesice[9] on a large number of *his-3* mutants suggested that mutants mapping towards the right end of the two maps lacked histidinol dehydrogenase and consequently accumulated histidinol, whereas mutants generally mapping at the left end were deficient for the early enzyme which controlled some step before the formation of imidazole glycerol phosphate (IGP). In addition to these two complementing groups there was a third class of noncomplementing mutants which seemed to lack both activities simultaneously. Like the single early-enzyme mutants, these noncomplementing mutants also failed to accumulate any free Bratton-Marshall positive compound.

The map of complementation among mutants in the *his-3* region is presented in Figure 2. Following the usual convention of complementation mapping, the presumptive damage on the polypeptide chain caused by the mutational alteration in a

*Present Address: Institute of Molecular Biology, University of Oregon, Eugene, Oregon.

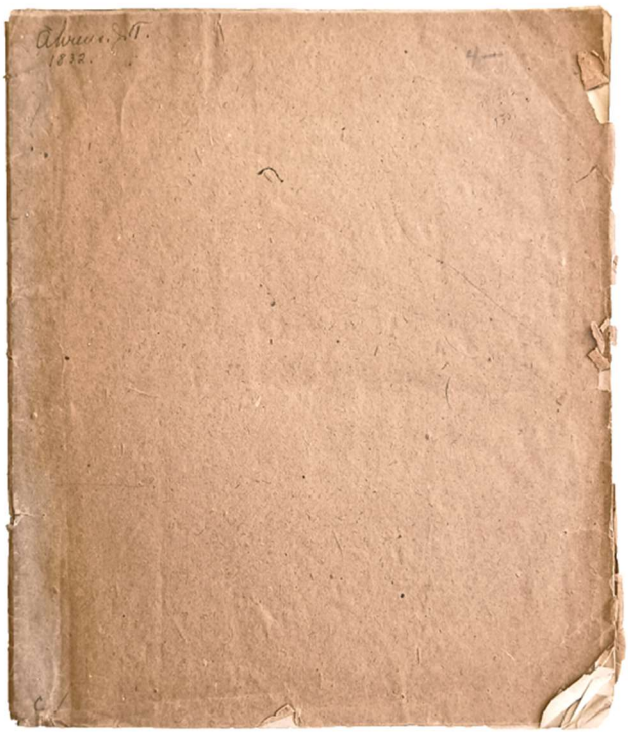
53

40. **AHMED, Asad**; **Mary E. CASE**; **Norman H. GILES**. *"The Nature of Complementation Among Mutants in the Histidine-3 Region of Neurospora Crassa."* Offprint from: *Subunit Structure of Proteins Biochemical and Genetic Aspects, Brookhaven Symposia in Biology*: no. 17, 1964. [No place: no publisher], 1964. ¶ 8vo. 53-65 pp. Tables. Printed wrappers. Ownership signature of Norman Horowitz. Fine. S7112 $ 10


UEBER DAS PROBLEM
DES
APOLLONIUS VON PERGA
VON DEN
BERÜHRUNGEN.

EINLADUNGS - SCHRIFT
ZU DER
AUF DEN XXXI. AUGUST FESTGESETZTEN
FEIERLICHEN
PREISE-VERTHEILUNG
AN DEM
KOENIGLICHEN GYMNASIUM zu St. ANNA
IN
AUGSBURG.
VON
Dr. JOH. THOM. AHRENS,
KOENIGLICHEN LYCEAL-PROFESSOR.

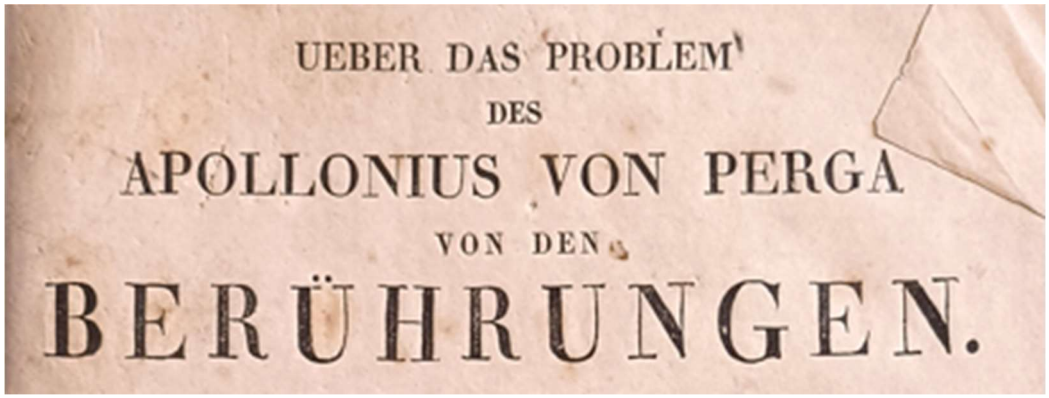
1832.
GEDRUCKT BEI J. C. WIRTH.

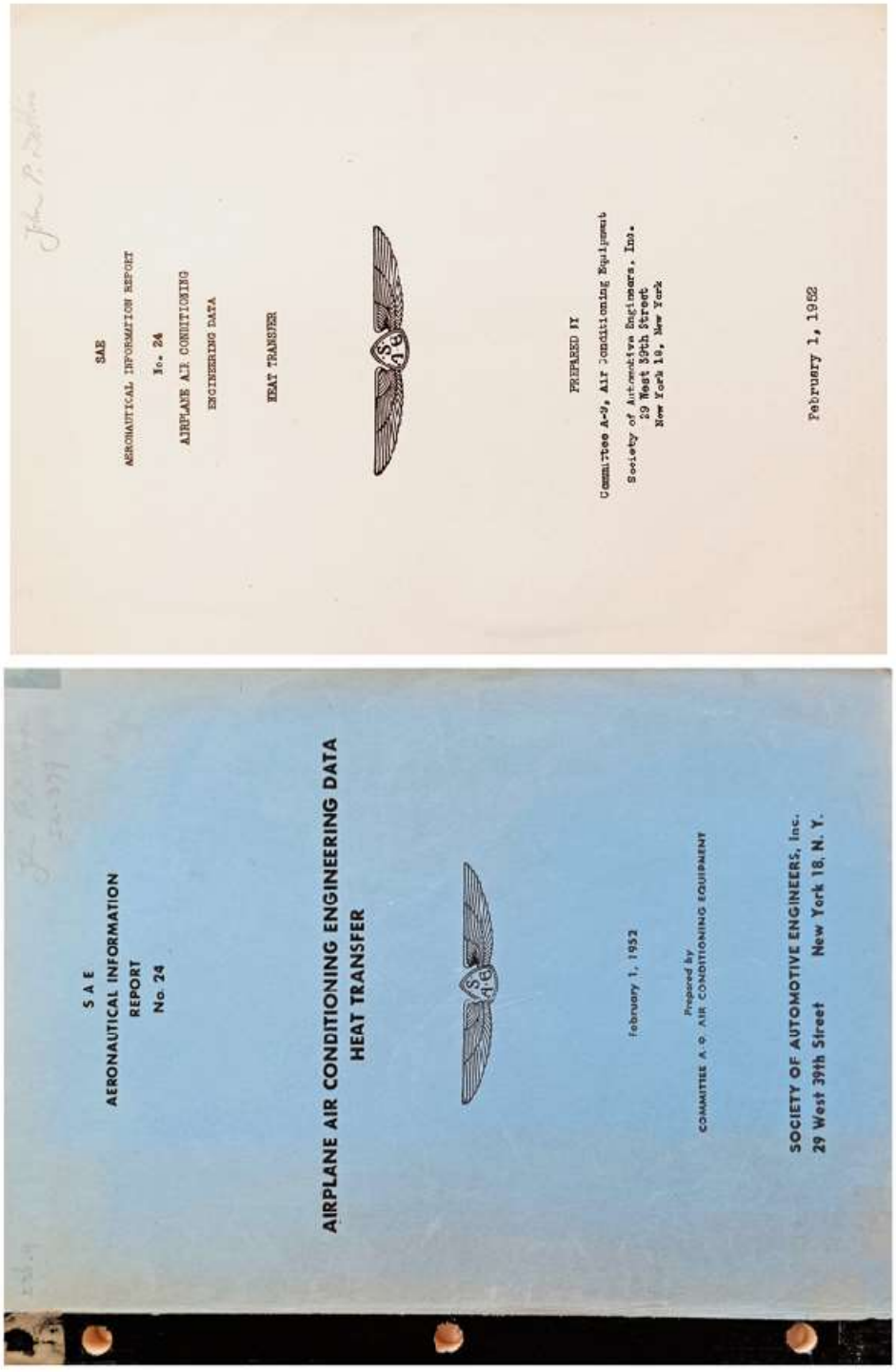


41. **AHRENS, Johann Thomas** (1786-1841). *Ueber das problem des Apollonius von Perga von den Beruhrungen. . .*.. Augsburg: J. C. Wirth, 1832. ¶ 4to. 18 pp. Table, 1 folding engraved plate. Plain wrappers; extremities chipped. Bound with class schedules for the Protestant Gymnasium of St. Anna, Augsburg. Good. S6262

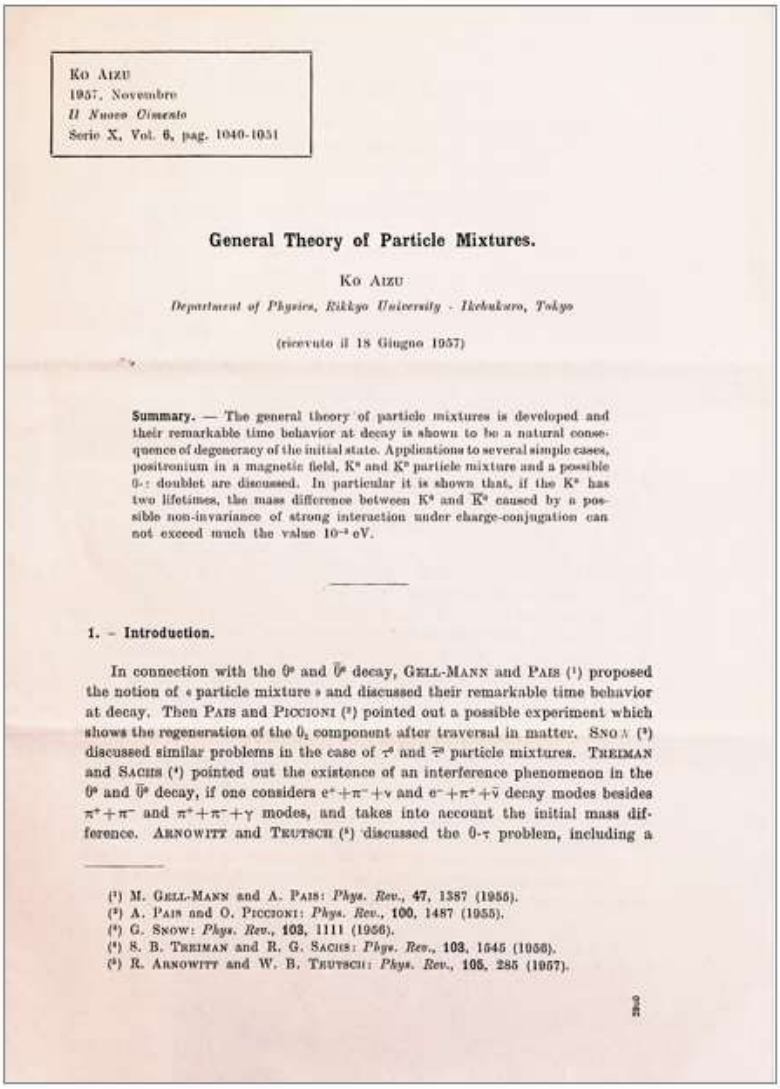
$ 25

Appolonius of Perga (fl. ca. 200 BCE) is usually associated with the development of the eccentric circle (in which the center of the circle is not the center of the earth) and the deferent-epicycle model (in which a planet is described as moving on a point on a circle, known as an epicycle, whose center is moving on yet another circle, known as a deferent). Johann Thomas Ahrens was professor of mathematics at the Gymnasium and Polytechnical School of Augsburg. Poggendorff, I, col. 19.


UEBER DAS PROBLEM
DES
APOLLONIUS VON PERGA
VON DEN
BERÜHRUNGEN.



42. [**Airplane Air Conditioning**] **COMMITTEE A-9, Air Conditioning Equipment**. SAE. *Aeronautical information report No. 24. Airplane air conditioning engineering data. Heat transfer.* New York: Society of Automotive Engineers, 1952. ¶ 4to. Variously paginated. Extensively illus. (including 1 folding plate). Quarter black cloth, printed wrappers; binder holes. Ownership signature of John P. Dobbins. Very good. S1171 $ 17



Ko Aizu
1957. Novembre
Il Nuovo Cimento
Serie X, Vol. 6, pag. 1040-1051

General Theory of Particle Mixtures.

Ko Aizu

Department of Physics, Rikkyo University - Ikebukuro, Tokyo

(ricevuto il 18 Giugno 1957)

Summary. — The general theory of particle mixtures is developed and their remarkable time behavior at decay is shown to be a natural consequence of degeneracy of the initial state. Applications to several simple cases, positronium in a magnetic field, K^0 and $\bar{K}^0$ particle mixture and a possible 0-: doublet are discussed. In particular it is shown that, if the K^0 has two lifetimes, the mass difference between K^0 and $\bar{K}^0$ caused by a possible non-invariance of strong interaction under charge-conjugation can not exceed much the value 10^{-5} eV.

1. – Introduction.

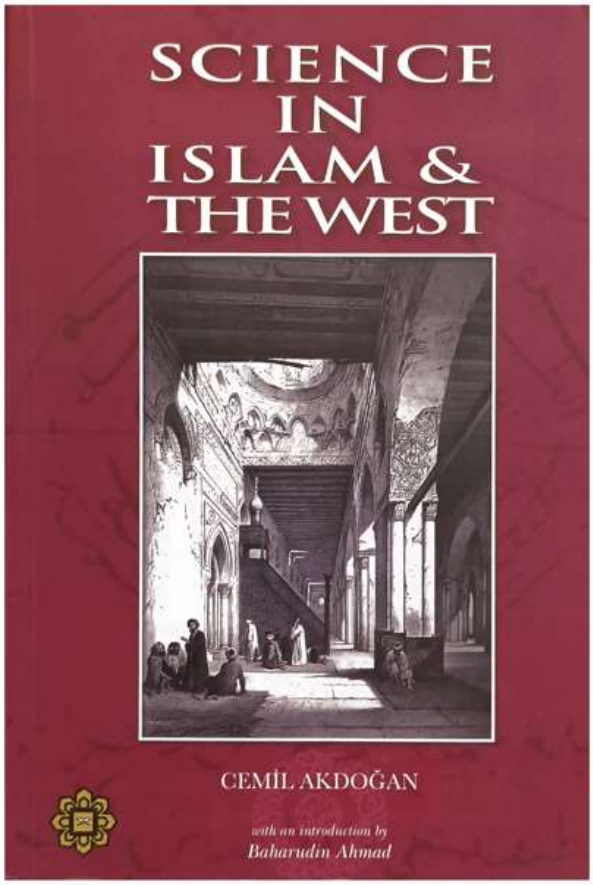
In connection with the θ^0 and $\bar{\theta}^0$ decay, Gell-Mann and Pais (1) proposed the notion of « particle mixture » and discussed their remarkable time behavior at decay. Then Pais and Piccioni (2) pointed out a possible experiment which shows the regeneration of the θ_2 component after traversal in matter. Snow (3) discussed similar problems in the case of τ^0 and $\bar{\tau}^0$ particle mixtures. Treiman and Sachs (4) pointed out the existence of an interference phenomenon in the θ^0 and $\bar{\theta}^0$ decay, if one considers $e^+ + \pi^- + \nu$ and $e^- + \pi^+ + \bar{\nu}$ decay modes besides $\pi^+ + \pi^-$ and $\pi^+ + \pi^- + \gamma$ modes, and takes into account the initial mass difference. Arnowitt and Teutsch (5) discussed the 0-τ problem, including a

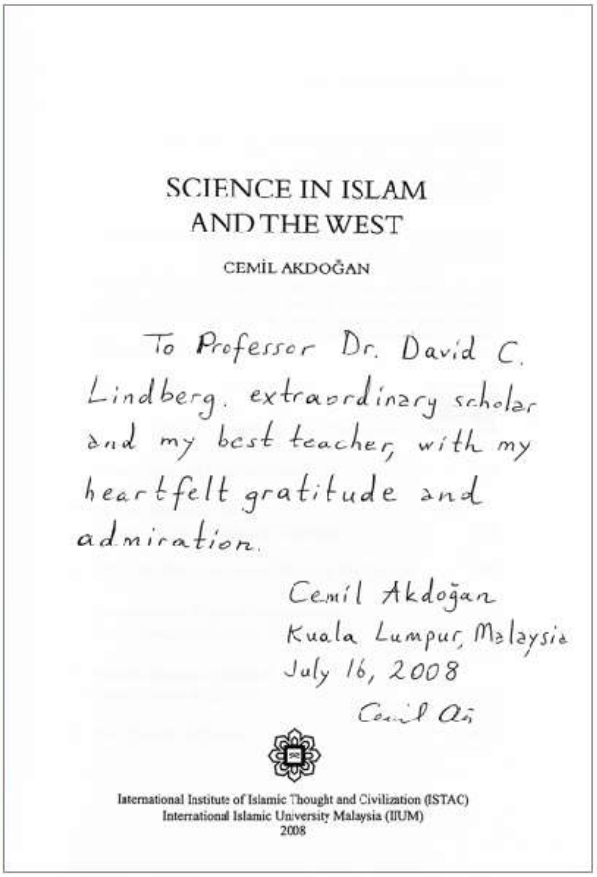
(1) M. Gell-Mann and A. Pais: *Phys. Rev.*, **47**, 1387 (1955).
(2) A. Pais and O. Piccioni: *Phys. Rev.*, **100**, 1487 (1955).
(3) G. Snow: *Phys. Rev.*, **103**, 1111 (1956).
(4) S. B. Treiman and R. G. Sachs: *Phys. Rev.*, **103**, 1545 (1956).
(5) R. Arnowitt and W. B. Teutsch: *Phys. Rev.*, **105**, 285 (1957).

43. **AIZU, Ko**. *"General Theory of Particle Mixtures."* [Rome?]: CERN, Serie X, vol. 6, Nov. 1957. ¶ 8vo. pp. 1040-1051. Self-wraps; creased. Fine. S7147 $ 12.50

Summary. – The general theory of particle mixtures is developed and their remarkable time behavior at decay is shown to be a natural consequence of degeneracy of the initial state. Applications to several simple cases, positronium in a magnetic field, K^0 and K^0 particle mixture and a possible 0-: doublet are discussed. In particular it is shown that, if the K^0 has two lifetimes, the mass difference between K^0 and K^0 caused by a possible non-invariance of strong interaction under charge-conjugation can not exceed much the value 10^{-5} eV.

Aizu was associated with the Dept. of Physics, Rikkyo University, Tokyo.




SCIENCE IN ISLAM
AND THE WEST

CEMİL AKDOĞAN

To Professor Dr. David C. Lindberg. extraordinary scholar and my best teacher, with my heartfelt gratitude and admiration.

Cemil Akdoğan
Kuala Lumpur, Malaysia
July 16, 2008

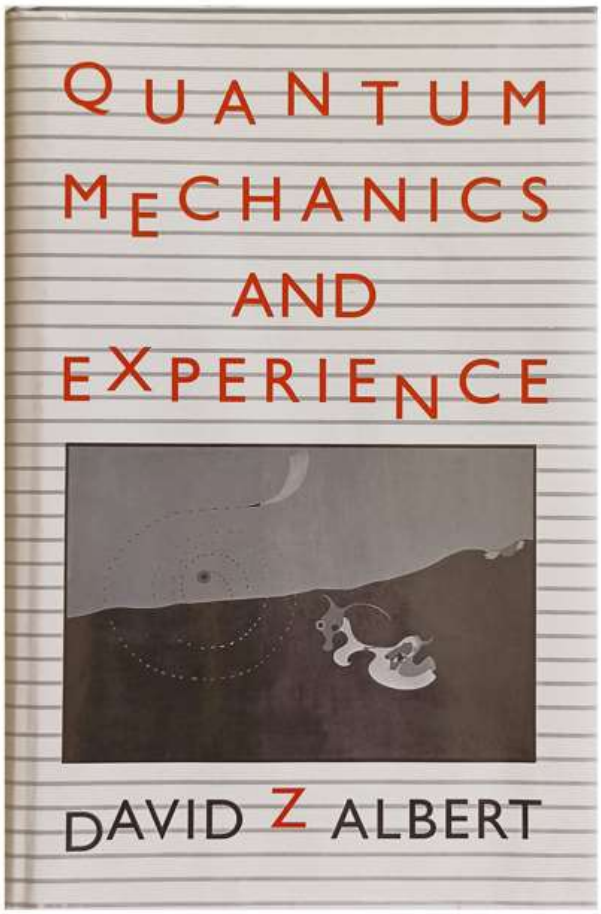
International Institute of Islamic Thought and Civilization (ISTAC)
International Islamic University Malaysia (IIUM)
2008

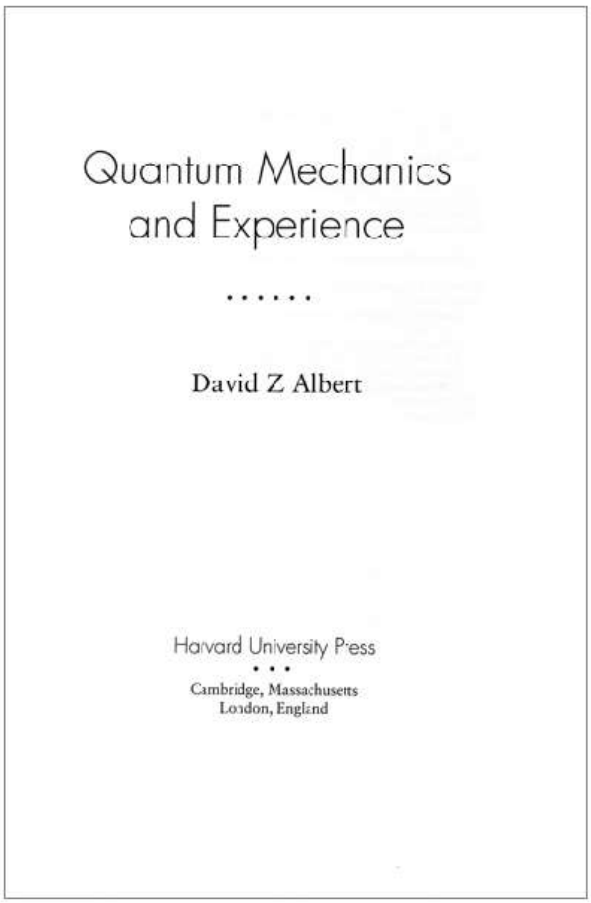
Inscribed by the Author

44. **AKDOGAN, Cemil**. *Science in Islam and the West.* Kuala Lumpur, Malaysia: International Institute of Islamic Thought and Civilization; International Islamic University, 2008. ¶ 8vo. xxii, 265 pp. Printed wrappers; nick on back cover edge. INSCRIBED BY THE AUTHOR TO DAVID C. LINDBERG. Very good +. Rare. RH1419

$ 75

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.



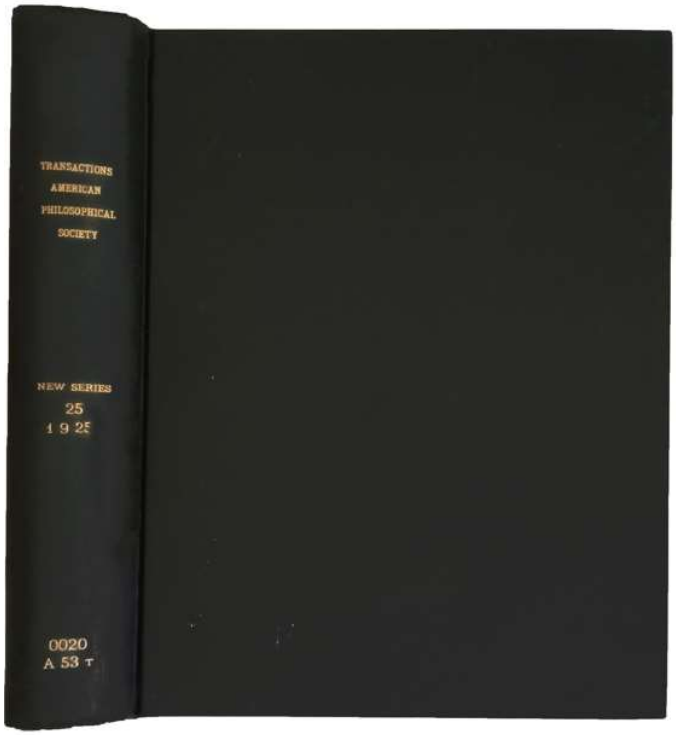


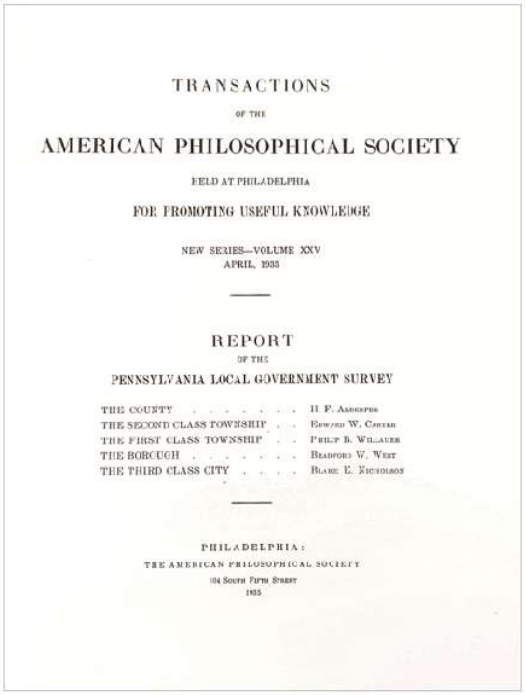
45. **ALBERT, David Z**. (1954-). *Quantum Mechanics and Experience*. Cambridge: Harvard University, 1993. ¶ 236 x 159 mm. 8vo. x, 206 pp. Illus., bibliog., index. Gray cloth, dust-jacket. Fine. S0854

$ 10

The more science tells us about the world, the stranger it looks. Ever since physics first penetrated the atom, early in this century, what it found there has stood as a radical and unanswered challenge to many of our most cherished conceptions of nature. It has literally been called into question since then whether or not there are always objective matters of fact about the whereabouts of subatomic particles, or about the locations of tables and chairs, or even about the very contents of our thoughts. A new kind of uncertainty has become a principle of science.

Albert is the Frederick E. Woodbridge Professor of Philosophy, Columbia University.





TRANSACTIONS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA

FOR PROMOTING USEFUL KNOWLEDGE

NEW SERIES—VOLUME XXV
APRIL, 1935

REPORT

OF THE

PENNSYLVANIA LOCAL GOVERNMENT SURVEY

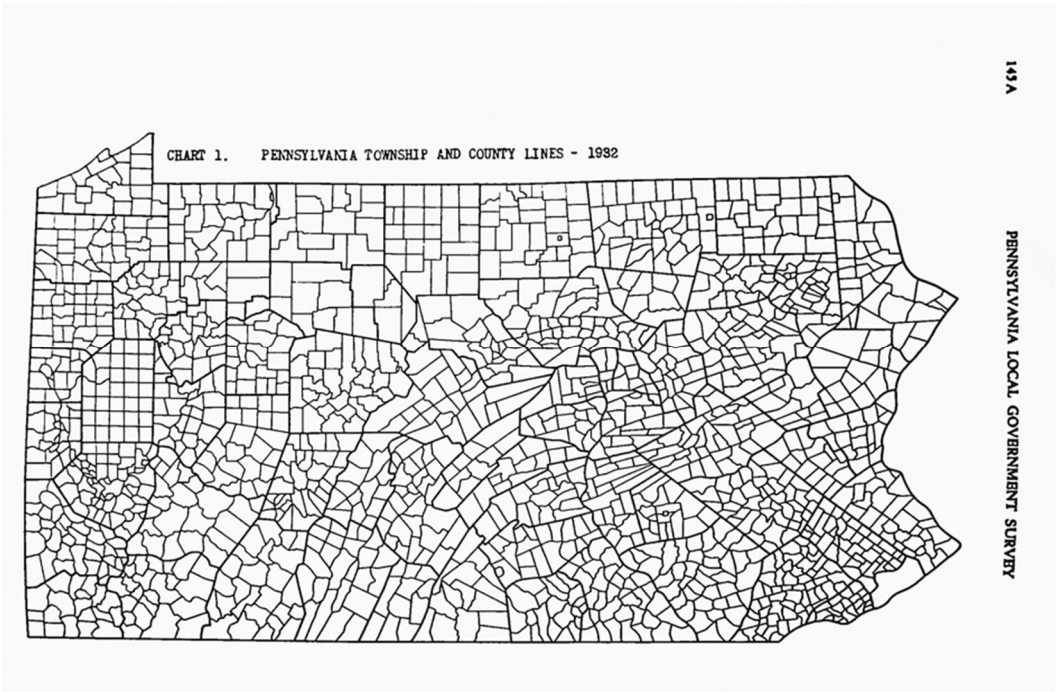
THE COUNTY . . . . . H. F. Alderfer
THE SECOND CLASS TOWNSHIP . . Edward W. Carter
THE FIRST CLASS TOWNSHIP . . Philip B. Wallace
THE BOROUGH . . . . . Bradford W. West
THE THIRD CLASS CITY . . . . Blake E. Nicholson

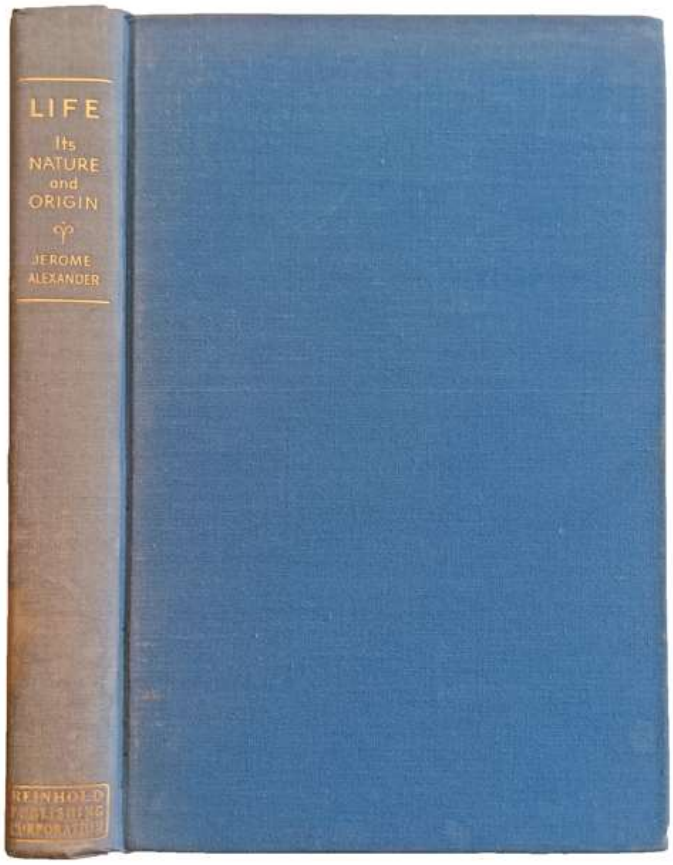
PHILADELPHIA:
THE AMERICAN PHILOSOPHICAL SOCIETY
104 South Fifth Street
1935

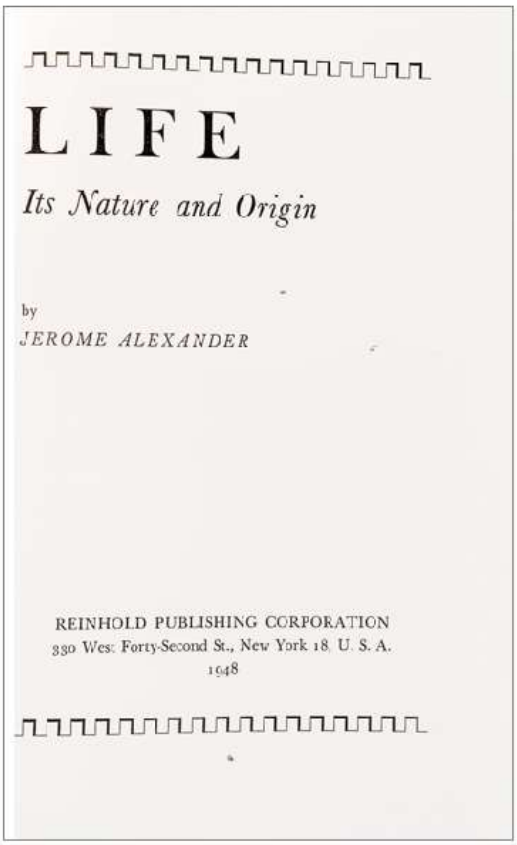
46. **[Philadelphia] ALDERFER, H. F.**, et al. *"Report of the Pennsylvania Local Government Survey."* In: Transactions of the American Philosophical Society, New Series, vol. XXV, April 1935. Philadelphia: American Philosophical Society, 1935. ¶ First edition. 4to. v, 483 pp. Tables, index. Dark green cloth, gilt spine. Fine. S7438

$ 25

Survey of the Pennsylvania government.







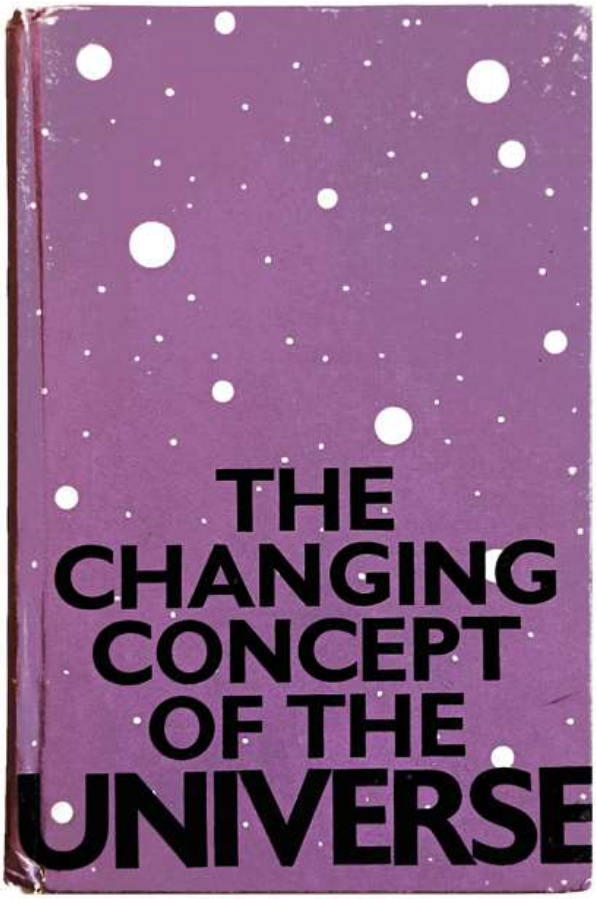
47. **ALEXANDER, Jerome**. *Life. Its Nature and Origin*. New York: Reinhold, 1948. ¶ 8vo. vii, 291 pp. Photos, figs., index. Blue cloth. Bookplate of H. Lee Gardner. FINE. S7862

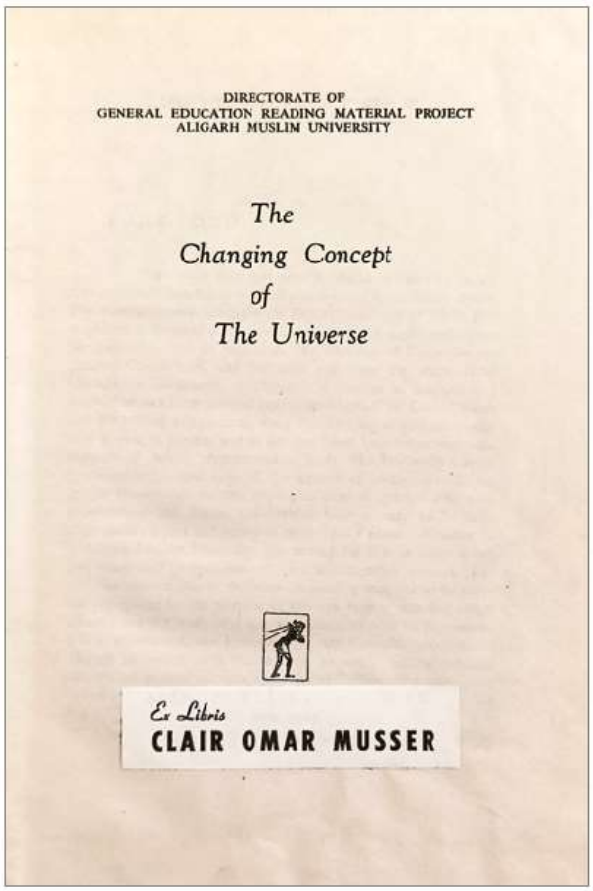
$ 7

First edition. "In this groundbreaking work, Alexander explores the nature of life itself, from its molecular building blocks to its complex evolutionary history. Drawing on the latest scientific discoveries and insights, he presents a comprehensive and compelling account of the origins and development of life on Earth. A must-read for anyone interested in biology, evolution, and the mysteries of the living world." – [online]

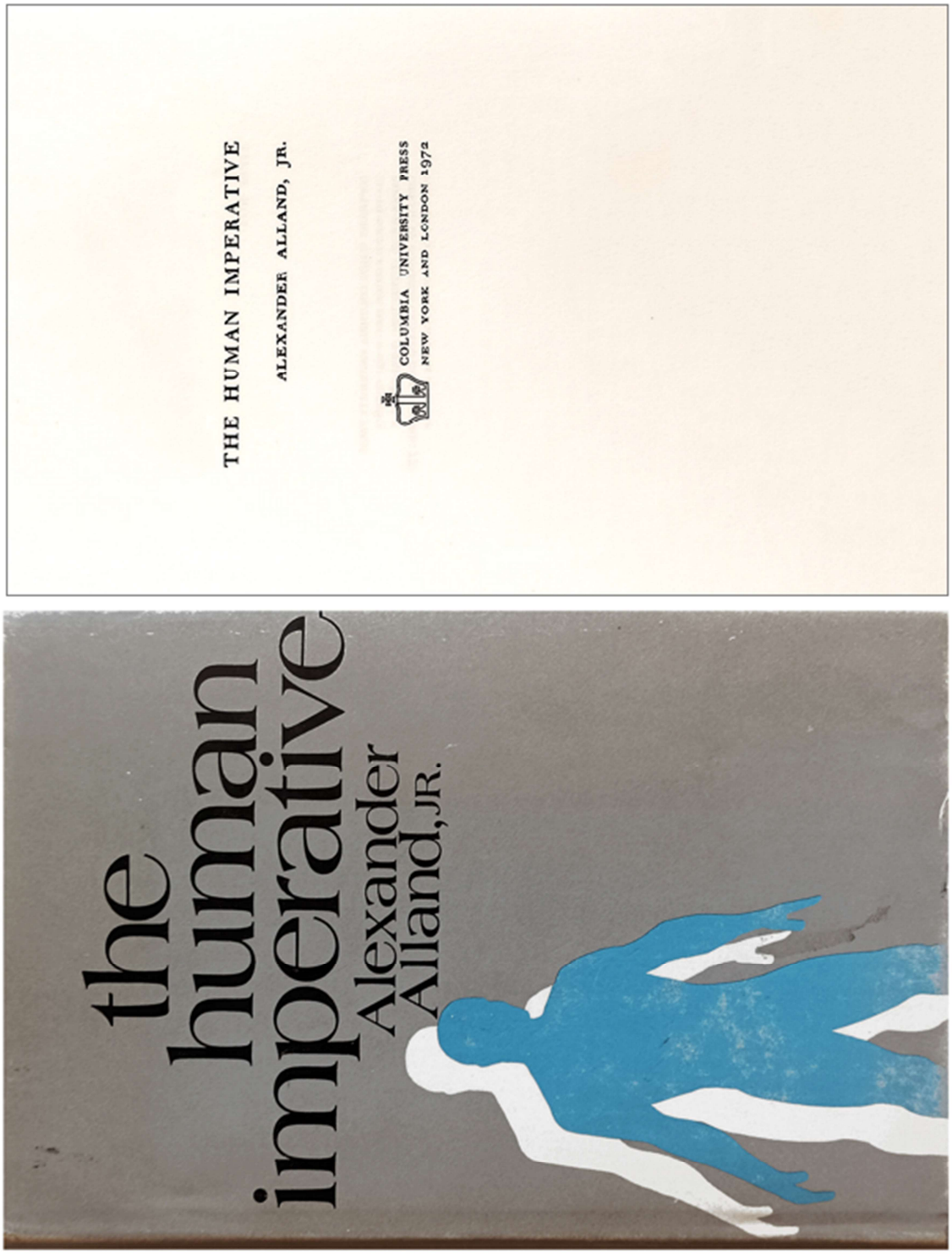
"Jerome Alexander, the distinguished colloid chemist, presents his stimulating theory of the origin and nature of life in this refreshing book, which is packed with erudition. Mr. Alexander's knowledge of chemistry is profound, and yet he has had the time and interest to acquire a wealth of information about biology and medicine; these combine to furnish a rational account of many processes occurring in the living cell which because of the author's chemical point of view will be read with profit by all those seeking a deeper insight into the nature of living things and a more fundamental understanding of medicine. / Mr. Alexander begins by stating

that life is an accomplished fact, a practical going concern and not a figment of someone's imagination—there must be some mechanism through which it got started. The most reasonable view is that life began with the chance formation of a self-reproducing unit of molecular or near molecular complexity. Life depends on a great variety of ordered chemical reactions which are limited in space, mass and time." [*JAMA*, 1948; 137(15): pp.1341-1342].

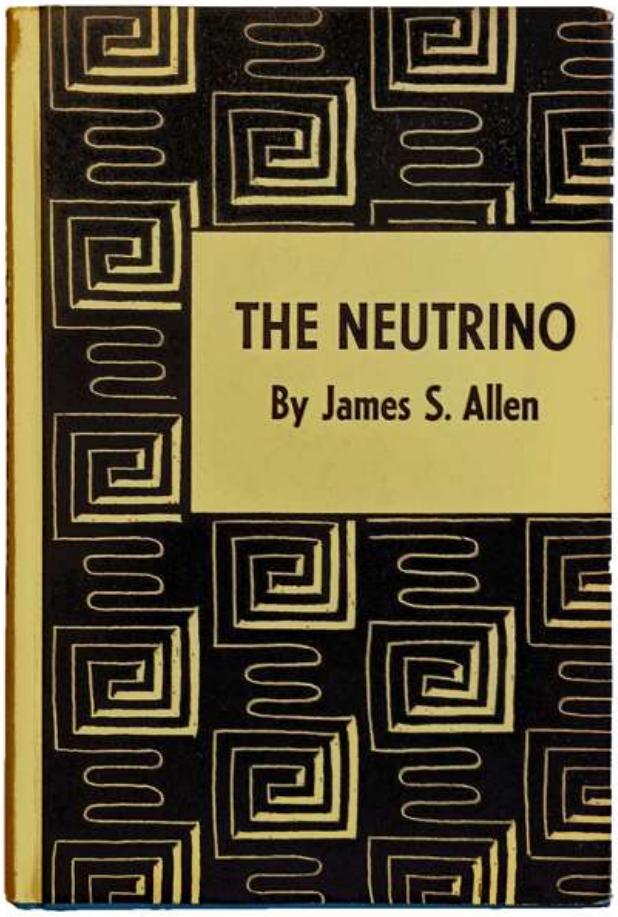


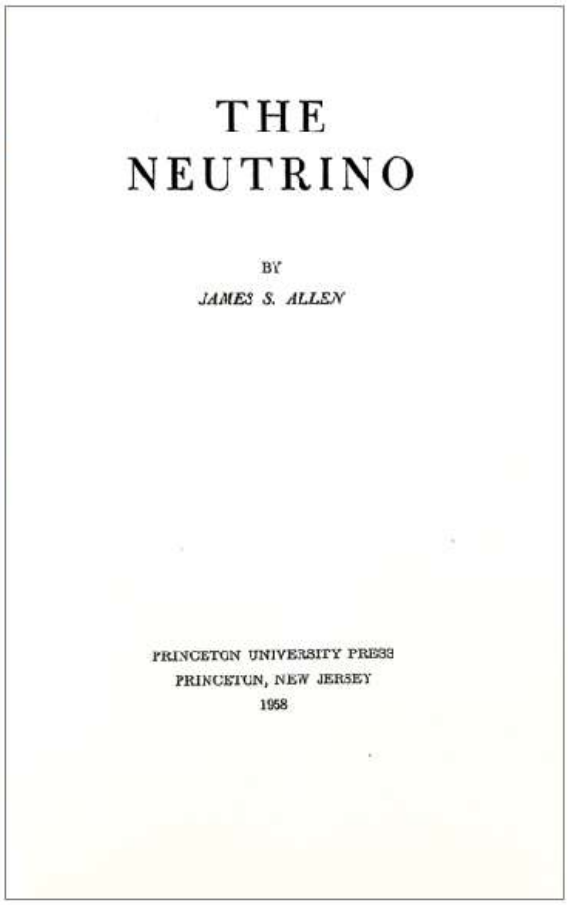


48. **Aligarh Muslim University**. *The Changing Concept of the Universe*. New York: Asia Publishing House, 1963. ¶ *General Education Reading Material Series* no. 15. First edition. 8vo. xii, 108 pp. Figs.; minor ink underlining (p. 38 one word). Pictorial boards; spine ends worn, corner rubbed. Bookplate on title. Very good. Scarce. [S7149] $ 15



49. **ALLAND, Alexander, Jr.** The Human Imperative. New York: Columbia University Press, 1972. ¶ First edition. 8vo. viii, 185 pp. Bibliog., index. Gray cloth, dust jacket. Ownership rubber stamp of M. W. Strickberger. FINE.
S7868 $ 12



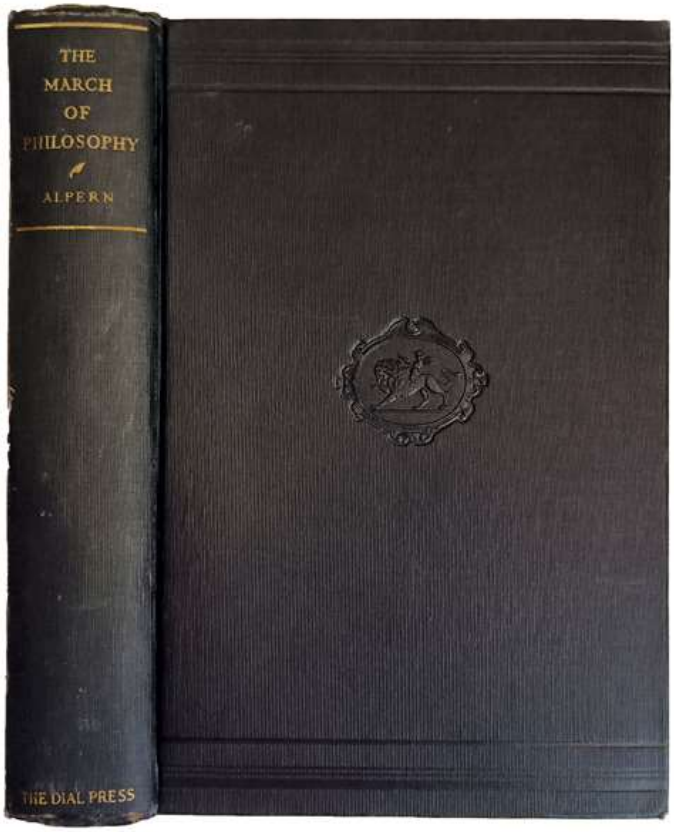

THE
NEUTRINO

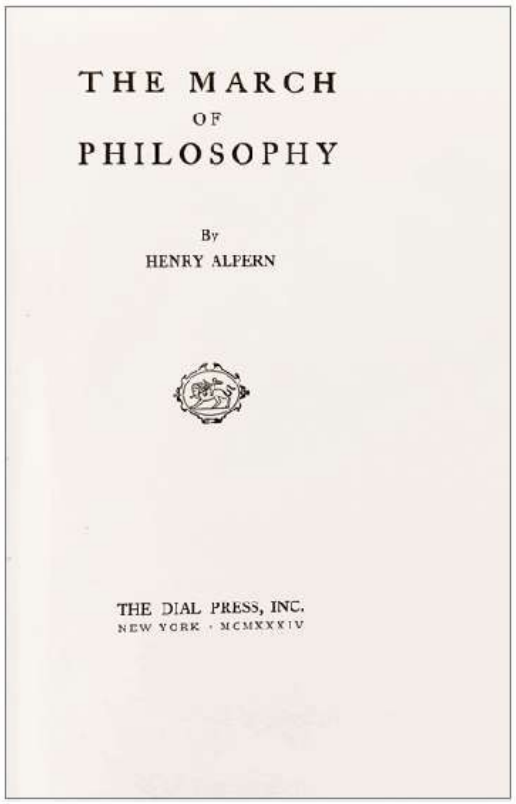
BY
JAMES S. ALLEN

PRINCETON UNIVERSITY PRESS
PRINCETON, NEW JERSEY
1958

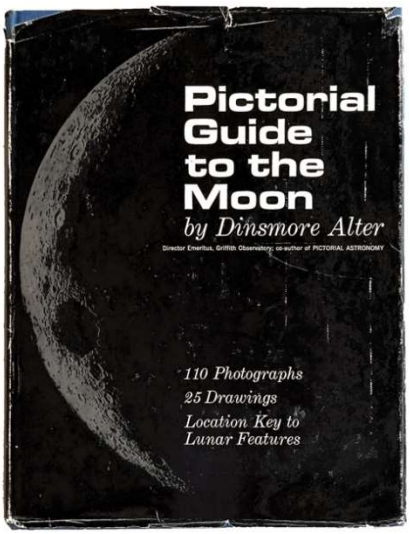
50. **ALLEN, James S**. (1911-1983). *The Neutrino*. Princeton: Princeton University Press, 1958. ¶ 8vo. viii, 168 pp. Figures (including on double-sided plate), diagrams, tables, index. Blue silver-stamped cloth, dust-jacket; extremities lightly rubbed. Ownership ink signature. Very good. [br] S12394 $ 10

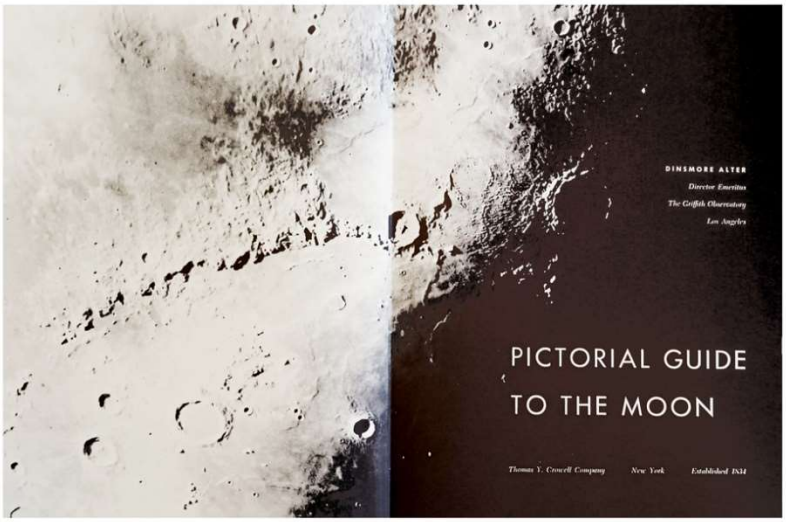
James Sircom Allen was a "Canadian-American physicist who worked at the Massachusetts Institute of Technology and Los Alamos during the Manhattan Project. During World War II, Allen worked first at the Massachusetts Institute of Technology Radiation Lab on the development of radar. In 1943 he moved to Los Alamos, where he worked with gaseous particle detectors and electron multipliers. After the war, he returned to the University of Chicago as an assistant professor. His research focused on measurements of the energy distribution of nuclear recoils and its correlation with the direction of emitted electrons, which helped provide information on the type of weak interactions involved in beta decay. In 1948, Allen moved to the University of Illinois at Urbana-Champaign, where he continued his study of beta decay. Allen stayed at the University of Illinois for twenty-five years." – Atomic Heritage Foundation.





51. **ALPERN, Henry**. *The March of Philosophy*. New York: Dial Press, 1934. ¶ 8vo. xviii, 381 pp. 8 illus, index. Blue cloth, blind-stamped cover ornament, gilt-stamped spine title. Exlib ink stamp. Very good. [S9774] $ 5

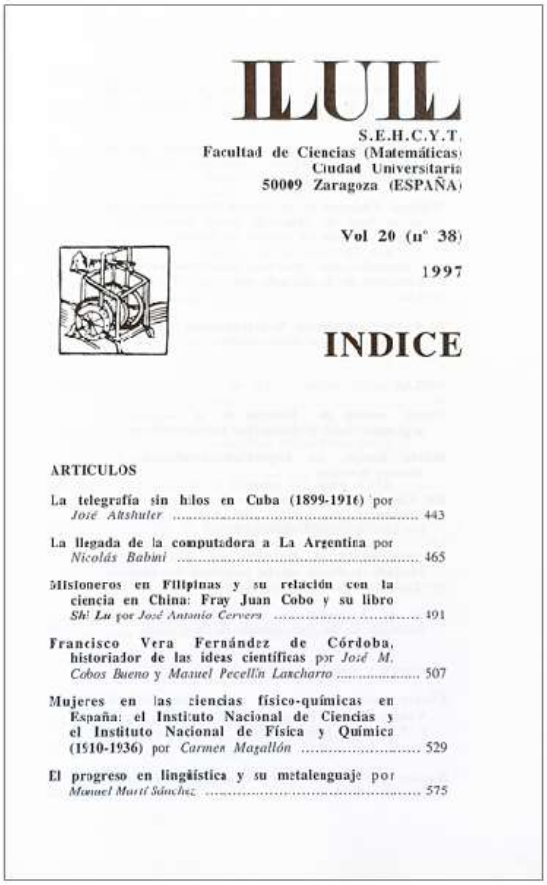




52. **ALTER, Dinsmore** (1888-1968). *Pictorial guide to the moon*. New York: Thomas Y. Crowell, 1963. ¶ 4to. [viii], 183 pp. Double-page title-page photography, numerous figs., tables, glossary, index. Blue cloth, dust-jacket, pictorial end-leaves; jacket lightly worn, else fine. [S5595]

$ 12.95

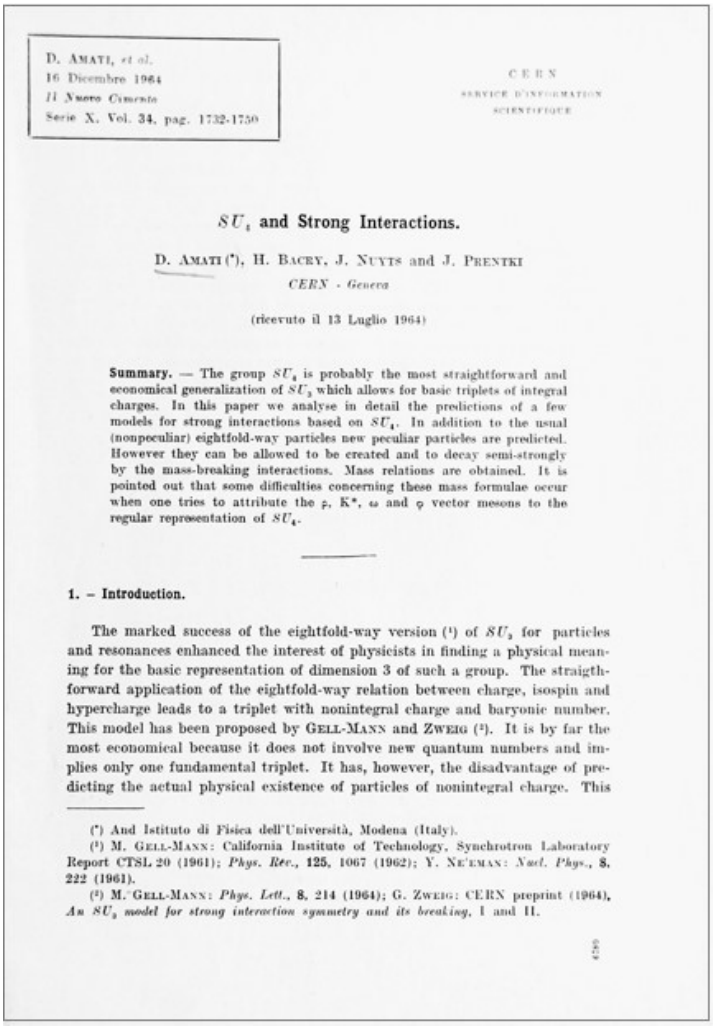
Dinsmore Alter was an American astronomer, meteorologist, and United States Army officer. He is known for his work with the Griffith Observatory and his creation of a lunar atlas. In 1956, he used the 60" reflector at the Mount Wilson Observatory to observe a peculiar obscuration on part of the floor of Alphonsus crater, which brought him worldwide notice. (This is a class of events now called a transient lunar phenomenon.)



53. **ALTSHULER, Jose**. *"La Telegrafia sin Hilos en Cuba (1899-1916)".* Within: *LLULL: Revista de la Sociedad Española de Historia de las Ciencias y de las Tecnicas*. Vol. 20, Nº 38, 1997. [no place]: Sociedad Española de Historia de las Ciencias y de las Tecnicas , 1997. ¶ Article pages 443-463. Full issue: 443-853, viii pp. Illus. Original printed wrappers. Fine. [S11528]

$ 10

Paper on the making of telegraph communications between the US and Cuba circa 1899 and 1916. Other articles include: Babini on the first computers in Argentina in 1960; Cervera on European missionaries coming to the Far East in the 16th century; Bueno & Lancharro on Francisco Vera, the eminent Argentinian historian of science; Magallon on Spanish women of science in physics and chemistry from 1910-1930, and others.



D. AMATI, *et al.*
16 Dicembre 1964
Il Nuovo Cimento
Serie X, Vol. 34, pag. 1732-1750

CERN
SERVICE D'INFORMATION
SCIENTIFIQUE

SU_4 and Strong Interactions.

D. AMATI (*), H. BACRY, J. NUYTS and J. PRENTKI
CERN - Geneva

(ricevuto il 13 Luglio 1964)

Summary. — The group SU_4 is probably the most straightforward and economical generalization of SU_3 which allows for basic triplets of integral charges. In this paper we analyse in detail the predictions of a few models for strong interactions based on SU_4. In addition to the usual (nonpeculiar) eightfold-way particles new peculiar particles are predicted. However they can be allowed to be created and to decay semi-strongly by the mass-breaking interactions. Mass relations are obtained. It is pointed out that some difficulties concerning these mass formulae occur when one tries to attribute the ρ, K*, ω and φ vector mesons to the regular representation of SU_4.

1. – Introduction.

The marked success of the eightfold-way version (1) of SU_3 for particles and resonances enhanced the interest of physicists in finding a physical meaning for the basic representation of dimension 3 of such a group. The straigthforward application of the eightfold-way relation between charge, isospin and hypercharge leads to a triplet with nonintegral charge and baryonic number. This model has been proposed by GELL-MANN and ZWEIG (2). It is by far the most economical because it does not involve new quantum numbers and implies only one fundamental triplet. It has, however, the disadvantage of predicting the actual physical existence of particles of nonintegral charge. This

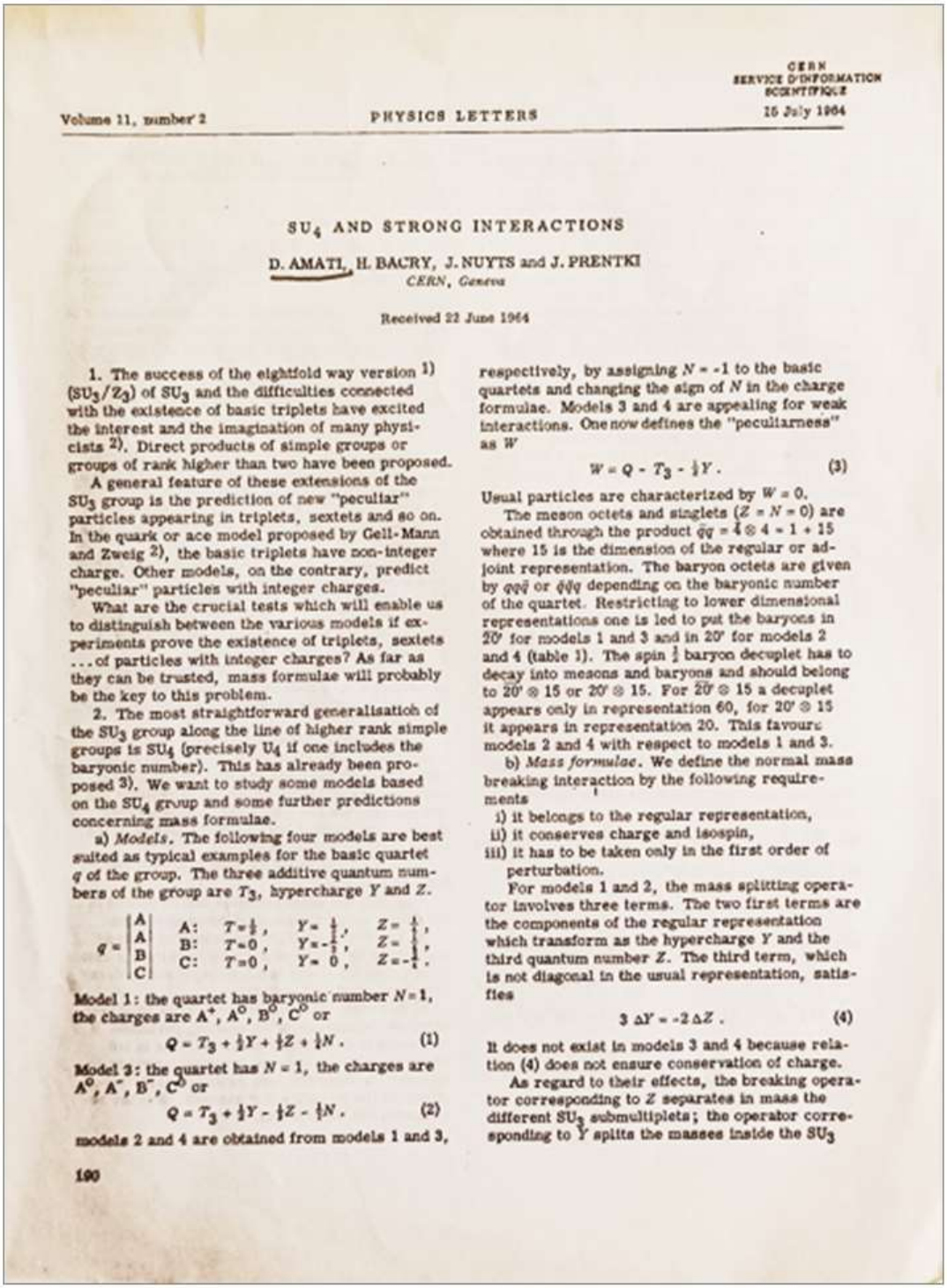
(*) And Istituto di Fisica dell'Università, Modena (Italy).
(1) M. GELL-MANN: California Institute of Technology, Synchrotron Laboratory Report CTSL 20 (1961); *Phys. Rev.*, **125**, 1067 (1962); Y. NE'EMAN: *Nucl. Phys.*, **8**, 222 (1961).
(2) M. GELL-MANN: *Phys. Lett.*, **8**, 214 (1964); G. ZWEIG: CERN preprint (1964), *An SU_3 model for strong interaction symmetry and its breaking*, I and II.

54. **AMATI, Daniele**; **H. BACRY**; **J. NUYTS**; **J. PRENTKI**. *SU_4 and Strong Interactions*. [Rome?]: CERN, Serie X, vol. 34, Dec. 16, 1964. ¶ 8vo. pp. 1732-1750. Self-wraps. Fine. [S7150]

$ 15

Summary. The group SU_4, is probably the most straightforward and economical generalization of SU_3, which allows for basic triplets of integral charges. In this paper we analyse in detail the predictions of a few models for strong interactions based on SU_4. In addition to the usual (nonpeculiar) eightfold-way particles new peculiar particles are predicted. However, they can be allowed to be created and to decay semi-strongly by the mass-breaking interactions. Mass relations are obtained. It is pointed out that some difficulties concerning these mass formulae occur when one tries to attribute the p, K*, w and vector mesons to the regular representation of SU_4.

Amati is a distinguished Italian physicist who spent many influential years at CERN in Geneva.



CERN
SERVICE D'INFORMATION
SCIENTIFIQUE

Volume 11, number 2 PHYSICS LETTERS 15 July 1964

SU_4 AND STRONG INTERACTIONS

D. AMATI, H. BACRY, J. NUYTS and J. PRENTKI
CERN, Geneva

Received 22 June 1964

1. The success of the eightfold way version [1] (SU_3/Z_3) of SU_3 and the difficulties connected with the existence of basic triplets have excited the interest and the imagination of many physicists [2]. Direct products of simple groups or groups of rank higher than two have been proposed.

A general feature of these extensions of the SU_3 group is the prediction of new "peculiar" particles appearing in triplets, sextets and so on. In the quark or ace model proposed by Gell-Mann and Zweig [2], the basic triplets have non-integer charge. Other models, on the contrary, predict "peculiar" particles with integer charges.

What are the crucial tests which will enable us to distinguish between the various models if experiments prove the existence of triplets, sextets ... of particles with integer charges? As far as they can be trusted, mass formulae will probably be the key to this problem.

2. The most straightforward generalisation of the SU_3 group along the line of higher rank simple groups is SU_4 (precisely U_4 if one includes the baryonic number). This has already been proposed [3]. We want to study some models based on the SU_4 group and some further predictions concerning mass formulae.

a) *Models.* The following four models are best suited as typical examples for the basic quartet q of the group. The three additive quantum numbers of the group are T_3, hypercharge Y and Z.

$$q = \begin{vmatrix} A \\ A \\ B \\ C \end{vmatrix} \quad \begin{matrix} A: & T=\frac{1}{2}, & Y=\frac{1}{3}, & Z=\frac{1}{4}, \\ B: & T=0, & Y=-\frac{1}{3}, & Z=\frac{1}{4}, \\ C: & T=0, & Y=0, & Z=-\frac{1}{4}. \end{matrix}$$

Model 1: the quartet has baryonic number $N=1$, the charges are A^+, A^0, B^0, C^0 or

$$Q = T_3 + \tfrac{1}{2}Y + \tfrac{1}{2}Z + \tfrac{1}{2}N. \qquad (1)$$

Model 2: the quartet has $N=1$, the charges are A^0, A^-, B^-, C^0 or

$$Q = T_3 + \tfrac{1}{2}Y - \tfrac{1}{2}Z - \tfrac{1}{2}N. \qquad (2)$$

models 2 and 4 are obtained from models 1 and 3, respectively, by assigning $N=-1$ to the basic quartets and changing the sign of N in the charge formulae. Models 3 and 4 are appealing for weak interactions. One now defines the "peculiarness" as W

$$W = Q - T_3 - \tfrac{1}{2}Y. \qquad (3)$$

Usual particles are characterized by $W=0$.

The meson octets and singlets ($Z=N=0$) are obtained through the product $\bar{q}q = \bar{4} \otimes 4 = 1 + 15$ where 15 is the dimension of the regular or adjoint representation. The baryon octets are given by qqq or $\bar{q}\bar{q}\bar{q}$ depending on the baryonic number of the quartet. Restricting to lower dimensional representations one is led to put the baryons in $\bar{20}'$ for models 1 and 3 and in $20'$ for models 2 and 4 (table 1). The spin $\frac{3}{2}$ baryon decuplet has to decay into mesons and baryons and should belong to $\bar{20}' \otimes 15$ or $20' \otimes 15$. For $\bar{20}' \otimes 15$ a decuplet appears only in representation 60, for $20' \otimes 15$ it appears in representation 20. This favours models 2 and 4 with respect to models 1 and 3.

b) *Mass formulae.* We define the normal mass breaking interaction by the following requirements

i) it belongs to the regular representation,
ii) it conserves charge and isospin,
iii) it has to be taken only in the first order of perturbation.

For models 1 and 2, the mass splitting operator involves three terms. The two first terms are the components of the regular representation which transform as the hypercharge Y and the third quantum number Z. The third term, which is not diagonal in the usual representation, satisfies

$$3\,\Delta Y = -2\,\Delta Z. \qquad (4)$$

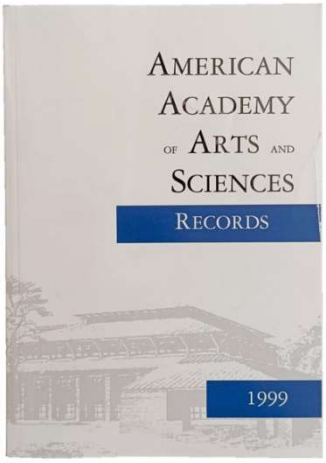
It does not exist in models 3 and 4 because relation (4) does not ensure conservation of charge.

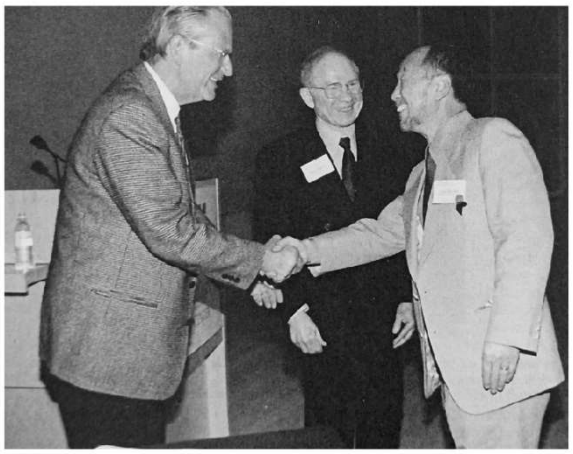
As regard to their effects, the breaking operator corresponding to Z separates in mass the different SU_3 submultiplets; the operator corresponding to Y splits the masses inside the SU_3

55. **AMATI, Daniele**; **H. BACRY**; **J. NUYTS**; **J. PRENTKI**. *"SU_4 and Strong Interactions."* [n.p.]: *Physics Letters*, vol. 11, no. 2, July 15, 1964. ¶ Offprint. Tall 8vo. pp. 190-192. Self-wraps. Very good. [S7151]

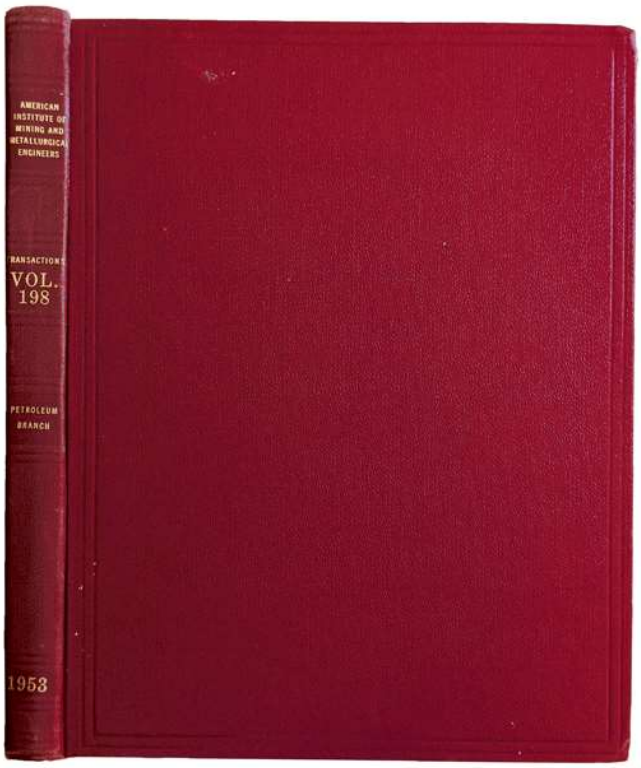
$ 15

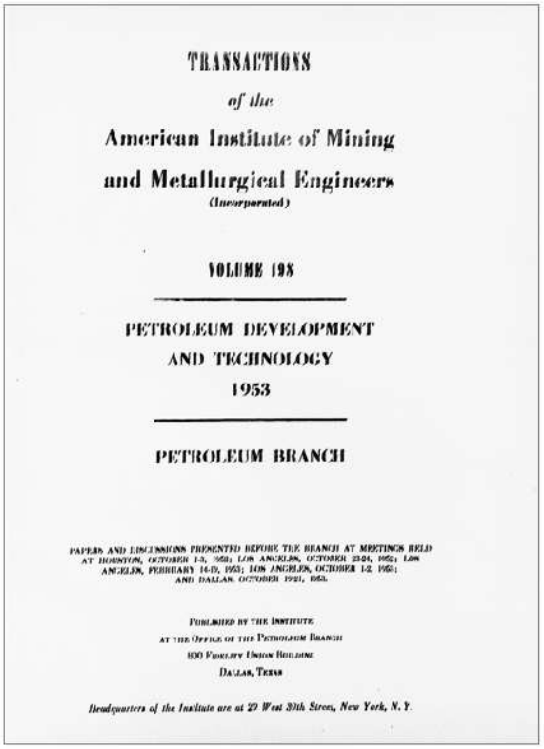
Amati is a distinguished Italian physicist who spent many influential years at CERN in Geneva.





56. **American Academy of Arts and Sciences**. *Records of the Academy, 1999.* Cambridge, MA: American Academy of Arts and Sciences, 1999. ¶ 254 x 179 mm. 8vo. [vi], 154 pp. Illus., lists of members. Printed wrappers. Very good. [S4779] $ 8




TRANSACTIONS
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American Institute of Mining
and Metallurgical Engineers
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VOLUME 198

PETROLEUM DEVELOPMENT
AND TECHNOLOGY
1953

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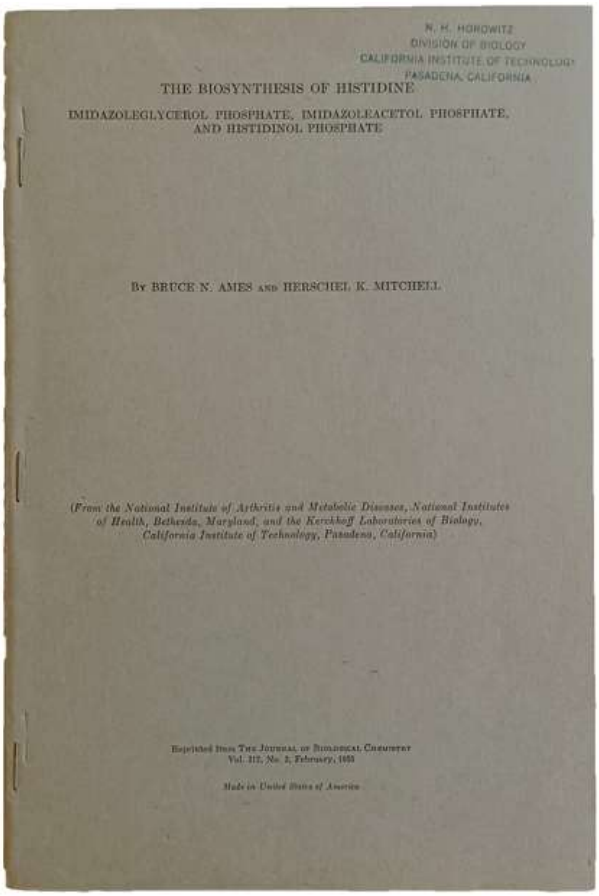
57. **American Institute of Mining and Metallurgical Engineers**. *Petroleum Development and Technology. Petroleum Branch.* Dallas: AIMME, 1953. ¶ Series: *Transactions of the American Institute of Mining and Metallurgical Engineers*, vol. 198. 4to. xi, 344 pp. Illus. throughout. Cloth. Ownership signature. Fine. [S4092]

$ 12

Contains numerous papers on drilling and producing equipment, drilling fluids and cement, electric logging, fluid injection, physical properties, natural gas technology, reservoir engineering, etc.


N. H. HOROWITZ
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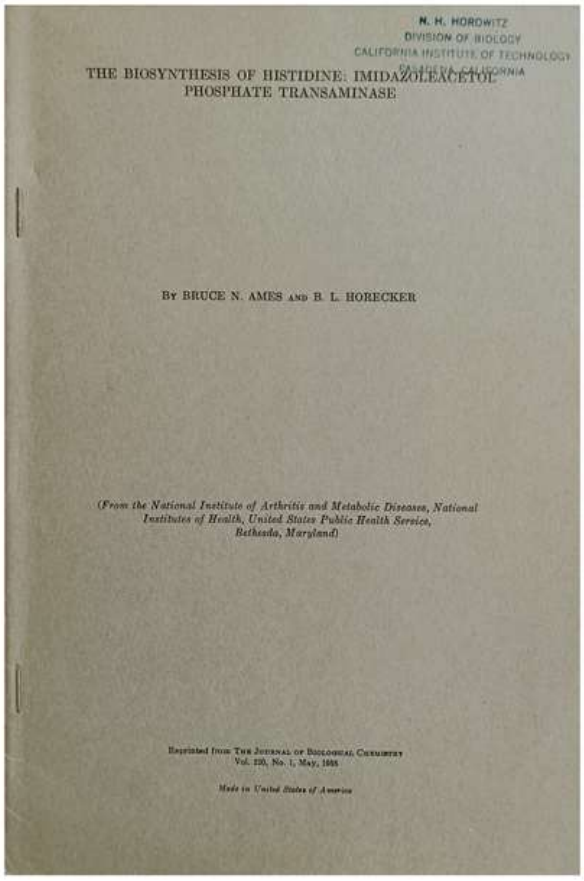
PASADENA, CALIFORNIA

THE BIOSYNTHESIS OF HISTIDINE

IMIDAZOLEGLYCEROL PHOSPHATE, IMIDAZOLEACETOL PHOSPHATE, AND HISTIDINOL PHOSPHATE

BY BRUCE N. AMES AND HERSCHEL K. MITCHELL

(From the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Bethesda, Maryland, and the Kerckhoff Laboratories of Biology, California Institute of Technology, Pasadena, California)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DIVISION OF BIOLOGY
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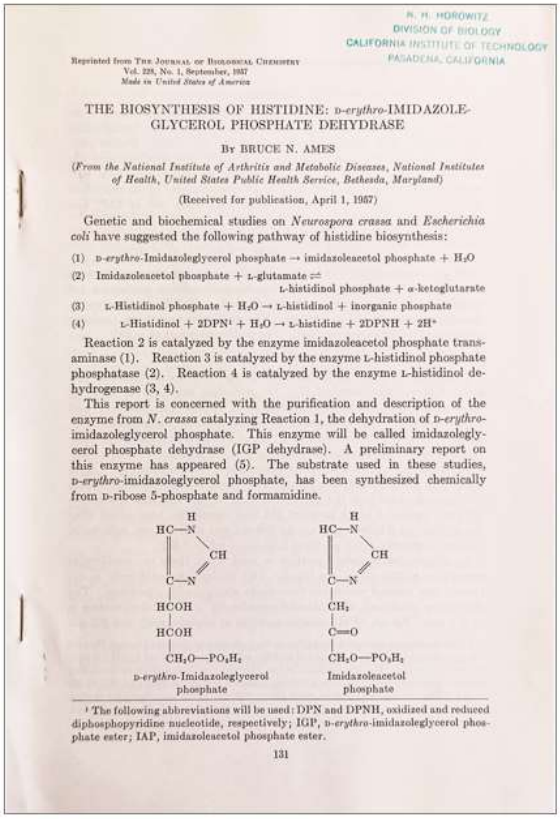
THE BIOSYNTHESIS OF HISTIDINE: IMIDAZOLEACETOL PHOSPHATE TRANSAMINASE

BY BRUCE N. AMES AND B. L. HORECKER

(From the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, United States Public Health Service, Bethesda, Maryland)

58. **AMES, Bruce N**. Group of 4 offprints. Includes: **AMES**, & **Herschel K. MITCHELL**. *"The Biosynthesis of Histidine. Imidazoleglycerol Phosphate, Imidazoleacetol Phosphate, and Histidinol Phosphate."* Offprint from: *Journal of Biological Chemistry*, vol. 212, no. 2. No place: Journal of Biological Chemistry, 1955. ¶ 8vo. 687-696 pp. Figs. Printed wrappers. Ownership rubber stamp of Norman Horowitz. Fine.

WITH: **AMES**, & **B. L. HORECKER**. *"The Biosynthesis of Histidine: Imidazoleacetol Phosphate Transaminase."* Offprint from: *Journal of Biological Chemistry*, vol. 220, no. 1, 1956. 8vo. 113-128 pp. Figs. Printed wrappers. Ownership rubber stamp of Norman Horowitz. Fine.

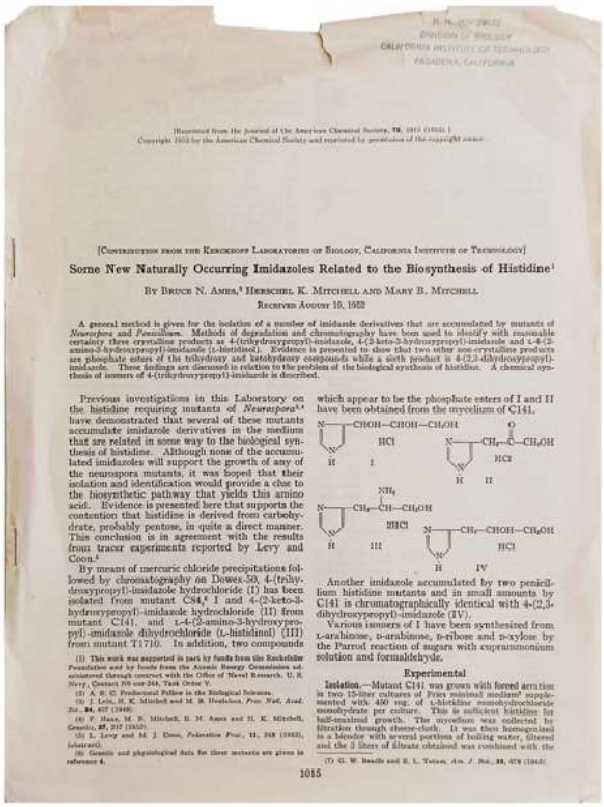


THE BIOSYNTHESIS OF HISTIDINE: D-*erythro*-IMIDAZOLE-GLYCEROL PHOSPHATE DEHYDRASE

By BRUCE N. AMES

(*From the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, United States Public Health Service, Bethesda, Maryland*)

(Received for publication, April 1, 1957)



Some New Naturally Occurring Imidazoles Related to the Biosynthesis of Histidine[1]

By Bruce N. Ames,[2] Herschel K. Mitchell and Mary B. Mitchell

Received August 10, 1953

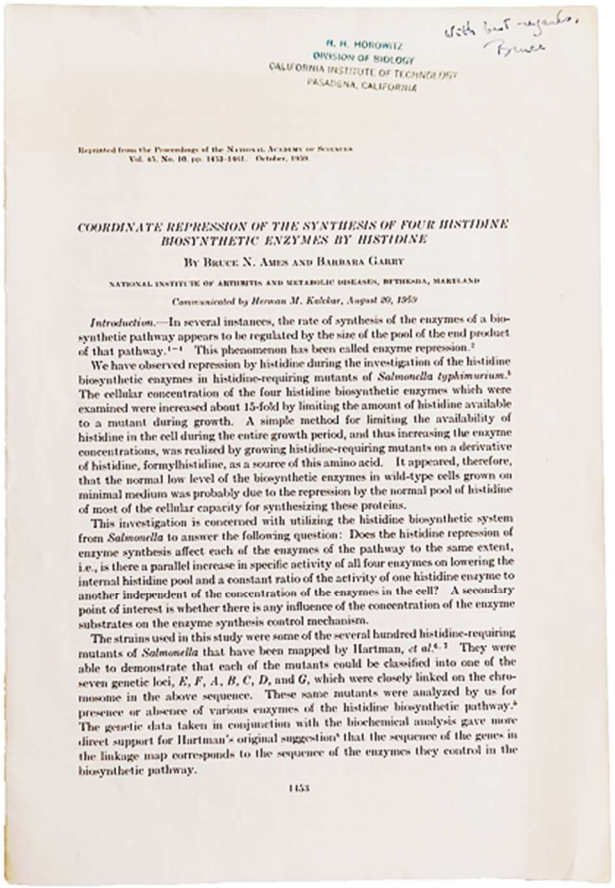
WITH: **AMES**. *"The Biosynthesis of Histidine: D-erythro-Imidazole-Glycerol Phosphate Dehydrase."* Offprint from: *Journal of Biological Chemistry*, vol. 228, no. 1, 1957. 8vo. 131-143 pp. Figs. Self-wraps. Ownership rubber stamp of Norman Horowitz. Fine.

WITH: **AMES**, **Herschel K. MITCHELL**, & **Mary B. MITCHELL**. *"Some New Naturally Occurring Imidazoles Related to the Biosynthesis of Histidine."* Offprint from: *Journal of the American Chemical Society*, 75, 1953. 4to. Single sheet. 1015-1018 pp. Extremities worn. Ownership rubber stamp of Norman Horowitz. Very good. [S7626]

$ 35

"The first comprehensive review of histidine biosynthesis was written by Brenner and B. N. Ames in 1971." These four papers are much earlier studies that lead to his 1971 review. See: Malcolm E. Winkler and Smirla Ramos-Montañez, "Biosynthesis of Histidine," *EcoSal Plus*. 2009 Aug; 3(2): 10.

Ames was associated with the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, United States Public Health Service, Bethesda, & Caltech.



N. H. HOROWITZ
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PASADENA, CALIFORNIA

With best regards,

Reprinted from the Proceedings of the National Academy of Sciences
Vol. 45, No. 10, pp. 1453-1461. October, 1959

COORDINATE REPRESSION OF THE SYNTHESIS OF FOUR HISTIDINE BIOSYNTHETIC ENZYMES BY HISTIDINE

By Bruce N. Ames and Barbara Garry

National Institute of Arthritis and Metabolic Diseases, Bethesda, Maryland

Communicated by Herman M. Kalckar, August 20, 1959

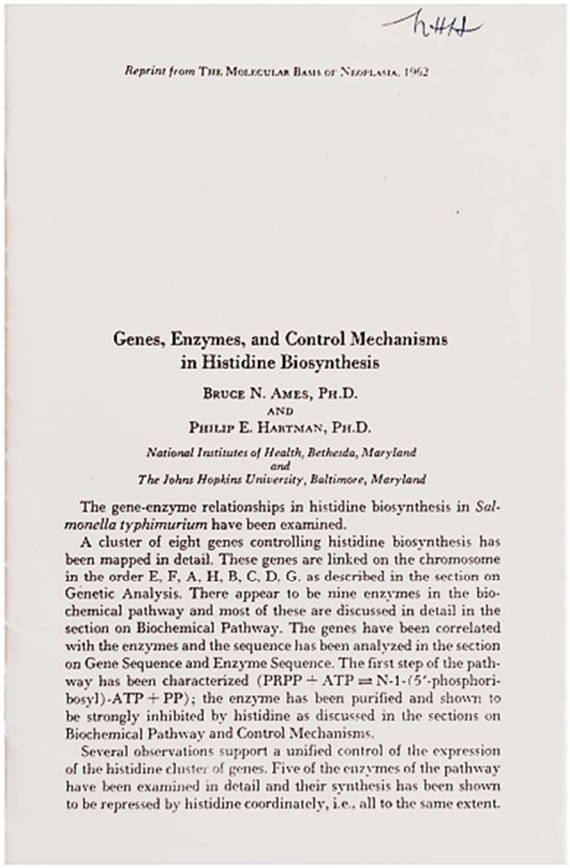
Introduction.—In several instances, the rate of synthesis of the enzymes of a biosynthetic pathway appears to be regulated by the size of the pool of the end product of that pathway.[1-4] This phenomenon has been called enzyme repression.[2]

We have observed repression by histidine during the investigation of the histidine biosynthetic enzymes in histidine-requiring mutants of *Salmonella typhimurium*.[5] The cellular concentration of the four histidine biosynthetic enzymes which were examined were increased about 15-fold by limiting the amount of histidine available to a mutant during growth. A simple method for limiting the availability of histidine in the cell during the entire growth period, and thus increasing the enzyme concentrations, was realized by growing histidine-requiring mutants on a derivative of histidine, formylhistidine, as a source of this amino acid. It appeared, therefore, that the normal low level of the biosynthetic enzymes in wild-type cells grown on minimal medium was probably due to the repression by the normal pool of histidine of most of the cellular capacity for synthesizing these proteins.

This investigation is concerned with utilizing the histidine biosynthetic system from *Salmonella* to answer the following question: Does the histidine repression of enzyme synthesis affect each of the enzymes of the pathway to the same extent, i.e., is there a parallel increase in specific activity of all four enzymes on lowering the internal histidine pool and a constant ratio of the activity of one histidine enzyme to another independent of the concentration of the enzymes in the cell? A secondary point of interest is whether there is any influence of the concentration of the enzyme substrates on the enzyme synthesis control mechanism.

The strains used in this study were some of the several hundred histidine-requiring mutants of *Salmonella* that have been mapped by Hartman, *et al.*[6, 7] They were able to demonstrate that each of the mutants could be classified into one of the seven genetic loci, *E, F, A, B, C, D,* and *G,* which were closely linked on the chromosome in the above sequence. These same mutants were analyzed by us for presence or absence of various enzymes of the histidine biosynthetic pathway.[8] The genetic data taken in conjunction with the biochemical analysis gave more direct support for Hartman's original suggestion[9] that the sequence of the genes in the linkage map corresponds to the sequence of the enzymes they control in the biosynthetic pathway.

1453



Reprint from The Molecular Basis of Neoplasia, 1962

Genes, Enzymes, and Control Mechanisms in Histidine Biosynthesis

Bruce N. Ames, Ph.D.
and
Philip E. Hartman, Ph.D.

National Institutes of Health, Bethesda, Maryland
and
The Johns Hopkins University, Baltimore, Maryland

The gene-enzyme relationships in histidine biosynthesis in *Salmonella typhimurium* have been examined.

A cluster of eight genes controlling histidine biosynthesis has been mapped in detail. These genes are linked on the chromosome in the order E, F, A, H, B, C, D, G, as described in the section on Genetic Analysis. There appear to be nine enzymes in the biochemical pathway and most of these are discussed in detail in the section on Biochemical Pathway. The genes have been correlated with the enzymes and the sequence has been analyzed in the section on Gene Sequence and Enzyme Sequence. The first step of the pathway has been characterized (PRPP + ATP ⇌ N-1-(5′-phosphoribosyl)-ATP + PP); the enzyme has been purified and shown to be strongly inhibited by histidine as discussed in the sections on Biochemical Pathway and Control Mechanisms.

Several observations support a unified control of the expression of the histidine cluster of genes. Five of the enzymes of the pathway have been examined in detail and their synthesis has been shown to be repressed by histidine coordinately, i.e., all to the same extent.

59. **AMES, Bruce N**. Group of 5 papers. Includes: **AMES**, & **Barbara GARRY**. *"Coordinate Repression of the Synthesis of Four Histidine Biosynthetic Enzymes by Histidine."* Offprint from: Proceedings of the National Academy of Sciences, vol. 45, no. 10. No place: National Academy of Sciences, 1959. ¶ 8vo. 1453-1461 pp. Self-wraps. Ownership rubber stamp of Norman Horowitz. INSCRIBED BY AMES. Fine. [S8457]

WITH: **AMES**, & **Philip E. HARTMAN**. *"Genes, Enzymes, and Control Mechanisms in Histidine Biosynthesis."* Offprint from: The Molecular Basis of Neoplasia, 1962. 8vo. 323-345 pp. Figs. Self-wraps.

$ 45

Ames was associated with the National Institute of Arthritis and Metabolic Diseases, Bethesda. Some of the papers bear the rubber stamp or signature of Pioneer Caltech geneticist Norman Horowitz. Full list available on request.

P.N.A.S. 1
in press

Detection of carcinogens as mutagens in the Salmonella/microsone test: Assay of 300 chemicals. Part II

(prevention of cancer & genetic defects/somatic mutation/environmental insult to DNA)

Joyce McCann and Bruce N. Ames

Department of Biochemistry
University of California
Berkeley, California 94720

Contributed by Bruce N. Ames, Jan. 5, 1976

Medical Sciences

Abbreviations: bold faced symbols (e.g. B21) refer to table in Part I.

2

ABSTRACT

About 300 carcinogens and non-carcinogens of a wide variety of chemical types have been tested for mutagenicity in the simple Salmonella/microsome test. The test uses bacteria as sensitive indicators of DNA damage, and mammalian liver extracts for metabolic conversion of carcinogens to their active mutagenic forms. There is a high correlation between carcinogenicity and mutagenicity: 90% (157/175) of the carcinogens were mutagenic in the test including almost all of the known human carcinogens that were tested. Despite the severe limitations inherent in defining non-carcinogenicity, few "non-carcinogens" showed any degree of mutagenicity. Carcinogens negative in the test and apparent false positives are discussed. We also discuss evidence that it is damage to DNA by environmental chemicals and radiation that is likely to initiate most human cancer and genetic defects. The Salmonella test can play a central role in a program of prevention: to identify mutagenic chemicals in the environment (all indications are there are many) and to aid in the development of non-mutagenic products to prevent future human exposure.

in Screening Tests in Chemical Carcinogenesis, eds. Montesano, R Bartsch, H. & Tomatis, L. (IARC, Lyon) (1975) in press.

Paper given at IARC meeting in Brussels, Belgium, June 1975

CARCINOGENS ARE MUTAGENS: A SIMPLE TEST SYSTEM

Bruce N. Ames and Joyce McCann

Biochemistry Department
University of California
Berkeley, California 94720

Science and the Law, Peter Huber, Ed.

July 25, 1990

ENVIRONMENTAL POLLUTION AND CANCER: SOME MISCONCEPTIONS

BRUCE N. AMES and LOIS SWIRSKY GOLD

Division of Biochemistry and Molecular Biology
Barker Hall
University of California
Berkeley, California 94720

Professor Ames is Director, N.I.E.H.S. Environmental Health Sciences Center, University of California, Berkeley, and was formerly on the board of directors of the National Cancer Institute (National Cancer Advisory Board). He is a member of the National Academy of Sciences. He was the recipient of the most prestigious award for cancer research, the General Motors Cancer Research Foundation Prize (1983), and of the highest award in environmental achievement, the Tyler Prize (1985). He has been elected to the Royal Swedish Academy of Sciences and the Japan Cancer Association. His 250 scientific publications have resulted in his being the 23rd most-cited scientist (in all fields)(1973-1984), and the 53rd most cited (1961-1976).

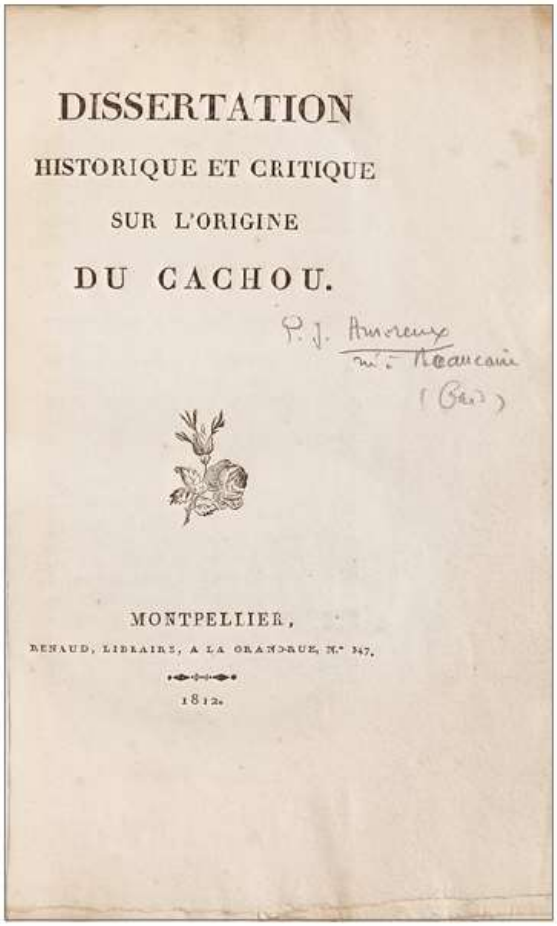
Dr. Gold is a staff scientist at the Lawrence Berkeley Laboratory and is the Director of the Carcinogenic Potency Project. She is on the Panel of Expert Reviewers which evaluates rodent carcinogenesis studies for the National Toxicology Program.

The public has numerous misconceptions about the relationship between environmental pollution and human cancer. Underlying these misconceptions is an erroneous belief that nature is benign. Below we highlight 8 of these misconceptions and describe the scientific information that undermines each one.

MISCONCEPTION No. 1: CANCER RATES ARE SOARING

Cancer death rates in the United States (after adjusting the rates for age and smoking) are staying steady or decreasing. According to the latest update from the National Cancer Institute (Feb. 1988), "the age adjusted mortality rate for all cancers combined except lung cancer has been declining since 1950 for all individual age groups except 85 and above." (That represents a 13-percent decrease overall, 44,000 deaths below expected, and a 0.1-percent increase in the over-85 group.)

The types of cancer deaths that have been decreasing during this period are primarily stomach (by 75 percent, 37,000 deaths below expected), cervical (by 73 percent, 11,000



60. **AMOREUX, Pierre Joseph** (1741-1824). *Dissertation Historique et Critique sur l'Origine du Cachou.* Montpellier: Renaud, 1812. ¶ 8vo. (224 x 147 mm) 56 pp. Uncut, wide margins, author's signature on the title-page. Pale red paper wrappers; some sun-fading to covers, spine chipped, pencil marking on cover. SIGNED PRESENTATION COPY. Very good. S8806

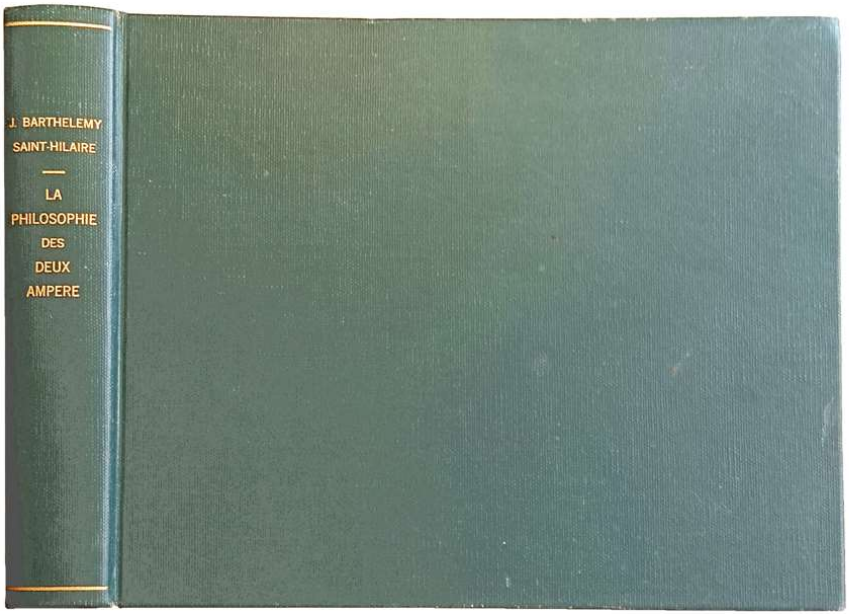
$ 135

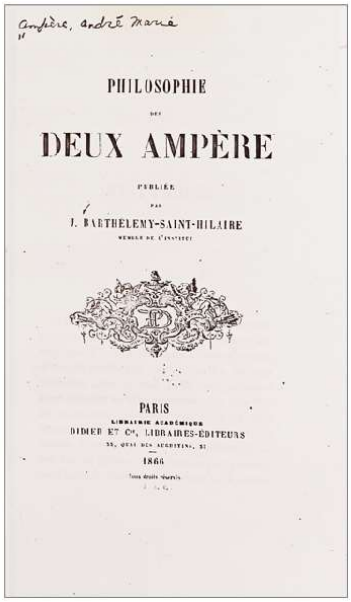
FIRST EDITION of this rare monograph on catechu, an extract of acacia and several other genus used in dyeing, tanning, manufacture of fibrous substances, and pharmacy. The author seeks to discover who first identified it and where it was first put to various uses. Catechu (also known as cutch, or cashoo) is an extract of any of several species of Acacia – but especially Acacia catechu – produced by boiling the wood in water and evaporating the resulting brew. The extract is an astringent and has been used since ancient times. When called cutch, it is a brown dye used for tanning and dyeing and for preserving fishnets and sails. [Wikip.]

Dr. Pierre Joseph Amoreux was librarian of the medical school in Montpellier, where he published a great number of works on medicine, natural history and

agriculture, including one of the earliest monographs on the cultivation of the olive tree. Wikip., "catechu".

□ NUC cites one copy at Harvard.

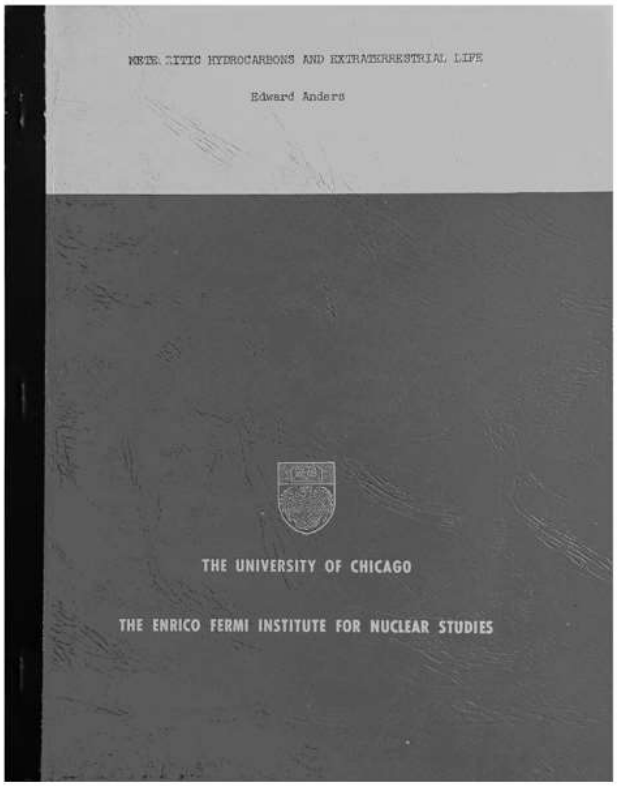


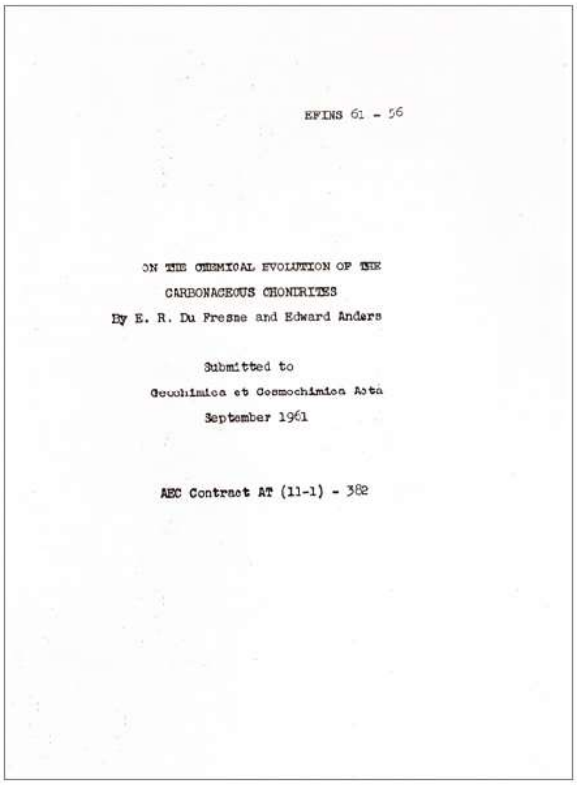


61. **[AMPERE, André-Marie** (1775-1836)**] J. Barthélemy SAINT-HILAIRE** (1805-1895). *Philosophie des Deux Ampère*. [no location: n.d., c. 1970s]. ¶ Facsimile reprint photocopy of 1866 edition (Paris: Didier, 1866). Oblong 8vo. xix, 461 pp. Green cloth, gilt-stamped spine. Very good. [S11024]

$ 20

Jules Barthelemy Saint-Hilaire, French philosopher, journalist, statesman, and possible illegitimate son of Napoleon I of France.




EFINS 61 - 56

ON THE CHEMICAL EVOLUTION OF THE
CARBONACEOUS CHONDRITES
By E. R. Du Fresne and Edward Anders

Submitted to
Geochimica et Cosmochimica Acta
September 1961

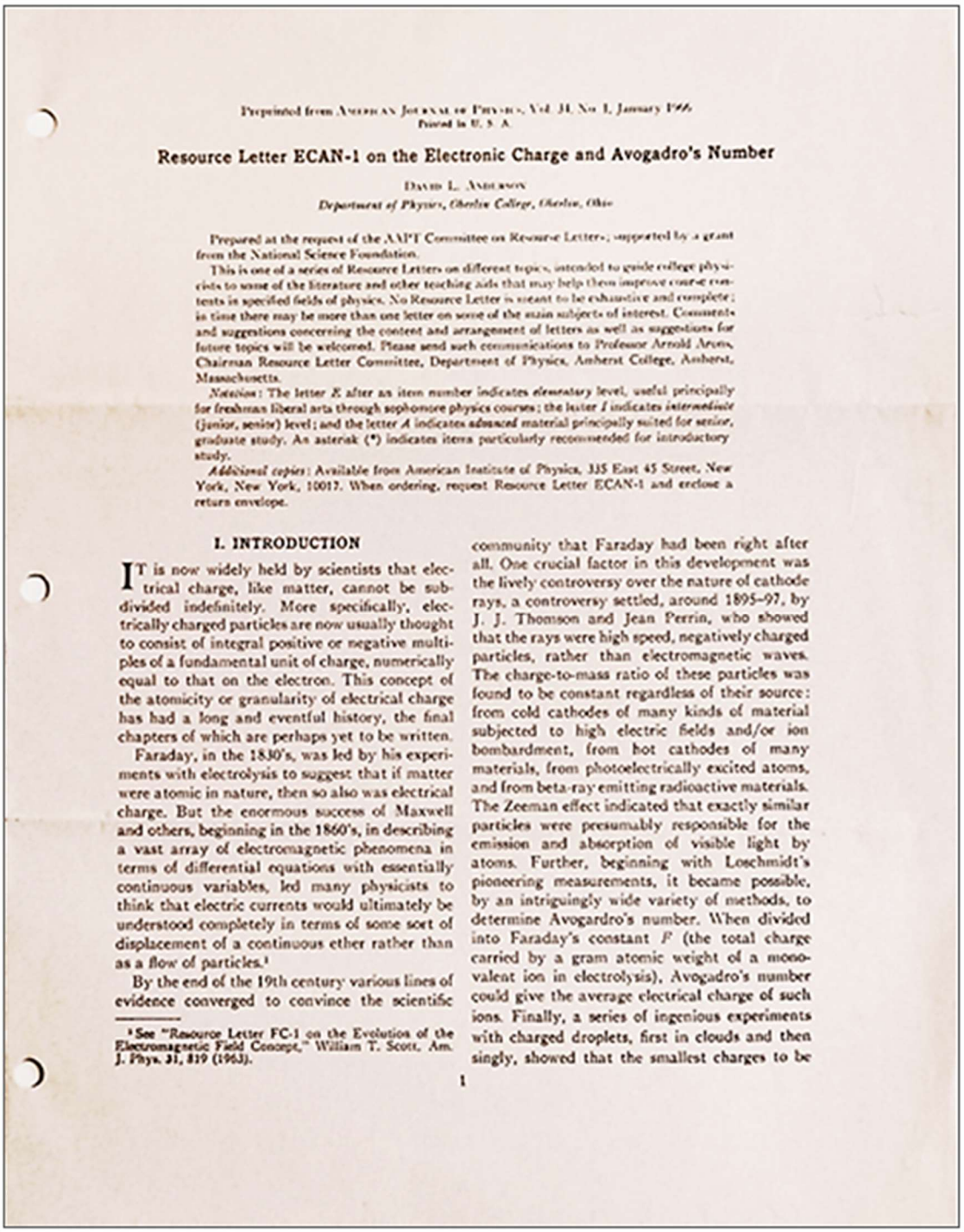
AEC Contract AT (11-1) - 382

62. **ANDERS, Edward**. Group of 8 papers. Includes: **ANDERS**, & **E. R. DU FRESNE**. *"On the Chemical Evolution of the Carbonaceous Chondrites."* No place: Paper submitted to: *Geochimica et Cosmochimica Acta,* Sept. 1961. ¶ 4to. 66 pp. Tables, figs. Printed wrappers of the University of Chicago, Enrico Fermi Institute for Nuclear Studies. FINE. [S7872]

$ 45

WITH: **ANDERS**, & **John W. LARIMER**. *"Chemical Fractionations in Meteorites. II. Abundance Patterns and Their Interpretation."* Paper submitted to: *Geochimica et Cosmochimica Acta*, Jan. 1967. ¶ 4to. 70 pp. Tables, figs. Printed wrappers of the University of Chicago, Enrico Fermi Institute for Nuclear Studies.

Full list available on request.



Preprinted from American Journal of Physics, Vol. 34, No. 1, January 1966
Printed in U. S. A.

Resource Letter ECAN-1 on the Electronic Charge and Avogadro's Number

David L. Anderson
Department of Physics, Oberlin College, Oberlin, Ohio

Prepared at the request of the AAPT Committee on Resource Letters, supported by a grant from the National Science Foundation.

This is one of a series of Resource Letters on different topics, intended to guide college physicists to some of the literature and other teaching aids that may help them improve course contents in specified fields of physics. No Resource Letter is meant to be exhaustive and complete; in time there may be more than one letter on some of the main subjects of interest. Comments and suggestions concerning the content and arrangement of letters as well as suggestions for future topics will be welcomed. Please send such communications to *Professor* Arnold Arons, Chairman Resource Letter Committee, Department of Physics, Amherst College, Amherst, Massachusetts.

Notation: The letter *E* after an item number indicates *elementary* level, useful principally for freshman liberal arts through sophomore physics courses; the letter *I* indicates *intermediate* (junior, senior) level; and the letter *A* indicates *advanced* material principally suited for senior, graduate study. An asterisk (*) indicates items particularly recommended for introductory study.

Additional copies: Available from American Institute of Physics, 335 East 45 Street, New York, New York, 10017. When ordering, request Resource Letter ECAN-1 and enclose a return envelope.

I. INTRODUCTION

IT is now widely held by scientists that electrical charge, like matter, cannot be subdivided indefinitely. More specifically, electrically charged particles are *now* usually thought to consist of integral positive or negative multiples of a fundamental unit of charge, numerically equal to that on the electron. This concept of the atomicity or granularity of electrical charge has had a long and eventful history, the final chapters of which are perhaps yet to be written.

Faraday, in the 1830's, was led by his experiments with electrolysis to suggest that if matter were atomic in nature, then so also was electrical charge. But the enormous success of Maxwell and others, beginning in the 1860's, in describing a vast array of electromagnetic phenomena in terms of differential equations with essentially continuous variables, led many physicists to think that electric currents would ultimately be understood completely in terms of some sort of displacement of a continuous ether rather than as a flow of particles.[1]

By the end of the 19th century various lines of evidence converged to convince the scientific community that Faraday had been right after all. One crucial factor in this development was the lively controversy over the nature of cathode rays, a controversy settled, around 1895–97, by J. J. Thomson and Jean Perrin, who showed that the rays were high speed, negatively charged particles, rather than electromagnetic waves. The charge-to-mass ratio of these particles was found to be constant regardless of their source: from cold cathodes of many kinds of material subjected to high electric fields and/or ion bombardment, from hot cathodes of many materials, from photoelectrically excited atoms, and from beta-ray emitting radioactive materials. The Zeeman effect indicated that exactly similar particles were presumably responsible for the emission and absorption of visible light by atoms. Further, beginning with Loschmidt's pioneering measurements, it became possible, by an intriguingly wide variety of methods, to determine Avogadro's number. When divided into Faraday's constant *F* (the total charge carried by a gram atomic weight of a monovalent ion in electrolysis), Avogadro's number could give the average electrical charge of such ions. Finally, a series of ingenious experiments with charged droplets, first in clouds and then singly, showed that the smallest charges to be

[1] See "Resource Letter FC-1 on the Evolution of the Electromagnetic Field Concept," William T. Scott, Am. J. Phys. 31, 819 (1963).

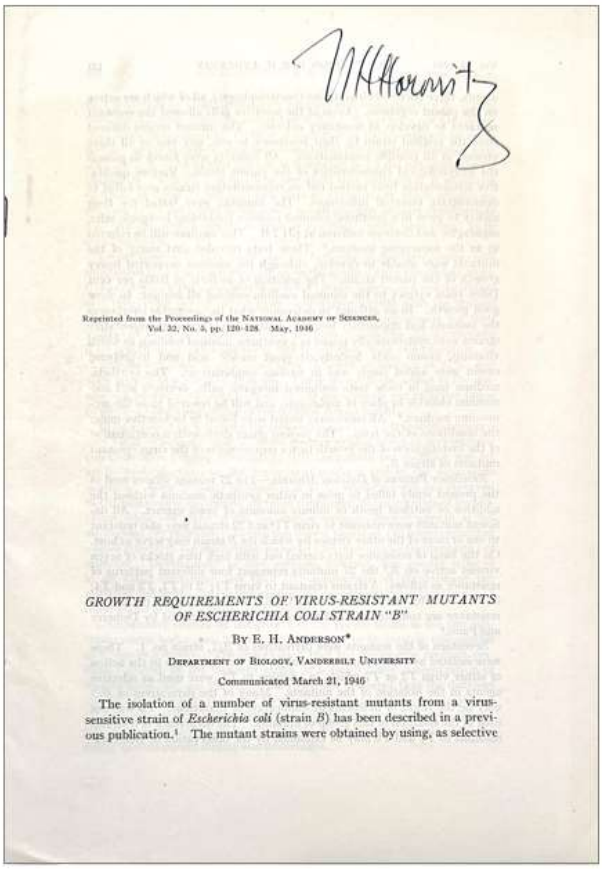
1

63. **ANDERSON David L.** (1919-1996). *"Resource Letter ECAN-1 on the Electronic Charge and Avogadro's Number."* Preprint from American Journal of Physics, vol. 34, no. 1, Jan. 1966. No place: American Journal of Physics, 1966. ¶ 4to. Self-wraps; creased, 3-holed punched. Very good. [S7152]

$ 15

David Leonard Anderson was with and Dept. of Physics, Oberlin College. He was an American physicist who worked on the Manhattan Project at Los Alamos and in

the Pacific. "Anderson . . . returned to study physics at Harvard, receiving his M.A. in 1947 and his Ph.D. in 1950. In 1948, he joined the Department of Physics at Oberlin College, where he was a professor until 1984. From 1963 to 1972, he was the chair of the department. He authored several books, including *The Discovery of the Electron* and *The Discovery of Nuclear Fission*, and a number of articles in scientific journals." – Atomic Heritage Foundation.



Reprinted from the Proceedings of the National Academy of Sciences,
Vol. 32, No. 5, pp. 120-128 May, 1946

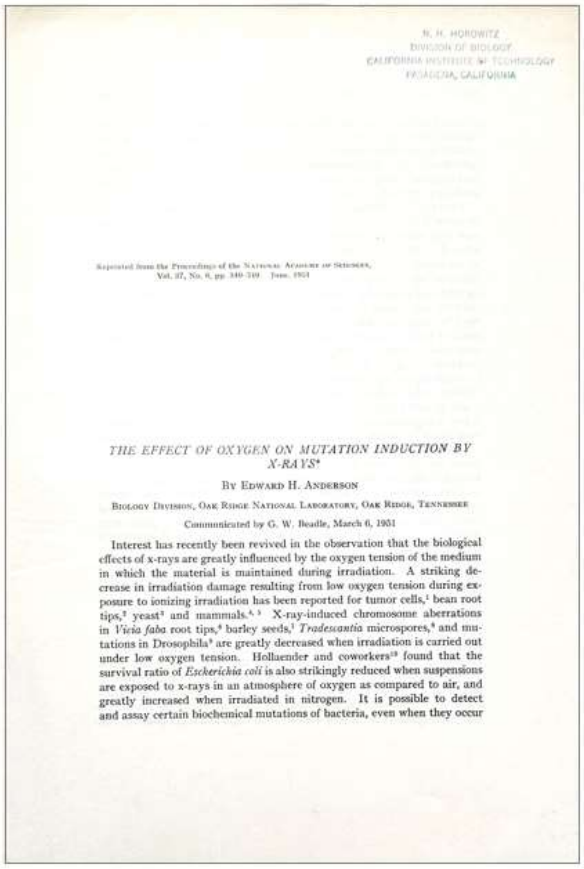
GROWTH REQUIREMENTS OF VIRUS-RESISTANT MUTANTS OF ESCHERICHIA COLI STRAIN "B"

By E. H. Anderson*

Department of Biology, Vanderbilt University

Communicated March 21, 1946

The isolation of a number of virus-resistant mutants from a virus-sensitive strain of *Escherichia coli* (strain *B*) has been described in a previous publication.[1] The mutant strains were obtained by using, as selective



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

Reprinted from the Proceedings of the National Academy of Sciences,
Vol. 37, No. 6, pp. 340-349 June, 1951

THE EFFECT OF OXYGEN ON MUTATION INDUCTION BY X-RAYS*

By Edward H. Anderson

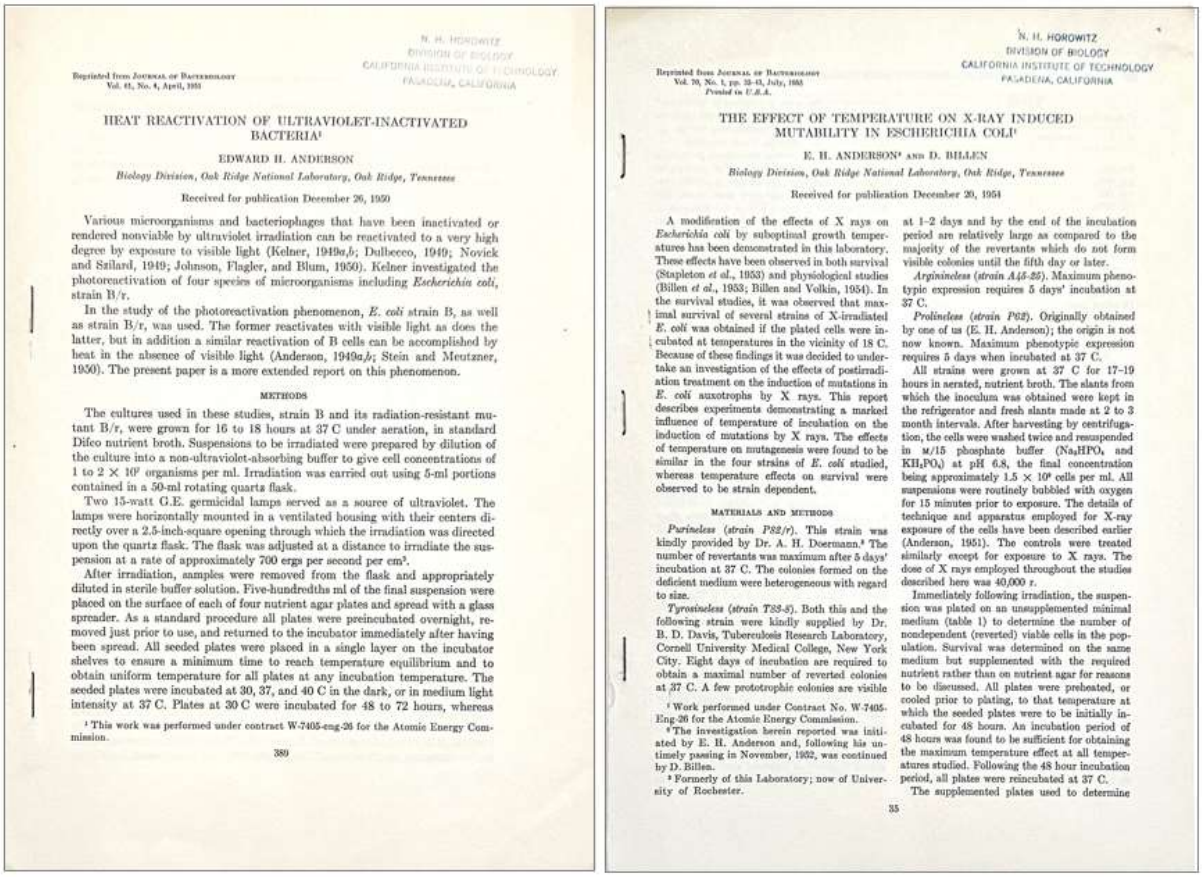
Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Communicated by G. W. Beadle, March 6, 1951

Interest has recently been revived in the observation that the biological effects of x-rays are greatly influenced by the oxygen tension of the medium in which the material is maintained during irradiation. A striking decrease in irradiation damage resulting from low oxygen tension during exposure to ionizing irradiation has been reported for tumor cells,[1] bean root tips,[2] yeast[3] and mammals.[4, 5] X-ray-induced chromosome aberrations in *Vicia faba* root tips,[6] barley seeds,[7] *Tradescantia* microspores,[8] and mutations in Drosophila[9] are greatly decreased when irradiation is carried out under low oxygen tension. Hollaender and coworkers[10] found that the survival ratio of *Escherichia coli* is also strikingly reduced when suspensions are exposed to x-rays in an atmosphere of oxygen as compared to air, and greatly increased when irradiated in nitrogen. It is possible to detect and assay certain biochemical mutations of bacteria, even when they occur

64. **ANDERSON, E. H.** [Edward H.] [Group of 4 offprints]. Includes: **ANDERSON**. *"Growth Requirements of Virus-Resistant Mutants of Escherichia Coli Strain 'B'."* Offprint from: *Proc. Nat. Acad. Sci.,* vol. 32, no. 5, 1946. No place: National Academy of Sciences, 1946. ¶ 8vo. 120-128 pp. Self-wraps. Ownership signature of Norman Horowitz. FINE.

WITH: **ANDERSON**. *"The Effect of Oxygen on Mutation Induction by X-Rays."* Offprint from: *Proc. Nat. Acad. Sci.*, vol. 37, no. 6, 1951. 8vo. 340-349 pp. Figs. Self-wraps.



HEAT REACTIVATION OF ULTRAVIOLET-INACTIVATED BACTERIA[1]

EDWARD H. ANDERSON

Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Received for publication December 26, 1950

THE EFFECT OF TEMPERATURE ON X-RAY INDUCED MUTABILITY IN ESCHERICHIA COLI[1]

E. H. ANDERSON[2] AND D. BILLEN[3]

Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

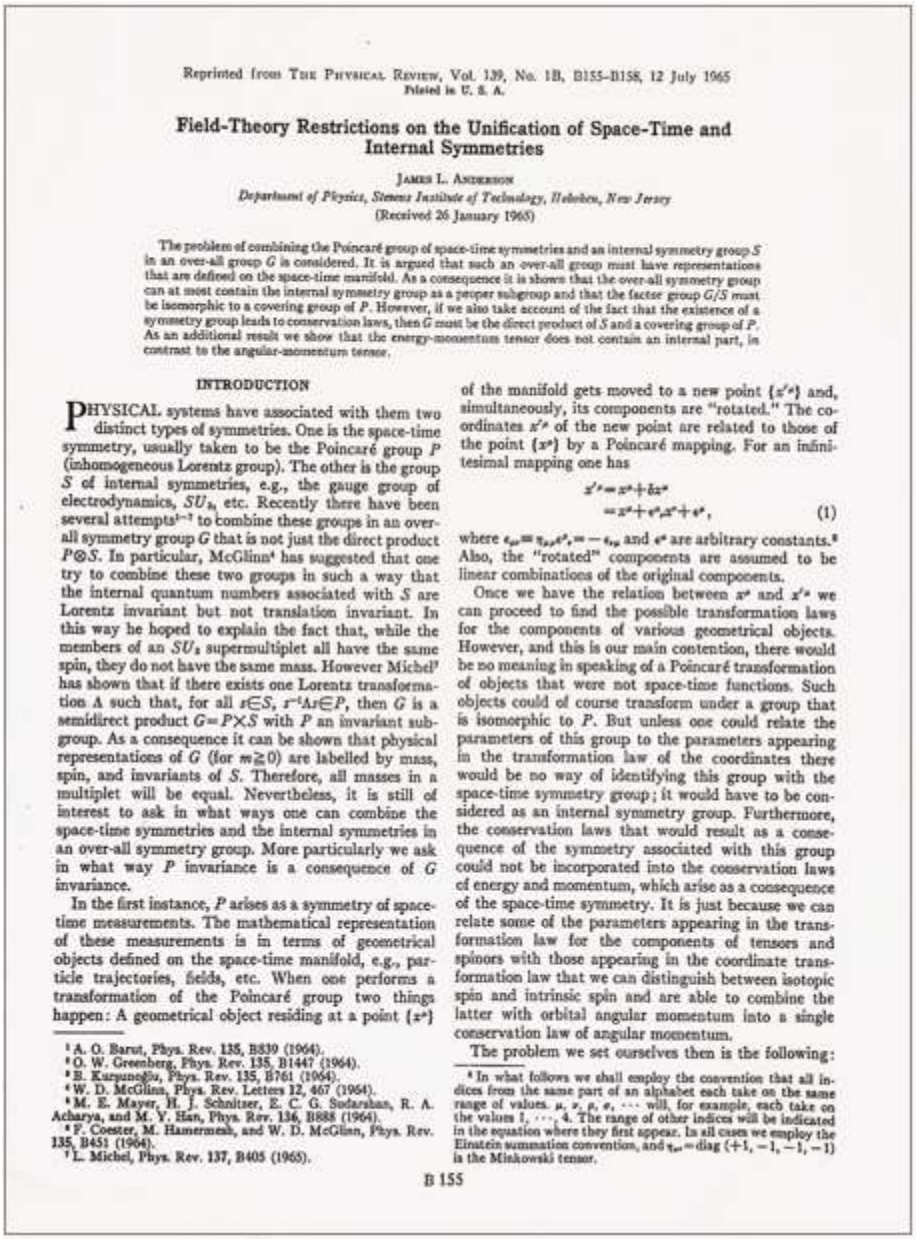
Received for publication December 20, 1954

WITH: **ANDERSON**. *"Heat Reactivation of Ultraviolet-Inactivated Bacteria."* Offprint from: *Journal of Bacteriology*, vol. 61, no. 4, 1951. 8vo. 389-394 pp. Self-wraps.

WITH: **ANDERSON**, & **D. BILLEN**. *"The Effect of Temperature on X-Ray Induced Mutability in Escherichia Coli."* Offprint from: *Journal of Bacteriology*, vol. 70, no. 1, 1955. 8vo. 35-43 pp. Figs. Self-wraps. All of the papers bear the rubber stamp or signature of pioneer Caltech geneticist Norman Horowitz. [S8203]

$ 40

Edward H. Anderson was associated with the Biology Division, Oak Ridge National Laboratory.



Reprinted from THE PHYSICAL REVIEW, Vol. 139, No. 1B, B155–B158, 12 July 1965
Printed in U. S. A.

Field-Theory Restrictions on the Unification of Space-Time and Internal Symmetries

JAMES L. ANDERSON
Department of Physics, Stevens Institute of Technology, Hoboken, New Jersey
(Received 26 January 1965)

The problem of combining the Poincaré group of space-time symmetries and an internal symmetry group S in an over-all group G is considered. It is argued that such an over-all group must have representations that are defined on the space-time manifold. As a consequence it is shown that the over-all symmetry group can at most contain the internal symmetry group as a proper subgroup and that the factor group G/S must be isomorphic to a covering group of P. However, if we also take account of the fact that the existence of a symmetry group leads to conservation laws, then G must be the direct product of S and a covering group of P. As an additional result we show that the energy-momentum tensor does not contain an internal part, in contrast to the angular-momentum tensor.

INTRODUCTION

PHYSICAL systems have associated with them two distinct types of symmetries. One is the space-time symmetry, usually taken to be the Poincaré group P (inhomogeneous Lorentz group). The other is the group S of internal symmetries, e.g., the gauge group of electrodynamics, SU_3, etc. Recently there have been several attempts[1–7] to combine these groups in an over-all symmetry group G that is not just the direct product $P\otimes S$. In particular, McGlinn[4] has suggested that one try to combine these two groups in such a way that the internal quantum numbers associated with S are Lorentz invariant but not translation invariant. In this way he hoped to explain the fact that, while the members of an SU_3 supermultiplet all have the same spin, they do not have the same mass. However Michel[7] has shown that if there exists one Lorentz transformation Λ such that, for all $s\in S$, $s^{-1}\Lambda s\in P$, then G is a semidirect product $G=P\times S$ with P an invariant subgroup. As a consequence it can be shown that physical representations of G (for $m\geq 0$) are labelled by mass, spin, and invariants of S. Therefore, all masses in a multiplet will be equal. Nevertheless, it is still of interest to ask in what ways one can combine the space-time symmetries and the internal symmetries in an over-all symmetry group. More particularly we ask in what way P invariance is a consequence of G invariance.

In the first instance, P arises as a symmetry of space-time measurements. The mathematical representation of these measurements is in terms of geometrical objects defined on the space-time manifold, e.g., particle trajectories, fields, etc. When one performs a transformation of the Poincaré group two things happen: A geometrical object residing at a point $\{x^\mu\}$ of the manifold gets moved to a new point $\{x'^\mu\}$ and, simultaneously, its components are "rotated." The coordinates x'^μ of the new point are related to those of the point $\{x^\mu\}$ by a Poincaré mapping. For an infinitesimal mapping one has

$$x'^\mu = x^\mu + \delta x^\mu = x^\mu + \epsilon^\mu{}_\nu x^\nu + \epsilon^\mu, \tag{1}$$

where $\epsilon_{\mu\nu}\equiv\eta_{\mu\rho}\epsilon^\rho{}_\nu = -\epsilon_{\nu\mu}$ and ϵ^μ are arbitrary constants.[8] Also, the "rotated" components are assumed to be linear combinations of the original components.

Once we have the relation between x^μ and x'^μ we can proceed to find the possible transformation laws for the components of various geometrical objects. However, and this is our main contention, there would be no meaning in speaking of a Poincaré transformation of objects that were not space-time functions. Such objects could of course transform under a group that is isomorphic to P. But unless one could relate the parameters of this group to the parameters appearing in the transformation law of the coordinates there would be no way of identifying this group with the space-time symmetry group; it would have to be considered as an internal symmetry group. Furthermore, the conservation laws that would result as a consequence of the symmetry associated with this group could not be incorporated into the conservation laws of energy and momentum, which arise as a consequence of the space-time symmetry. It is just because we can relate some of the parameters appearing in the transformation law for the components of tensors and spinors with those appearing in the coordinate transformation law that we can distinguish between isotopic spin and intrinsic spin and are able to combine the latter with orbital angular momentum into a single conservation law of angular momentum.

The problem we set ourselves then is the following:

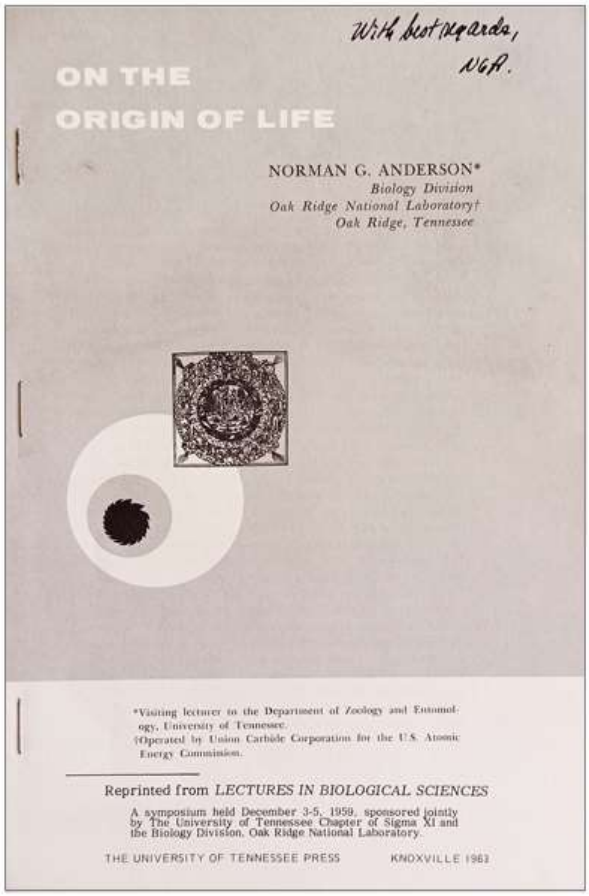
[1] A. O. Barut, Phys. Rev. 135, B839 (1964).
[2] O. W. Greenberg, Phys. Rev. 135, B1447 (1964).
[3] B. Kursunoğlu, Phys. Rev. 135, B761 (1964).
[4] W. D. McGlinn, Phys. Rev. Letters 12, 467 (1964).
[5] M. E. Mayer, H. J. Schnitzer, E. C. G. Sudarshan, R. A. Acharya, and M. Y. Han, Phys. Rev. 136, B888 (1964).
[6] F. Coester, M. Hamermesh, and W. D. McGlinn, Phys. Rev. 135, B451 (1964).
[7] L. Michel, Phys. Rev. 137, B405 (1965).

[8] In what follows we shall employ the convention that all indices from the same part of an alphabet each take on the same range of values. μ, ν, ρ, σ, $\cdots$ will, for example, each take on the values $1, \cdots, 4$. The range of other indices will be indicated in the equation where they first appear. In all cases we employ the Einstein summation convention, and $\eta_{\mu\nu}=\text{diag}\,(+1,-1,-1,-1)$ is the Minkowski tensor.

65. **ANDERSON, James L.** *"Field-theory Restrictions on the Unification of Space-Time and Internal Symmetries."* Reprint from *The Physical Review*, vol. 139, no. 1B, B155-158, 12 July, 1965. No place: *The Physical Review*, 1965. ¶ 4to. Self-wraps. Creased. Very good. [S7153]

$ 15

James L. Anderson was associated with the Dept. of Physics, Stevens Inst. of Technology, Hoboken, NJ.

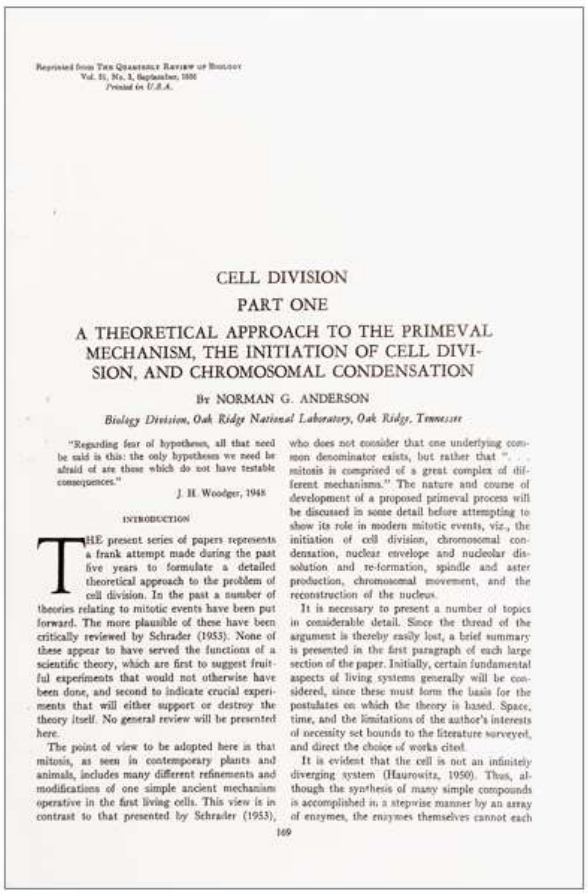

With best regards,
NGA.

ON THE
ORIGIN OF LIFE

NORMAN G. ANDERSON*
Biology Division
Oak Ridge National Laboratory†
Oak Ridge, Tennessee

*Visiting lecturer to the Department of Zoology and Entomology, University of Tennessee.
†Operated by Union Carbide Corporation for the U.S. Atomic Energy Commission.

Reprinted from *LECTURES IN BIOLOGICAL SCIENCES*
A symposium held December 3-5, 1959, sponsored jointly by The University of Tennessee Chapter of Sigma Xi and the Biology Division, Oak Ridge National Laboratory.
THE UNIVERSITY OF TENNESSEE PRESS KNOXVILLE 1963


Reprinted from THE QUARTERLY REVIEW OF BIOLOGY
Vol. 31, No. 3, September, 1956
Printed in U.S.A.

CELL DIVISION
PART ONE
A THEORETICAL APPROACH TO THE PRIMEVAL MECHANISM, THE INITIATION OF CELL DIVISION, AND CHROMOSOMAL CONDENSATION

BY NORMAN G. ANDERSON
Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

"Regarding fear of hypotheses, all that need be said is this: the only hypotheses we need be afraid of are those which do not have testable consequences."
J. H. Woodger, 1948

INTRODUCTION

THE present series of papers represents a frank attempt made during the past five years to formulate a detailed theoretical approach to the problem of cell division. In the past a number of theories relating to mitotic events have been put forward. The more plausible of these have been critically reviewed by Schrader (1953). None of these appear to have served the functions of a scientific theory, which are first to suggest fruitful experiments that would not otherwise have been done, and second to indicate crucial experiments that will either support or destroy the theory itself. No general review will be presented here.

The point of view to be adopted here is that mitosis, as seen in contemporary plants and animals, includes many different refinements and modifications of one simple ancient mechanism operative in the first living cells. This view is in contrast to that presented by Schrader (1953), who does not consider that one underlying common denominator exists, but rather that "... mitosis is comprised of a great complex of different mechanisms." The nature and course of development of a proposed primeval process will be discussed in some detail before attempting to show its role in modern mitotic events, viz., the initiation of cell division, chromosomal condensation, nuclear envelope and nucleolar dissolution and re-formation, spindle and aster production, chromosomal movement, and the reconstruction of the nucleus.

It is necessary to present a number of topics in considerable detail. Since the thread of the argument is thereby easily lost, a brief summary is presented in the first paragraph of each large section of the paper. Initially, certain fundamental aspects of living systems generally will be considered, since these must form the basis for the postulates on which the theory is based. Space, time, and the limitations of the author's interests of necessity set bounds to the literature surveyed, and direct the choice of works cited.

It is evident that the cell is not an infinitely diverging system (Haurowitz, 1950). Thus, although the synthesis of many simple compounds is accomplished in a stepwise manner by an array of enzymes, the enzymes themselves cannot each

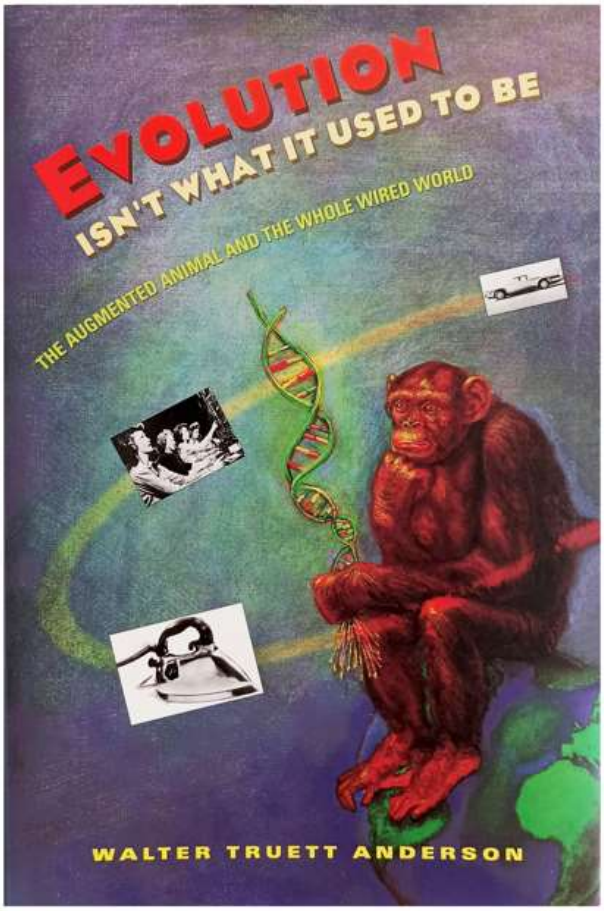
169

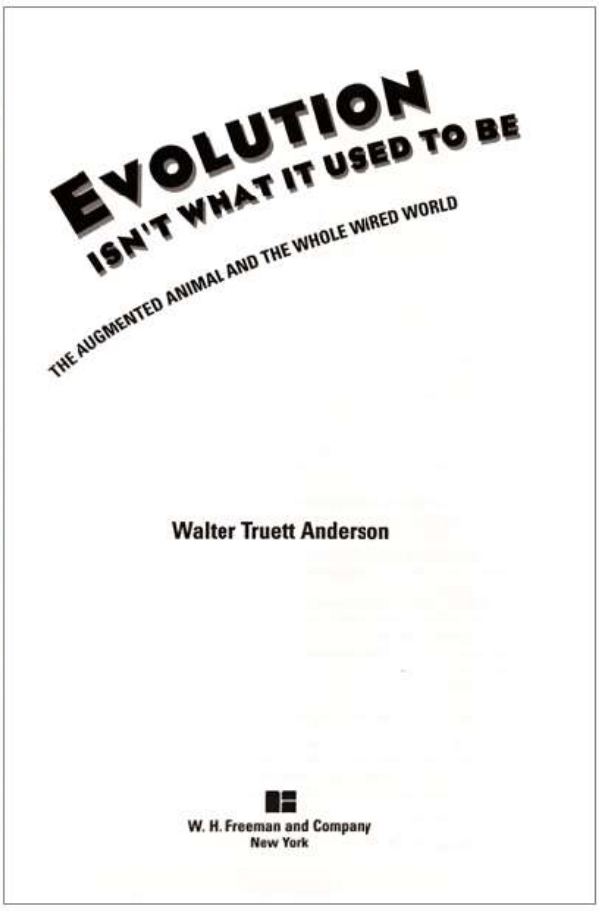
66. **ANDERSON, Norman G**. Group of 2 offprints. Includes: **ANDERSON**. *"On the Origin of Life."* Offprint from: Lectures in Biological Sciences. Knoxville: University of Tennessee Press, 1963. ¶ 8vo. 13 pp. Printed wrappers. INSCRIBED BY ANDERSON. Fine. [S7394]

WITH: **ANDERSON**. *"Cell Division Part One. A Theoretical Approach to the Primeval Mechanism, the Initiation of Cell Division, and Chromosomal Condensation."* Offprint from: The Quarterly Review of Biology, vol. 31, no. 3, 1956. 8vo. 169-199 pp. Photos, figs. Self wraps. Fine.

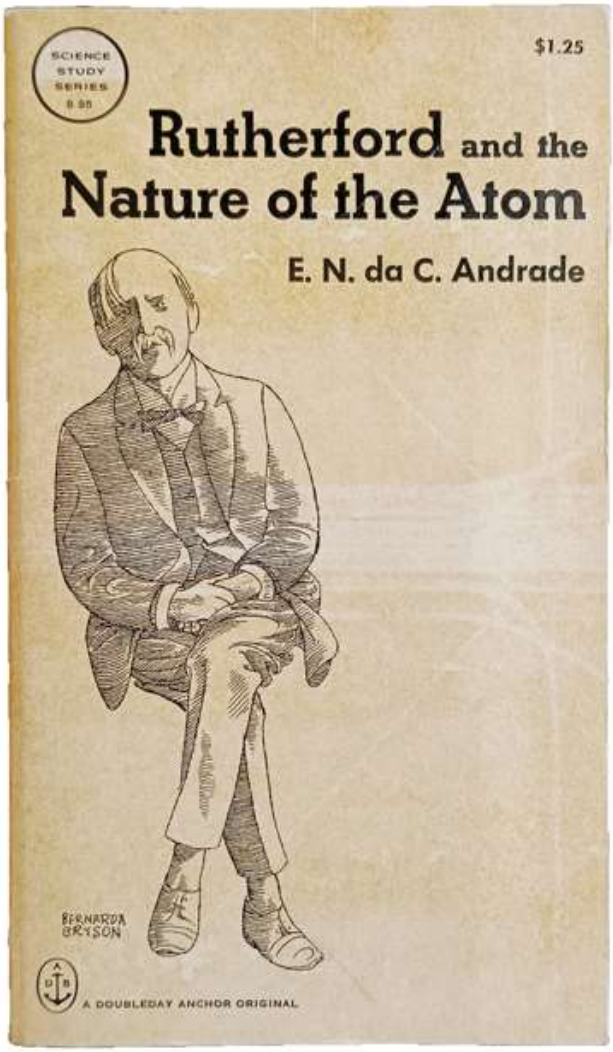
$ 15

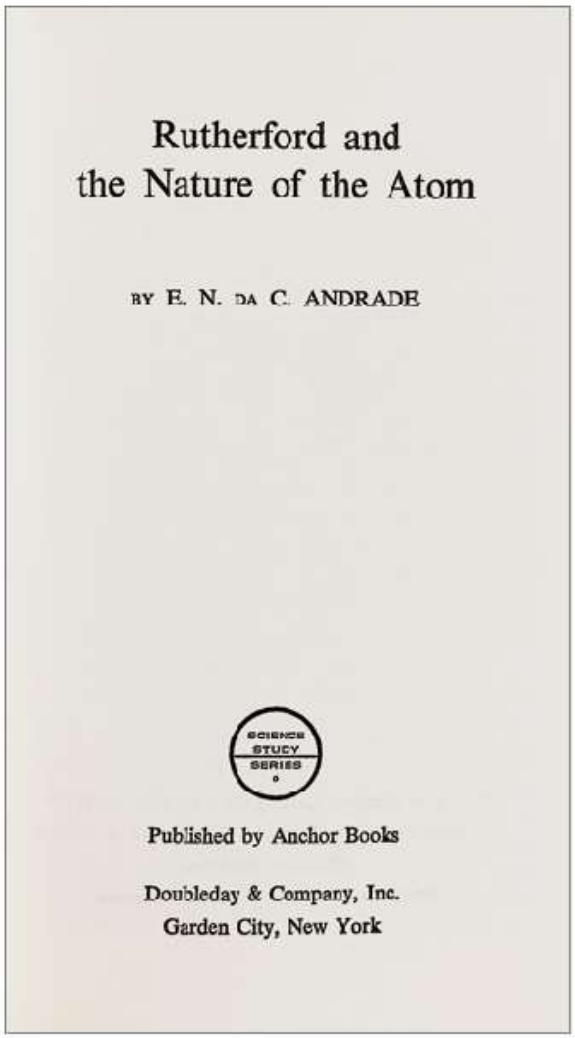
During his time at Oak Ridge National Laboratory, he invented the first high-pressure liquid chromatography systems, the zonal ultracentrifuge, and the centrifugal fast analyzer and holds over 30 patents.





67. **ANDERSON, Walter Truett** (1933-). *Evolution Isn't What It Used to Be. The Augmented Animal and the Whole Wired World.* New York: W. H. Freeman, (1996). ¶ First edition. 8vo. xii, 223 pp. Index. Cloth backed boards, dust jacket. FINE. [S7873] $ 5





68. **ANDRADE, Edward Neville da Costa**. *Rutherford and the Nature of the Atom.* New York: Doubleday Anchor, (1960). ¶ Sm. 8vo. xix, 218 pp. Illus., figs., index. Paperback. Very good. [S11530] $ 4

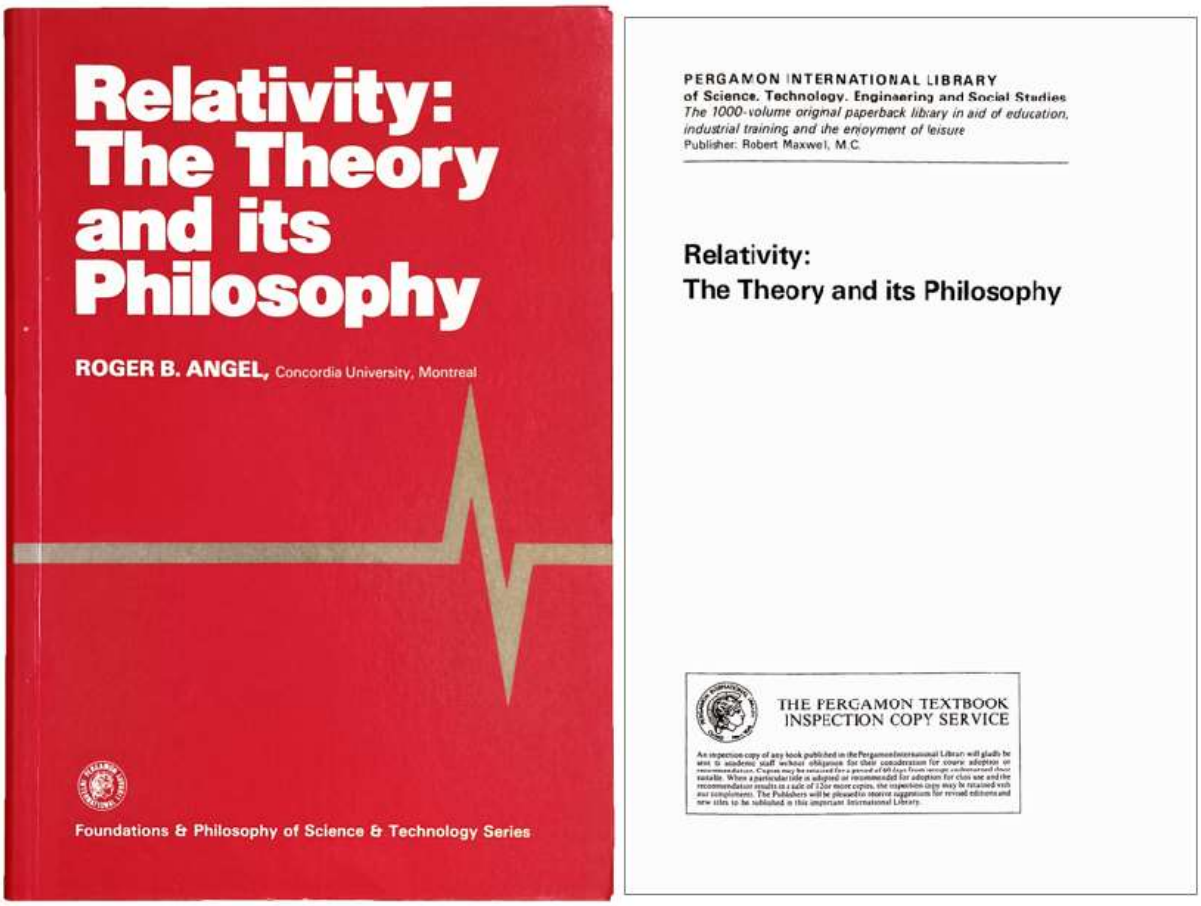
69. **ANGEL, Roger B**. *Relativity: The Theory and its Philosophy*. Oxford: Pergamon Press, 1980. ¶ Series: *Foundations & Philosophy of Science & Technology Series*. 8vo. x, 259 pp. Diagrams, figures, index. Original red, white and gray printed wrappers. Near fine. [br] [S12395]

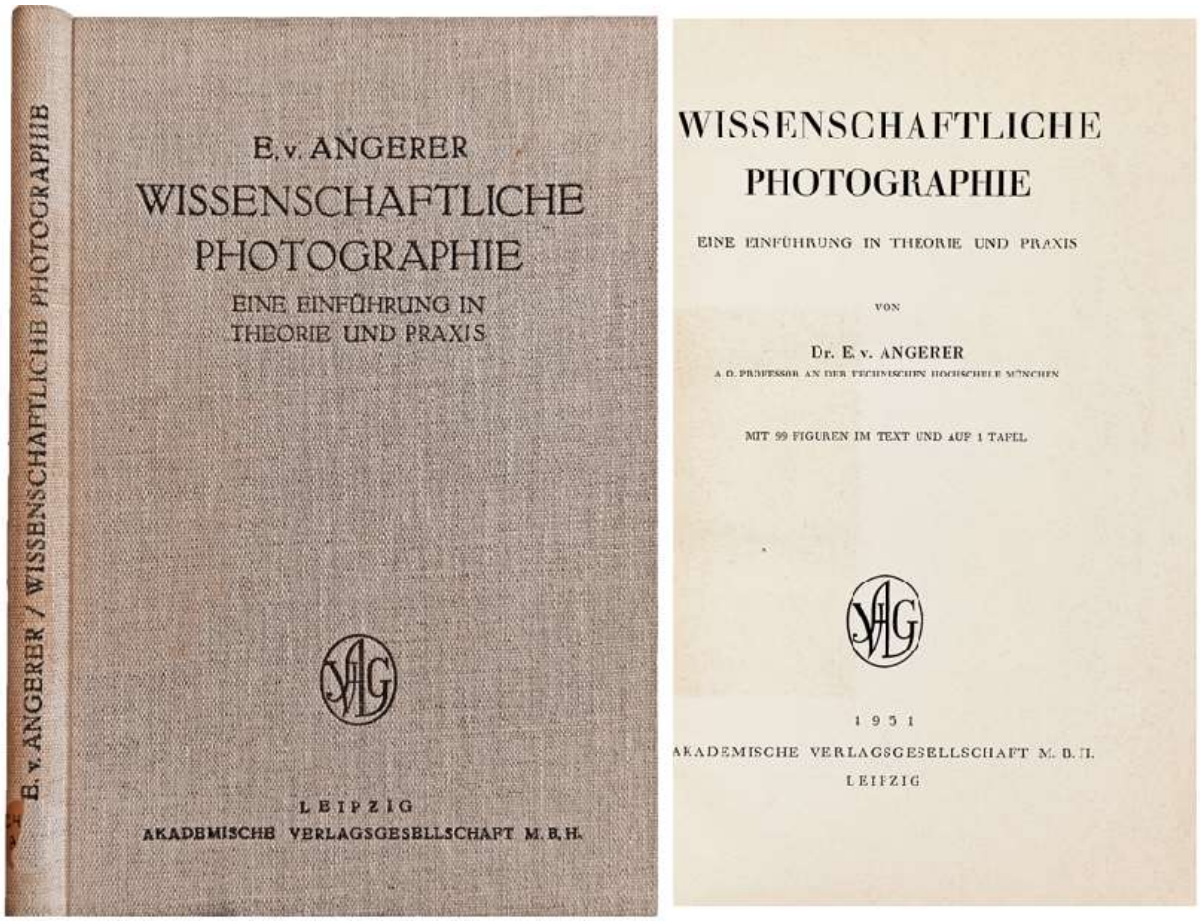
$ 45

Relativity: The Theory and its Philosophy provides a completely self-contained treatment of the philosophical foundations of the theory of relativity. It also surveys the most essential mathematical techniques and concepts that are indispensable to an understanding of the foundations of both the special and general theories of relativity. In short, the book includes a crash course in applied mathematics, ranging from elementary trigonometry to the classical tensor calculus. Comprised of 11 chapters, this book begins with an introduction to fundamental mathematical

concepts such as sets, relations, and functions; N-tuples, vectors, and matrices; and vector algebra and calculus. The discussion then turns to the concept of relativity and elementary foundations of Newtonian mechanics, as well as the principle of special relativity and its philosophical interpretation by means of empiricism and rationalism. Subsequent chapters focus on the status of the doctrine of conventionalism in the theory of special relativity; the commensurability of classical and relativistic mechanics; mathematical foundations of special relativistic physics; and the classical or Newtonian theory of gravitation. The principle of general covariance and its relation to the principle of general relativity are also examined. The final chapter addresses the fundamental question as to the actual information concerning the structure of spacetime that is conveyed to us through the theory of general relativity. This monograph will be of interest to students, teachers, practitioners, and researchers in physics, mathematics, and philosophy. – Publisher.

Contains the mathematical and physical tools to enable an informed and independent assessment of the philosophical claims based on the theory of relativity.



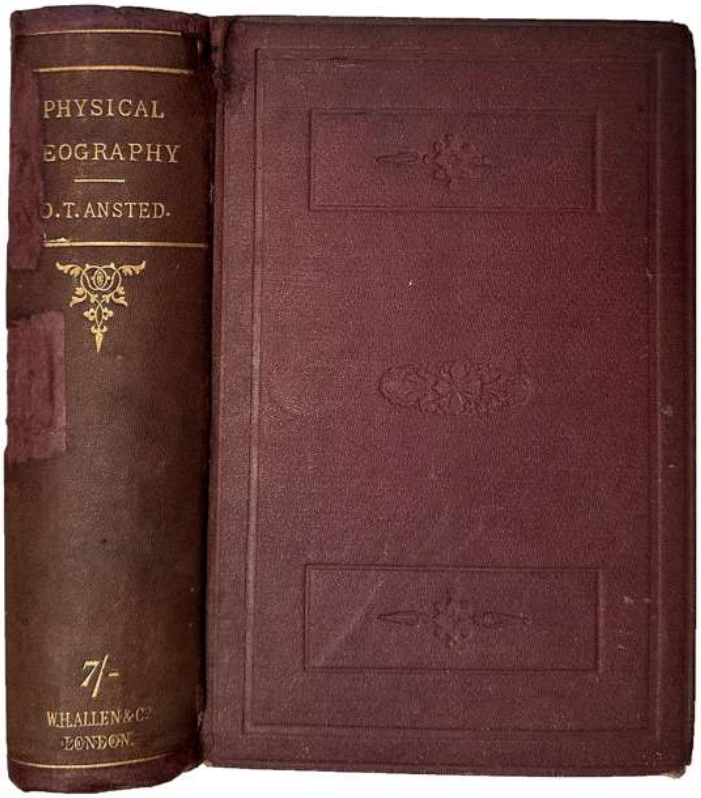


Scientific Photography

70. **ANGERER, Ernst von** (1881-1951). *Wissenschaftliche Photographie; eine Einfuhrung in Theorie und Praxis.* Leipzig: Akademische Verlagsgesellschaft, 1931. ¶ 24 cm. viii, 185 pp. 99 illus., 1 plate, index; inner corner damaged. Brown cloth stamped in brown. With Carnegie Mount Wilson Observatory blind-stamp. [S1182]

$ 10

Scientific photography; an introduction to theory and practice. At the Mount Wilson Observatory (the former owner of this book) scientific photography was a vital tool for their astronomical records.



PHYSICAL GEOGRAPHY.

BY

DAVID THOMAS ANSTED, M.A.,
F.R.S., F.G.S., F.R.G.S.,

HONORARY FELLOW AND LATE PROFESSOR OF GEOLOGY, KING'S COLLEGE, LONDON.
SIXTH FELLOW OF JESUS COLLEGE, CAMBRIDGE, ETC., ETC., ETC.

Fifth Edition,

[WITH ILLUSTRATIVE MAPS.]

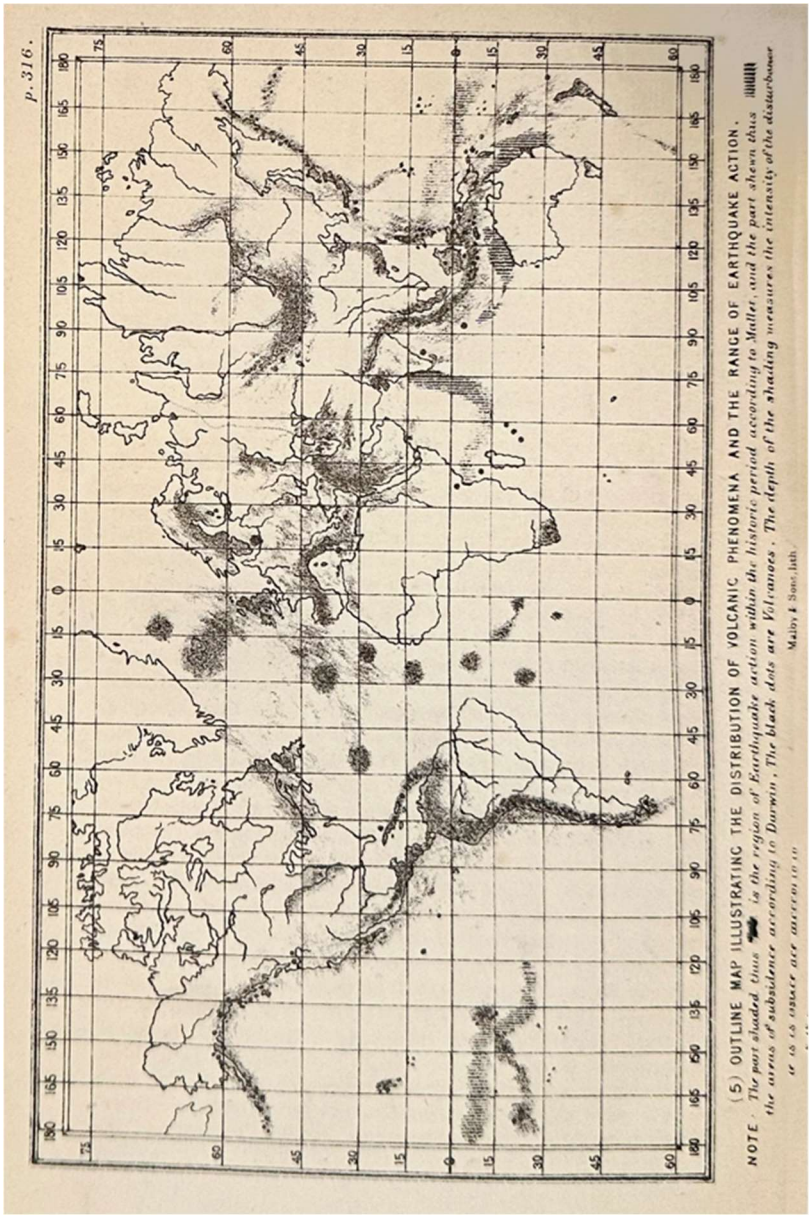
LONDON:
WM. H. ALLEN & CO., 13, WATERLOO PLACE,
PALL MALL, S.W.
1871.

[*All Rights reserved.*]

71. **ANSTED, David Thomas** (1814-1880). *Physical Geography*. London: Wm. H. Allen & Co., 1871. ¶ Fifth edition. Small 8vo. xlviii, 509, 37, [3] pp. 6 maps: map frontis., world map of volcanos, hydrographic map of the world, world Land map, map showing the Principle Phenomena of Land, map showing the distribution of plants, ads; foxing. Original blind-stamped maroon cloth, gilt-stamped spine title; covers soiled, spine heavily mended with kozo, applied to the spine. Prize awarded to a student: Science and Art Department of the Committee of Council on Education, Queen's Prize obtained by Frederick I. Dixon, in the Examination of Science Classes held May 1873. Good. S9083

$ 20

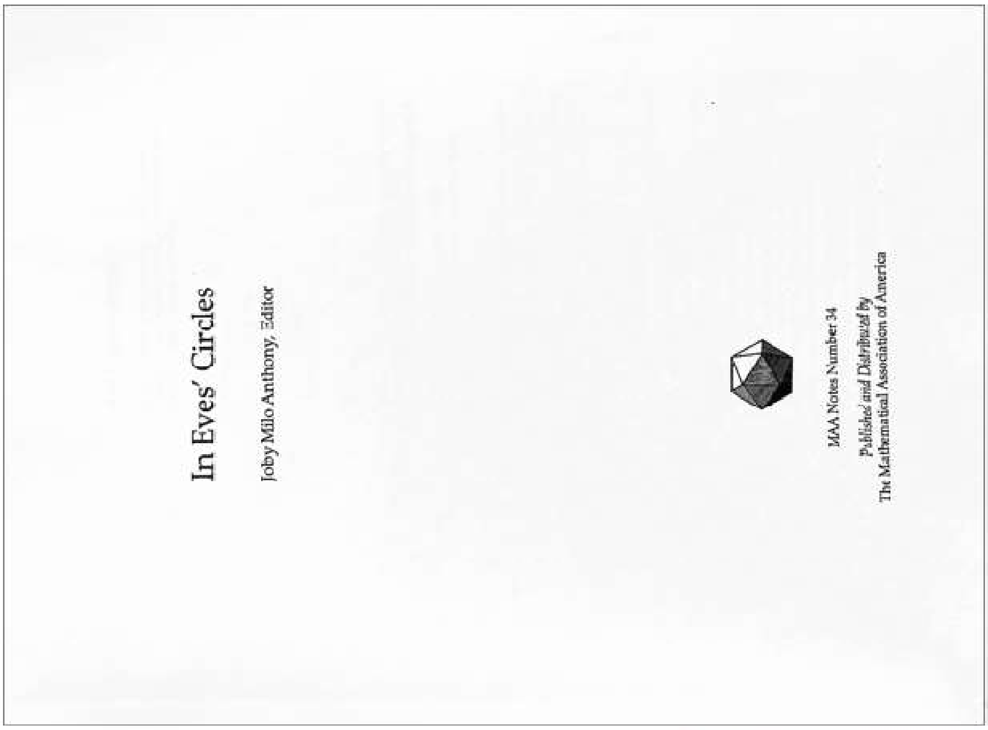
David Thomas Ansted FRS was an English professor of geology and author of numerous books on geology. His role as a teacher at Addiscombe Military Seminary, where future East India Company army officers were trained, had an influence on the study of geology in the colonies.



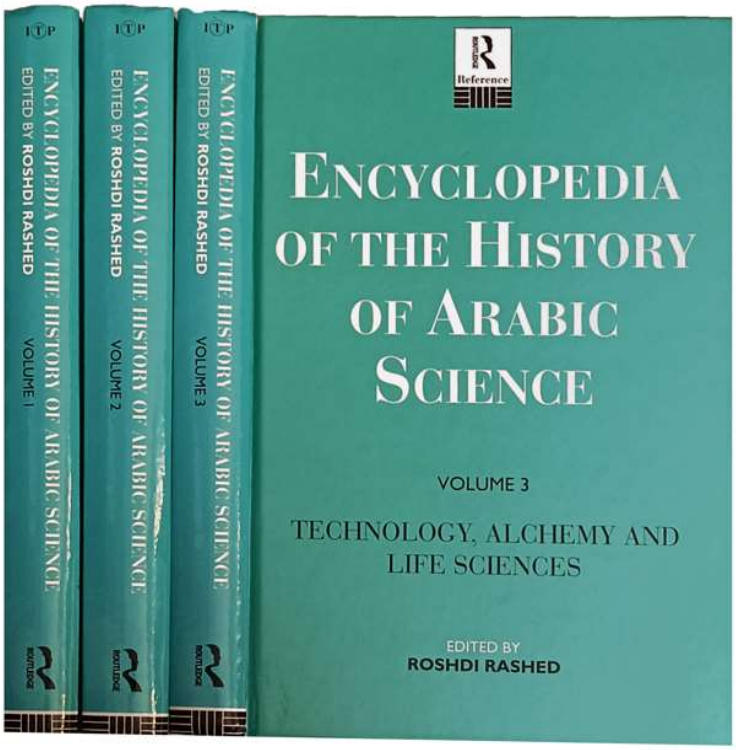
[71]

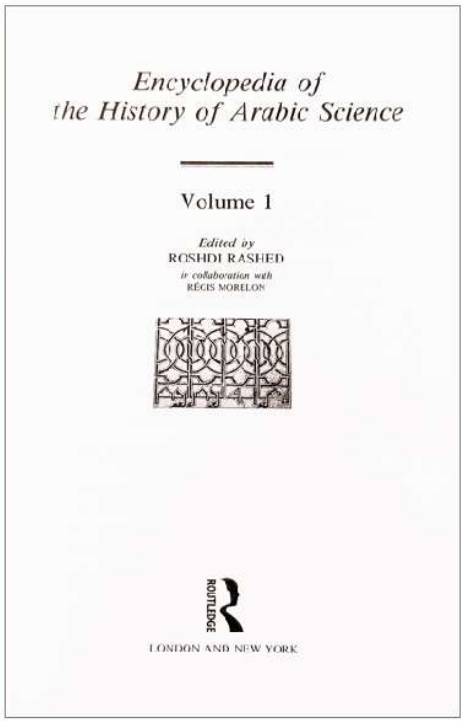
"From 1844 to 1847 he acted as assistant-secretary of the Geological Society, and for many years he edited its quarterly journal. In later life, from about 1850, he turned to the practical applications of geology in connection with mining, engineering, water-supply, and the like, and was constantly consulted on such matters both in this country and abroad." [*DNB*].

"Ansted had a good career as a geologist, teaching at King's College London, and lecturing as well to members of the British East India Company and a school for civil engineers. He wrote many books on geology and geography." [Linda Hall Libr.].



72. **Mathematical Association of America; ANTHONY, Joby Milo** (ed.). *In Eves' Circles*. Washington, DC: Mathematical Association of America, (1994). ¶ Series: MAA Notes no. 34. 4to. xxvii, 209 pp. Illus. figs. diag.; owner's ink inscription ffep, 2 minor ink marginal notes (p. xxv), Printed wrappers. Very good. S11581 $ 5





73. [**Arabic Science**] **Roshdi RASHED** (ed.). *Encyclopedia of the History of Arabic Science*. London & New York: Routledge, (1996). ¶ Three volumes. 8vo. xiv, 330; vii, 331-750; vii, 751-1105 pp. Indexes; some former marks erased (minor). Original printed boards; minor rubbing on head of vol. III joint. Ownership ink signatures of David C. Lindberg. DL1002

$ 135

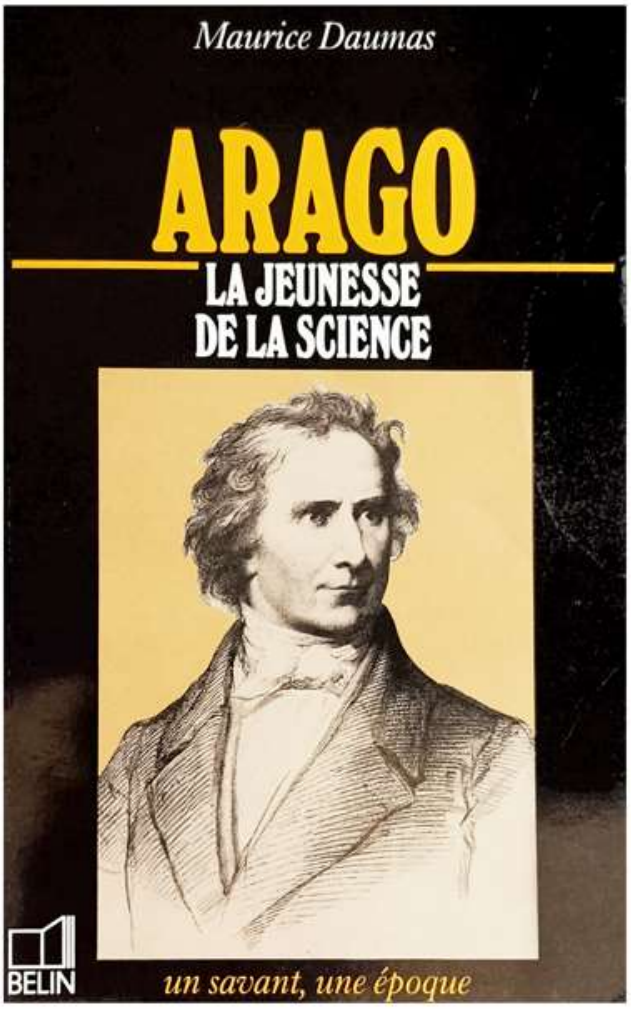
First Printing. This is a contributor's copy, that of Lindberg, who contributed the paper "The Western reception of Arabic optics," (pp.716-729).

Arranged in three major sections: Astronomy-theoretical and applied; Mathematics and the Physical Sciences; Technology, Alchemy and Life Sciences.

Roshdi Rashed "is a mathematician, philosopher and historian of science, whose work focuses largely on mathematics and physics of the medieval Arab world.[citation needed] His work explores and illuminates the unrecognized Arab scientific tradition, being one of the first historians to study in detail the ancient and medieval texts, their journey through the Eastern schools and courses, their immense contributions to Western science, particularly in regarding the development of algebra and the first formalization of physics."

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.

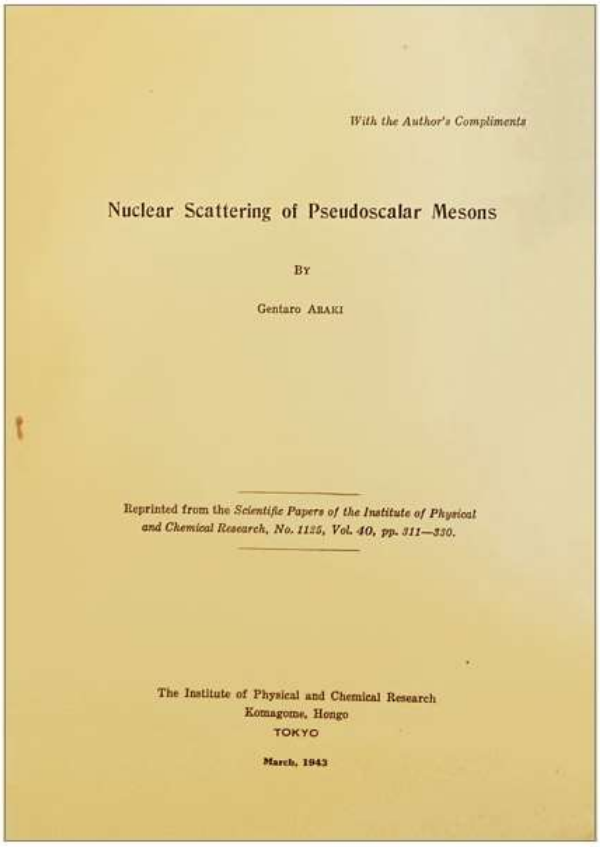
Lindberg was the Hilldale Professor Emeritus of History of Science and past director of the Institute for Research in the Humanities, at the University of Wisconsin, Madison.



74. [**Arago, François** 1786–1853] **DAUMAS, Maurice** (1910-1984). *Arago1786-1853, La Jeunesse de la Science*. Paris: Belin, 1987. ¶ Series: *Un Savant, Un Epoque*. 8vo. 303 pp. Illus., index. Black printed wrappers. Fine. RARE. RH1243

$ 17

Dominique François Jean Arago was a French mathematician, physicist, astronomer, and freemason. "Arago's earliest physical researches were on the pressure of steam at different temperatures, and the velocity of sound, 1818 to 1822. His magnetic observations mostly took place from 1823 to 1826. He discovered rotatory magnetism, what has been called Arago's rotations, and the fact that most bodies could be magnetized; these discoveries were completed and explained by Michael Faraday." – Wikip.


With the Author's Compliments

Nuclear Scattering of Pseudoscalar Mesons

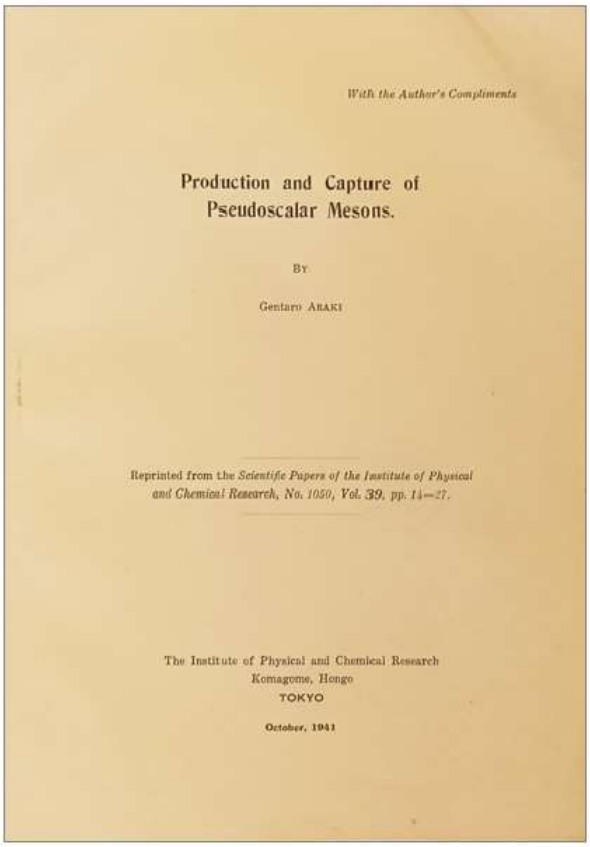
By

Gentaro Araki

Reprinted from the *Scientific Papers of the Institute of Physical and Chemical Research, No. 1125, Vol. 40, pp. 311—330.*

The Institute of Physical and Chemical Research
Komagome, Hongo
TOKYO

March, 1943


With the Author's Compliments

Production and Capture of Pseudoscalar Mesons.

By

Gentaro Araki

Reprinted from the *Scientific Papers of the Institute of Physical and Chemical Research, No. 1050, Vol. 39, pp. 14—27.*

The Institute of Physical and Chemical Research
Komagome, Hongo
TOKYO

October, 1941

Author's Presentation Copy

75. **ARAKI, Gentaro**. (9 offprints). Includes: **ARAKI**. *"Production and Capture of Pseudoscalar Mesons."* Tokyo: The Inst. of Physical and Chemical Research, Komagome, Hongo, Oct. 1941. ¶ Reprinted from Scientific Papers of the Inst. of Physical and Chemical Research, no. 1050, vol. 39, pp. 14-27. 8vo. Printed wrappers. Ownership signatures of Bram Pais. Fine. S7155

ARAKI. *"Nuclear Scattering of Pseudoscalar Mesons."* Tokyo: The Inst. of Physical and Chemical Research, Komagome, Hongo, March 1943. Reprinted from *Scientific Papers of the Inst. of Physical and Chemical Research*, no. 1125, vol. 40, pp. 311-330. 8vo. Printed wrappers. Fine. AUTHOR'S PRESENTATION COPY, with printed clause on front cover.

WITH: **ARAKI**. *Magnetic Moment and Virtual Dissociation of Nuclear Particle.* Osaka, Japan: Akitaya, 1946. Series: Progress of Theoretical Physics, vol. 1, no. 1, July 1946. 8vo. 12 pp. Printed wrappers. Fine. INSCRIBED BY THE AUTHOR.

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WITH: **ARAKI**. *"On the Difficulty on the Meson Theory of Nuclear Physics."* Reprinted from *The Physical Review*, vol. 75, no. 7, 1101-1102, April 1, 1949. Single sheet; creased. Pais.

WITH: **ARAKI**. *"On the Vector and Pseudovector Theories of Nuclear Physics."* Reprinted from *The Physical Review*, vol. 75, no. 8, 1262, April 15, 1949. Single sheet; creased. Pais.

WITH: **ARAKI**. *"Production of Scalar and Pseudoscalar Mesons by Photons."* Reprinted from *Progress of Theoretical Physics*, vol. V, no. 4, July-Aug. 1950. 8vo. 507-518 pp. Printed wrappers. Fine.

WITH: **ARAKI** & **Yukio MORI**. *"Pseudoscalar Meson Theory and Ground State of Deutreron."* Reprinted from *Progress of Theoretical Physics*, vol. VI, no. 2, March-April, 1951. 8vo. 188-192 pp. Printed wrappers. Very good. After a comparison of the rates of mesotron decay and capture by Hideki Yukawa (1907-1981) and Taisuke Okayama, Akari and Tomonaga improved upon the results "by taking into account the very different effect of the Coulomb field of the nucleus on slow mesotrons of opposite sign." *Twentieth Century Physics*, vol. I, p. 406. Extremely rare collection of offprints.

$ 650

Araki was a noted Japanese nuclear physicist who specialized in the study of Mesons, and was associated with the Dept. of Industrial Chemistry, Kyoto University, Kyoto, Japan. After a comparison of the rates of mesotron decay and capture by Hideki Yukawa (1907-1981), Akari and Shinichiro Tomonaga (1906-1979) improved upon the results "by taking into account the very different effect of the Coulomb field of the nucleus on slow mesotrons of opposite sign." *Twentieth Century Physics*, vol. I, p. 406.

With the compliments of G. Araki

PROGRESS OF THEORETICAL PHYSICS

Edited by H. YUKAWA

Volume 1 JULY, 1946 Number 1

CONTENTS

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Volume 42 pp. 87–94

SCIENTIFIC PAPERS OF THE INSTITUTE OF PHYSICAL AND CHEMICAL RESEARCH

PHYSICS

April, 1944

The Institute of Physical and Chemical Research
Komagome, Hongo
TOKYO
April, 1944

Pais

Reprinted from THE PHYSICAL REVIEW, Vol. 75, No. 7, 1088–1092, April 1, 1949
Printed in U. S. A.

On the Difficulty of the Meson Theory of Nuclear Forces

GENTARO ARAKI
Department of Industrial Chemistry, Kyoto University, Kyoto, Japan
January 28, 1949

IT has generally been believed that the meson theories of nuclear forces involve a difficulty of r^{-5}. Mixtures of two fields were considered first by Møller and Rosenfeld[1] and later by Schwinger[2] in order to eliminate such a term. Furthermore, a divergence difficulty was noticed by the present author, and another mixture was proposed by him.[3] It will be shown in the following, however, that these difficulties are merely apparent so far as the pseudoscalar theory is concerned. Consequently it means that they have no connection with the general defect of the contemporary field theory.

In the meson theory the matrix element of the two-nucleon potential, W, is given by

$$W_{\beta\delta}=\sum_I H_{\alpha I}H_{\gamma\delta}{}^{*}/(E_I-E_\alpha)-\sum_I H_{\alpha I}{}^{*}H_{\gamma\delta}/(E_I-E_\delta) \quad (1)$$

where H' is the interaction between mesons and nucleons. We can find W itself by the Fourier theorem as follows:

$$W=\sum_{\mathbf{k}} W_{\mathbf{k}}\exp(i\mathbf{k}\mathbf{x}), \quad (2)$$

where $\mathbf{x}$ is the relative position vector between two nucleons, $\hbar\mathbf{k}$ is the momentum of a meson in the intermediate state, I, and matrix elements of the charge and spin operators are suitably converted to the operators themselves.

If we adopt the pseudoscalar meson theory, H' is given by

$$H'=-(f/\kappa^2)\int\psi^{*}\boldsymbol{\sigma}\,\mathrm{grad}\,U\psi\,d\tau'+\text{its adjoint} \quad (3)$$

in the non-relativistic approximation where ψ is the wave function of nucleons, U is the pseudoscalar wave function of mesons, and the other notations have the usual meaning. Matrix elements of H' in (1) should be calculated in the non-relativistic approximation, for W is required only in such an approximation. In this approximation we have

$$(1/\kappa)\boldsymbol{\sigma}\,\mathrm{grad}\,U=(1M/\mu)\sigma U, \quad (4)$$

where M and μ are masses of a nucleon and a meson, respectively. This identity can easily be shown for every one of their matrix elements with respect to eigenstates of the nucleon momentum on the basis of Dirac's equation. Such a relation was first suggested by Nelson[4] and was later derived by Dyson[5] according to a method of a transformation.

Making use of the relations (1), (2), (3), and (4) we have

$$W=-(2M/\mu)^2(f/\kappa)^2\exp(-\sigma\tau)T\sigma_1{}^{(0)}\sigma_2{}^{(0)}, \quad (5)$$

where $T=(\tau_1{}^{(0)}\tau_2{}^{(0)}+\tau_1{}^{(3)}\tau_2{}^{(3)})/2$ (charged theory) or $\tau_1{}^{(0)}\tau_2{}^{(0)}/2$ (symmetrical theory). At first sight it seems as if this potential vanishes in the non-relativistic approximation, but this is not the case because of the first factor and of the peculiar properties of σ_2 and Dirac's Hamiltonian. This two-nucleon potential has neither an r^{-5} term nor a divergent integral (especially it has no term of δ-function type). This verifies what was said at the beginning of this letter.

The potential given by (5) seems to be quite different from a usual one, but it is just the same as a hitherto well-known expression, as will be shown in the following. The Hamiltonian of a two-nucleon system with the interaction (5) is given by

$$H=\mu_1{}^{(0)}\boldsymbol{\sigma}_1\mathbf{p}_1+\mu_1{}^{(0)}\boldsymbol{\sigma}_2\mathbf{p}_2+(\mu_1{}^{(0)}+\mu_1{}^{(0)})M'+W, \quad (6)$$

where $\mathbf{p}$ is equal to $-i\hbar\nabla$. We expand the eigenfunction of H as follows:

$$\psi=\psi^{++}\chi^{+}(1)\chi^{+}(2)+\psi^{+-}\chi^{+}(1)\chi^{-}(2) +\psi^{-+}\chi^{-}(1)\chi^{+}(2)+\psi^{--}\chi^{-}(1)\chi^{-}(2), \quad (7)$$

where χ^{+} and χ^{-} are eigenfunctions of σ_z belonging to its eigenvalues $+1$ and -1, respectively. If we substitute (6) and (7) into $H\psi=E\psi$, this equation becomes a system of simultaneous equations for ψ^{++}, ψ^{+-}, ψ^{-+}, and ψ^{--}. In the non-relativistic case ψ^{++} is largest. If we eliminate ψ^{+-}, ψ^{-+}, and ψ^{--} on an assumption that $\psi\ll1$, we have $H''\psi^{++}=(E-2M'c^2)\psi^{++}$ in the non-relativistic approximation where H'' is a non-relativistic Hamiltonian given by $H''=-(\hbar^2/2M)\times(\partial_1{}^2+\partial_2{}^2)+W'$. W' and ψ are given by

$$W'=f^2\Gamma\exp(-\sigma\tau)/(1+\mathfrak{a}/(1+2\mathfrak{a}/\tau)(\boldsymbol{\sigma}_1\boldsymbol{\sigma}_2 +[1+1/\sigma\tau+1/\sigma^2\tau^2]S), \quad (8)$$

$$\psi=(M/\mu)(f^2/4\pi)(|\mathbf{x}|/\sigma\tau)\exp(-\sigma\tau), \quad (9)$$

and

$$S=3(\boldsymbol{\sigma}_1\mathbf{x})(\boldsymbol{\sigma}_2\mathbf{x})/r^2-\boldsymbol{\sigma}_1\boldsymbol{\sigma}_2, \quad (10)$$

where ψ is the eigenvalue of T.

ψ in the expression of W' should be omitted, for W' is derived in the non-relativistic approximation. If we put $\psi=0$ in Eq. (8) it is just the same as the well-known potential of the pseudoscalar meson theory. Equation (8) is correct only for large r as is seen from the assumption for its derivation (compare (9) and $\psi\ll1$). When ψ becomes comparable with or larger than unity, Eq. (8) does not hold. If such a region of small r does not play any role for the behavior of the system, the expression (8) can be used as a non-relativistic approximation of W' given by (5) for all values of r because of involving no r^{-5} term. Such a possibility was once imagined by Bethe,[6] but finally discarded by him.

From this consideration we find Oka's r^{-4} term and divergent integrals are due to the unsuitable non-relativistic form of $W_{\beta\delta}$ in the customary method. In the actual calculation, the sum in (2) includes relativistic states whereas $W_{\beta\delta}$ is non-relativistic. Therefore the non-relativistic form of $W_{\beta\delta}$ should be so determined that the contribution from a relativistic region in the sum of (2) does not play any role. The method of the present letter satisfies this requirement, whereas the customary method does not. The difficulties of the latter come from the relativistic region in the sum of (2).

[1] C. Møller and L. Rosenfeld, Kgl. Danske Vid. Sels. Math.-Fys. Medd., **17**, No. 8 (1940).
[2] J. Schwinger, Phys. Rev. **61**, 387 (1942).
[3] G. Araki, Phys. Rev. **74**, 503, 994 (1948).
[4] E. C. Nelson, Phys. Rev. **60**, 830 (1941).
[5] F. J. Dyson, Phys. Rev. **73**, 929 (1948).
[6] H. A. Bethe, Phys. Rev. **57**, 390 (1940).

Pais

Production of Scalar and Pseudoscalar Mesons by Photons

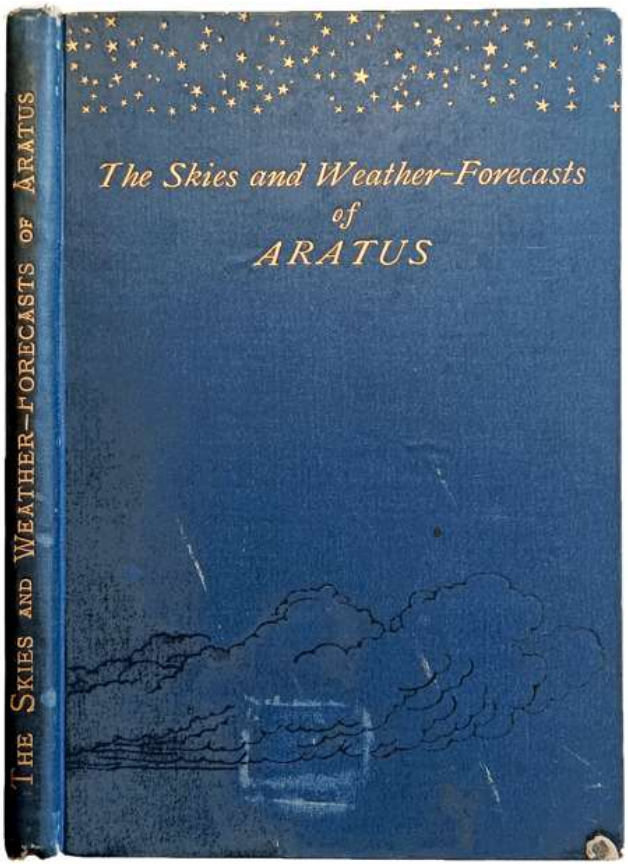
GENTARO ARAKI

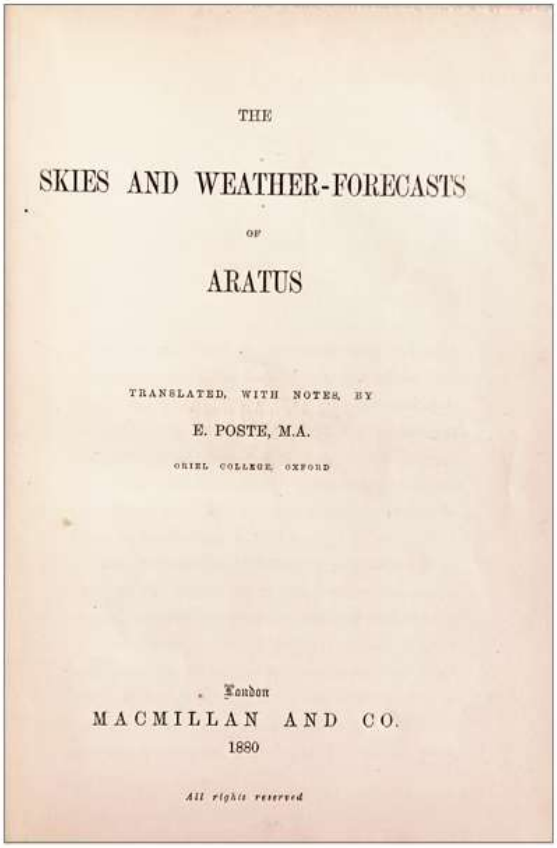
Reprinted from Progress of Theoretical Physics, Vol. V, No. 4
July–August, 1950

"As we have indicated in the last section, the lack of evidence for strong nuclear interaction of mesotrons began to emerge as the biggest interaction would be the comparison of the rates of mesotron decay and puzzle in elementary particle physics. A crucial measure of nuclear capture, especially for slow mesotrons. An analysis of this ratio was made by Yukawa and Taisuke Okayama in 1939 (1330]. They estimated the capture time in a dense medium, such as lead, to be about 10 much shorter than the stopping time due to ionization, while the decay time was longer (about 10-6 s). Thus, they concluded, the main of mesotrons are captured by nuclei after having stopped complete. In gaseous media, e.g. air, they expected that most mesotrons would decay in flight."

"Tomonaga and Gentaro Araki improved the results of Yukawa and Okayama by taking into account the very different effect of the Coulomh field of the nucleus on slow mesotrons of opposite sign. They found that negative mesotrons should almost always be captured, while positive ones should decay." – *Twentieth Century Physics* edited by Laurie M Brown, Abraham Pais, Sir Brian Pippard, 1995, vol I.

PROVENANCE: Abraham Pais (1918-2000) was a Dutch-American physicist and science historian. Pais earned his Ph.D. from University of Utrecht just prior to a Nazi ban on Jewish participation in Dutch universities during World War II. He was a physics professor at Rockefeller University until his retirement. His writings on the history of 20th century physics include his personal relationships with leading figures of physics: Einstein, Oppenheimer, Niels Bohr, Max Born, Paul Dirac, George Uhlenbeck, etc.



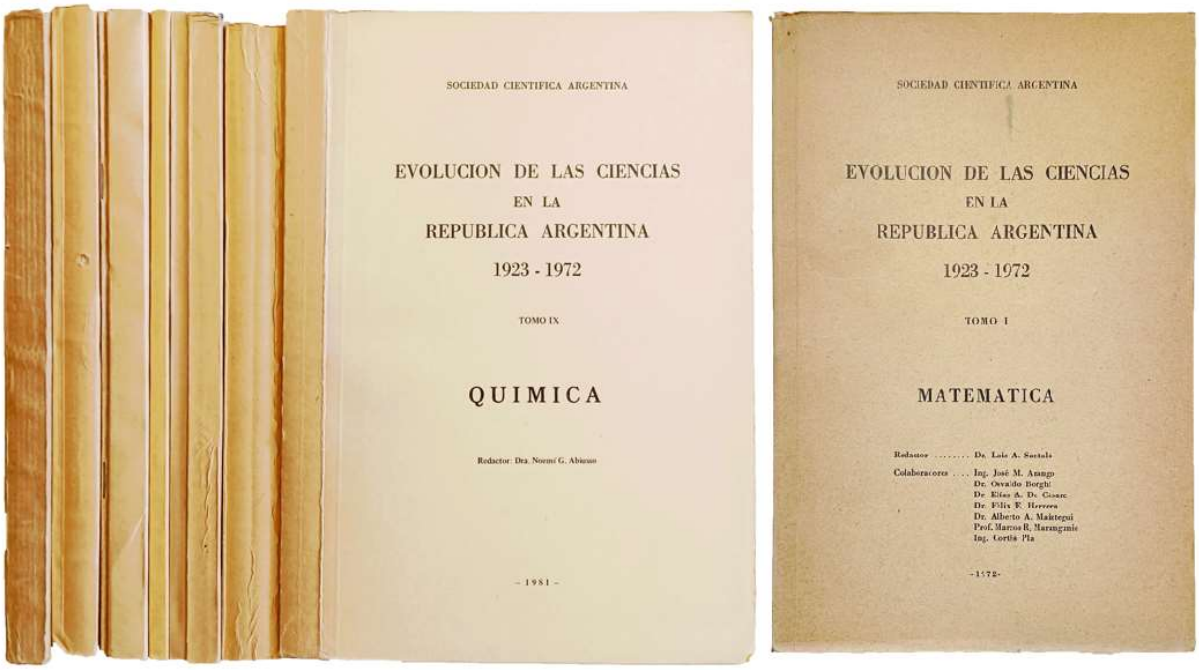


76. **ARATUS** (c. 315/310-240 BC)**; POSTE, Edward** (1823-1902) (trans.). *The skies and weather-forecasts of Aratus. Translated with notes*. London: Macmillan & Co., 1880. ¶ Small 8vo. vii, 71 pp. Original blue cloth, gilt-stamped cover and spine titles; extremities rubbed. Very good. S10658

$ 30

ARATUS OF SOLI was a Greek poet who flourished in Macedonia in the early C3rd B.C. His only surviving work is the *Phaenomena*, a book describing the constellations and weather signs.

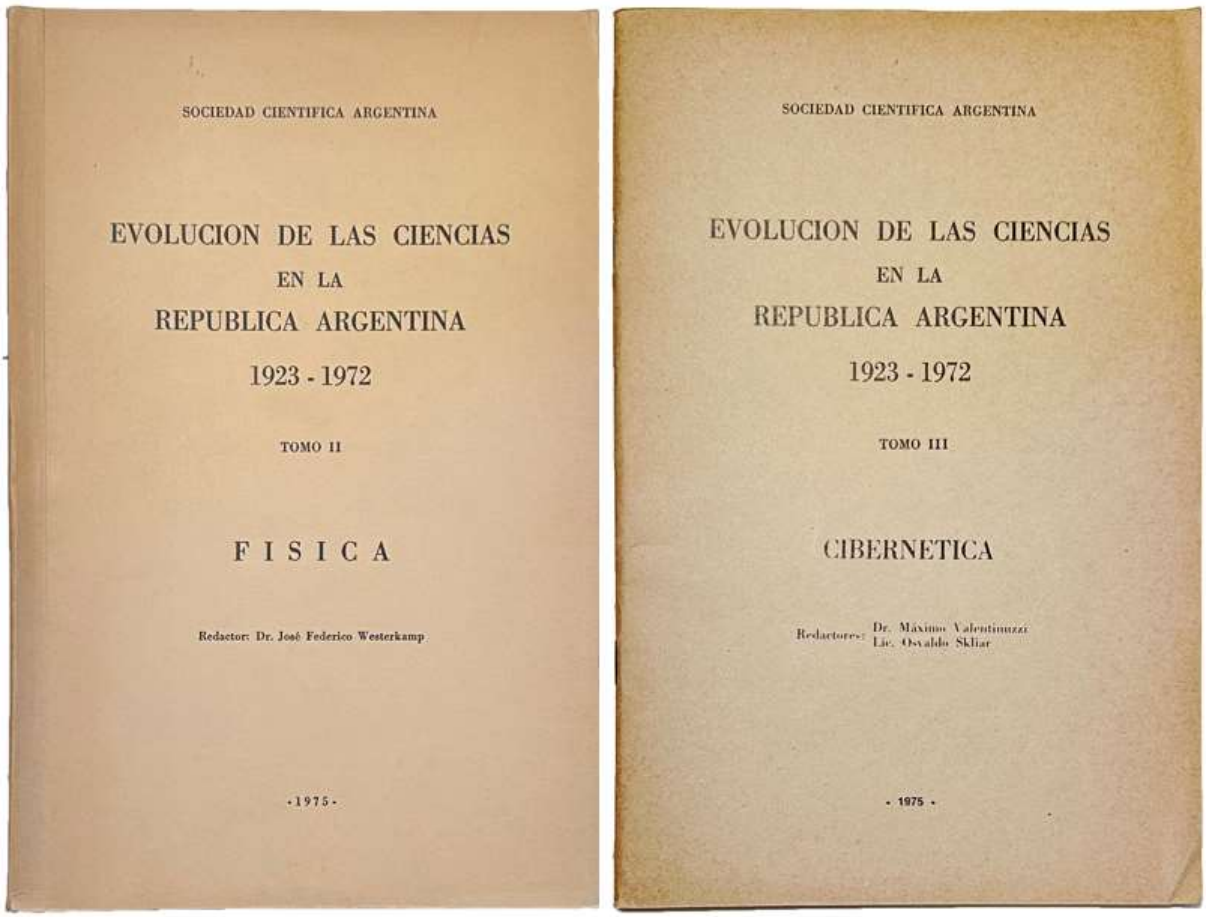
"Three more English translations of the *Phaenomena* were published in the 19th century. In The Skies and Weather Forecasts of Aratus [1880], E. Poste, writing in a predominately iambic line that varies in syllable count, produced a more accurate translation than Lamb and, for the most part, employs a much simpler diction, eschewing the kinds of ornament and embellishment that misrepresent Aratus' stylistic austerity . . . In many ways, Poste is the best of the 19th century poetic translators. He is especially good on technical passages and his notes, with Greek and Latin quotation kept to a minimum, are efficient, helpful and interesting on matters astronomical and meteorological." – D. Mark Possanza, University of Pittsburgh [review of *Aratus: Phaenomena*, 2010].



77. [**Argentinean Science**] **Sociedad Cientifica Argentina Buenos Aires**; **SANTALÓ, Luis A**. (1911-2001); **Jose Federico WESTERKAMP** (1918-2014); **Maximo VALENTINUZZI** (1932-2021); **Osvaldo SKLIAR**; **Luis B. MAZOTI**; **Juan Héctor HUNZIKER** (1925-2003); **Jose Angel ALVAREZ**; **Ángel Lulio CABRERA** (1908-1999); **Simón GERSHANIK** (1907-2008); **Luis Ambrosio MILONE** (1933-2018); **Otto SCHNEIDER**; **Noemí G. ABIUSSO** [eds.]. *Evolución de las Ciencias en la Republica Argentina 1923-1972. I: Matematica. II: Fisica. III: Cibernetica. IV: Genetica. V: Meterología, Oceanografía y Radiopropagación. VI: Botanica. VII: Astronomia. VIII: Geofisica y Geodesia. IX: Quimica.* [Buenos Aires]: Sociedad Científica Argentina, 1972-81. ¶ Complete set of 9 volumes. 8vo. ix, 243; [x], 220; x, 35; [x], 242; [x], 102; [viii], 107; [x], 224; ix, 518; ix, 326 pp. Printed wrappers; some covers slightly smudged. Burndy Library bookplates. Very good. S11278

$ 100

Contains: Evolution of the Sciences in the Argentine Republic 1923-1972. I: Mathematics. II: Physics. III: Cybernetics. IV: Genetics. V: Meteorology, Oceanography and Radio-propagation. VI: Botany. VII: Astronomy. VIII: Geophysics and Geodesy. IX: Chemistry.



AUTHORS:
[1] Luis A. Santaló was "A pioneer in the field of integral geometry, he published over two hundred research papers on integral geometry, metric geometry, affine geometry, projective differential geometry, the geometry of convex bodies, number theory, geometric probability and unified field theory. His works, which have been particularly influential in the scientific community of Spanish-speaking nations, were published in the major North American, British, German and Russian scientific journals. Although the mathematical work of Santaló was basic research, some of his findings were of decisive importance for other applied disciplines, particularly in operative research, biology and stereology. A key aspect of Santaló's work was his profound contribution to social progress and his constant efforts to modernize the teaching of mathematics in Spanish-speaking countries. Part of his work was devoted to this end in the form of articles and books on the teaching of mathematics in secondary education."

[2] José Federico "Pipo" Westerkamp was a doctor in Chemistry and Physics and Argentine university professor.

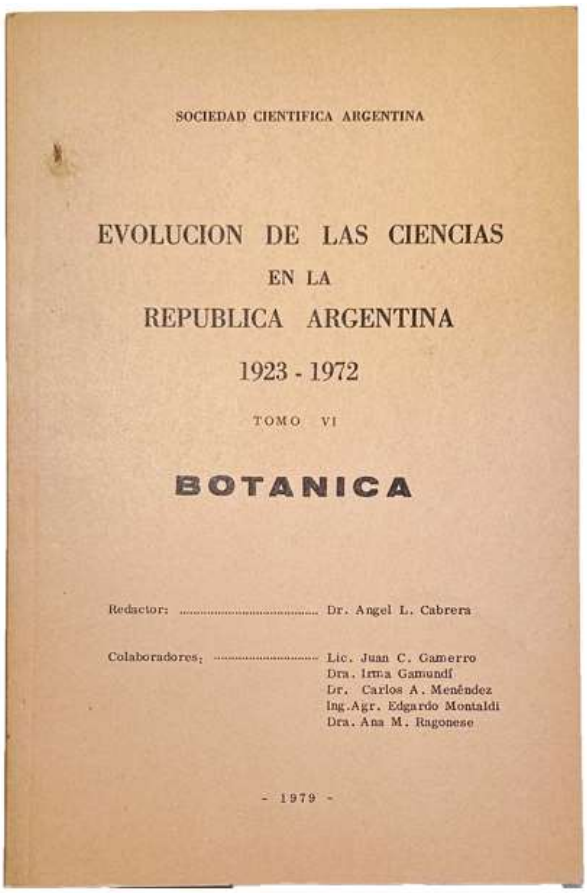
[3] Máximo Eugenio Valentinuzzi, better known as Max Valentinuzzi, was an Argentine Telecommunications Engineer dedicated to teaching and research in the area of Bioengineering. He received more than 25 lifetime achievement awards and honors, including the Bernardo Houssay Award and the Konex Platinum Award.

[6] Juan Héctor Hunziker was a prominent Argentine botanist and geneticist.

[8] Ángel Lulio Cabrera was an Argentine botanist.

[9] Simón Gershanik was an Argentine geophysicist, his life and work focused mainly on research and teaching in the area of Seismology and the development of Geophysics in Argentina and South America.

[10] Luis Ambrosio Milone was a historian of astronomy.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1923 - 1972

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BOTANICA

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Colaboradores: ..... Lic. Juan C. Gamerro
Dra. Irma Gamundí
Dr. Carlos A. Menéndez
Ing.Agr. Edgardo Montaldi
Dra. Ana M. Ragonese

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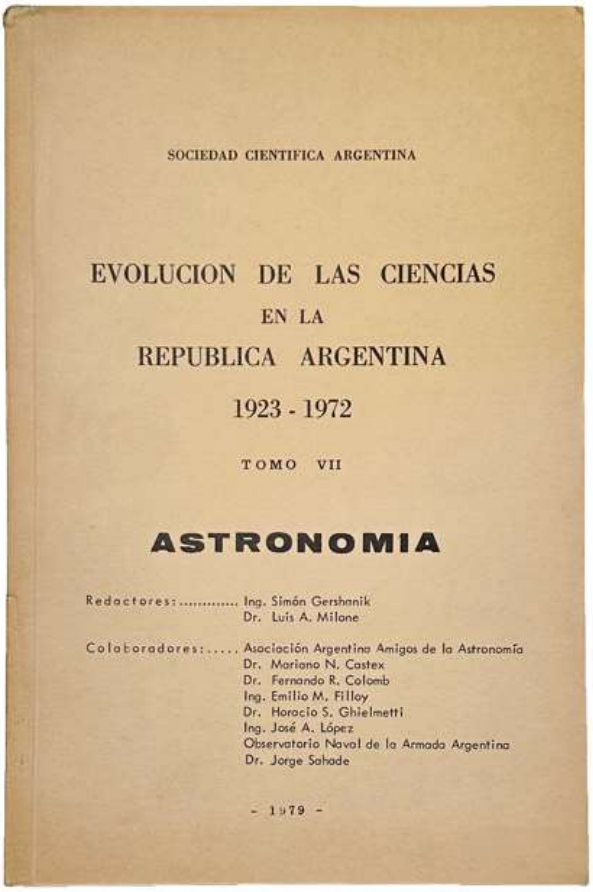
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1923 - 1972

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ASTRONOMIA

Redactores: ..... Ing. Simón Gershanik
Dr. Luis A. Milone

Colaboradores: ..... Asociación Argentina Amigos de la Astronomía
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Dr. Fernando R. Colomb
Ing. Emilio M. Filloy
Dr. Horacio S. Ghielmetti
Ing. José A. López
Observatorio Naval de la Armada Argentina
Dr. Jorge Sahade

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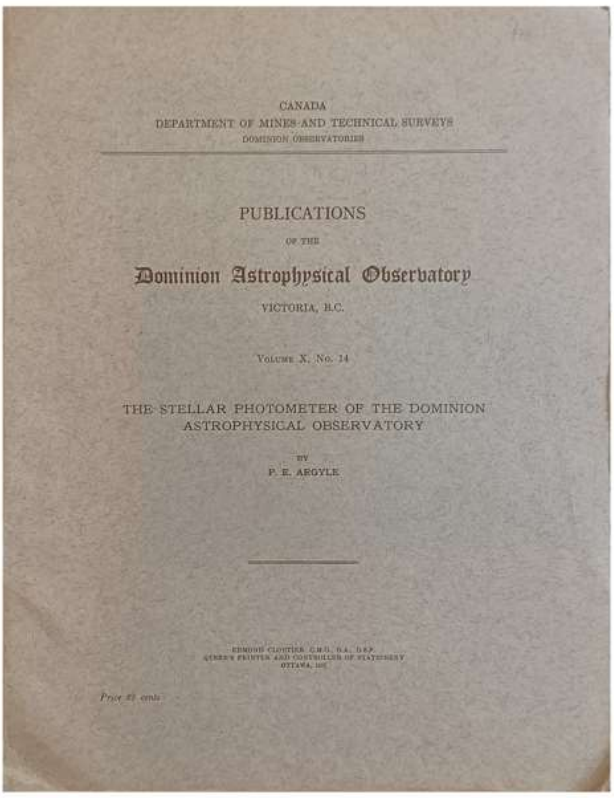
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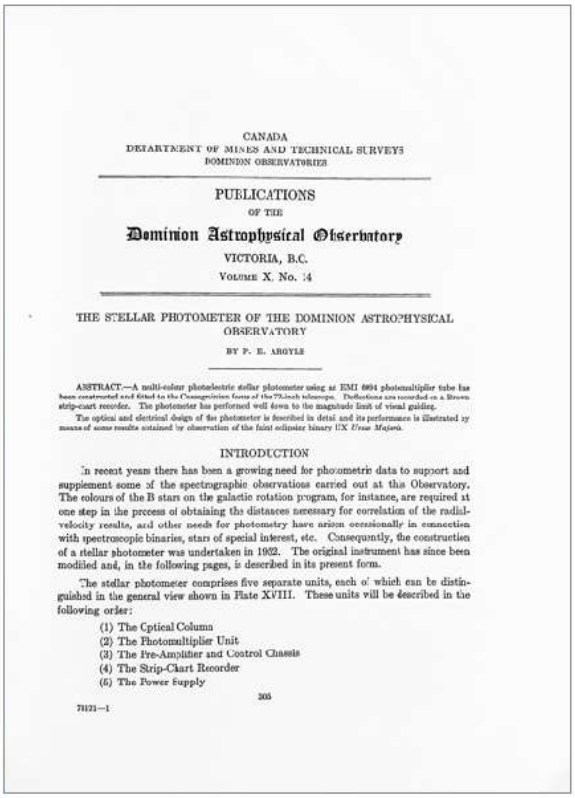
VOLUME X, No. 14

THE STELLAR PHOTOMETER OF THE DOMINION ASTROPHYSICAL OBSERVATORY
BY
P. E. ARGYLE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THE STELLAR PHOTOMETER OF THE DOMINION ASTROPHYSICAL OBSERVATORY
BY P. E. ARGYLE

ABSTRACT.—A multi-colour photoelectric stellar photometer using an EMI 6094 photomultiplier tube has been constructed and fitted to the Cassegrainian focus of the 72-inch telescope. Deflections are recorded on a Brown strip-chart recorder. The photometer has performed well down to the magnitude limit of visual guiding.
The optical and electrical design of the photometer is described in detail and its performance is illustrated by means of some results obtained by observation of the faint eclipsing binary UX *Ursae Majoris*.

INTRODUCTION

In recent years there has been a growing need for photometric data to support and supplement some of the spectrographic observations carried out at this Observatory. The colours of the B stars on the galactic rotation program, for instance, are required at one step in the process of obtaining the distances necessary for correlation of the radial-velocity results, and other needs for photometry have arisen occasionally in connection with spectroscopic binaries, stars of special interest, etc. Consequently, the construction of a stellar photometer was undertaken in 1952. The original instrument has since been modified and, in the following pages, is described in its present form.

The stellar photometer comprises five separate units, each of which can be distinguished in the general view shown in Plate XVIII. These units will be described in the following order:

(1) The Optical Column
(2) The Photomultiplier Unit
(3) The Pre-Amplifier and Control Chassis
(4) The Strip-Chart Recorder
(5) The Power Supply

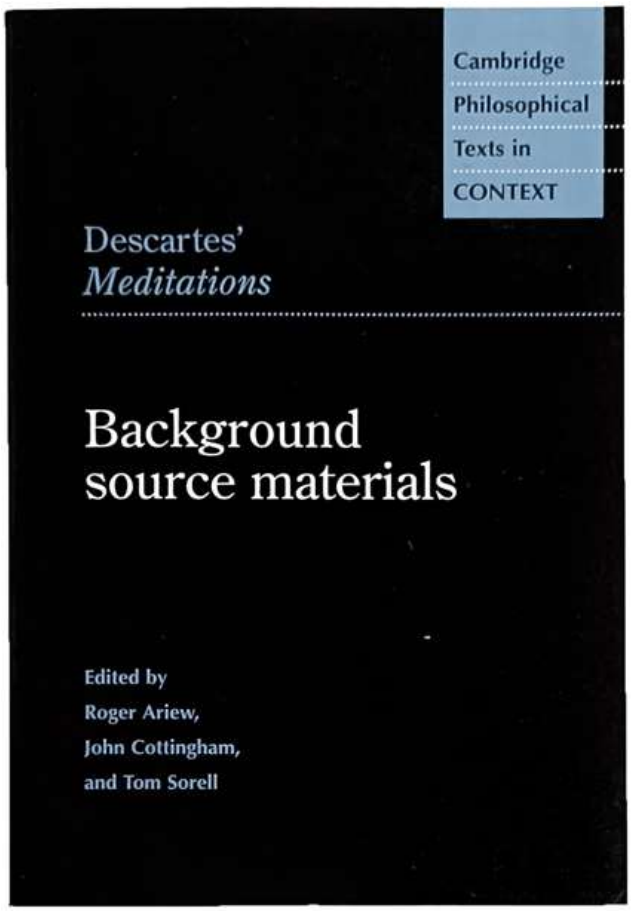
305

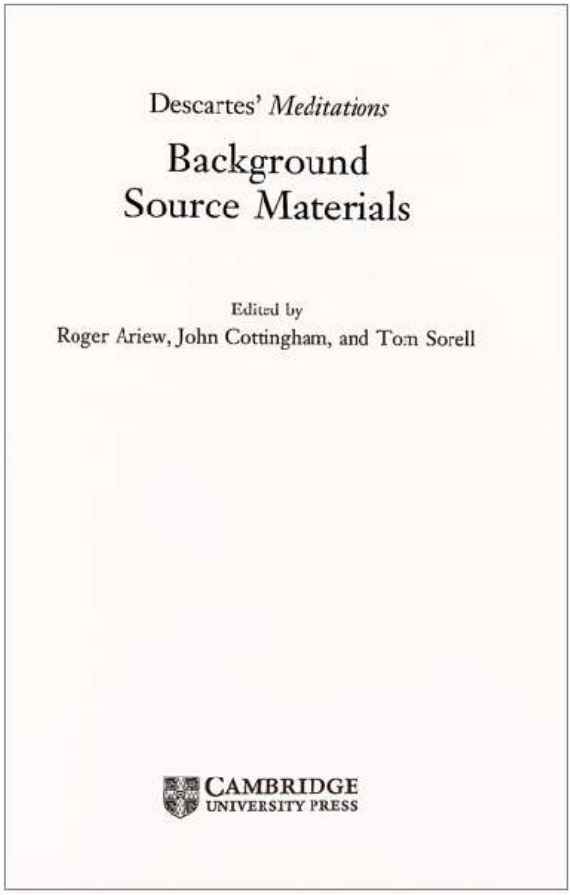
78121—1

78. **ARGYLE, P. E.** *"The stellar photometer of the Dominion Astrophysical Observatory."* Offprint from: *Publications of the Dominion Astrophysical Observatory, Victoria, B.C.*, Vol. X, No. 14. Ottawa: Edmond Cloutier, 1957. ¶ 4to. 305-321 pp. 2 plates, 9 figs., 2 tables. Printed wrappers. Fine. S5890

$ 6

ABSTRACT: "A multi-colour photoelectric stellar photometer using an EMI 0091 photomultiplier tube has been constructed and fitted to the Cassegrainian focus of the 72-inch telescope, Deflections are recorded on a Brown strip-chart recorder. The photometer has performed well down to the magnitude limit of visual guiding The optical and electrical design of the photometer is described in detail and its performance is illustrated by means of some results obtained by observation of the faint eclipsing binary UX Ureae Majoris INTRODUCTION In recent years there has been a growing need for photometric data to support and supplement some of the spectrographic observations carried out at this Observatory. The colours of the B stars on the galactic rotation program, for instance, are required at one step in the process of obtaining the distances necessary for correlation of the radial velocity results, and other needs for photometry have arisen occasionally in connection with spectroscopic binaries, stars of special interest, etc. Consequently, the construction of a stellar photometer was undertaken in 1952. The original instrument has since been modified and, in the following pages, is described in its present form."



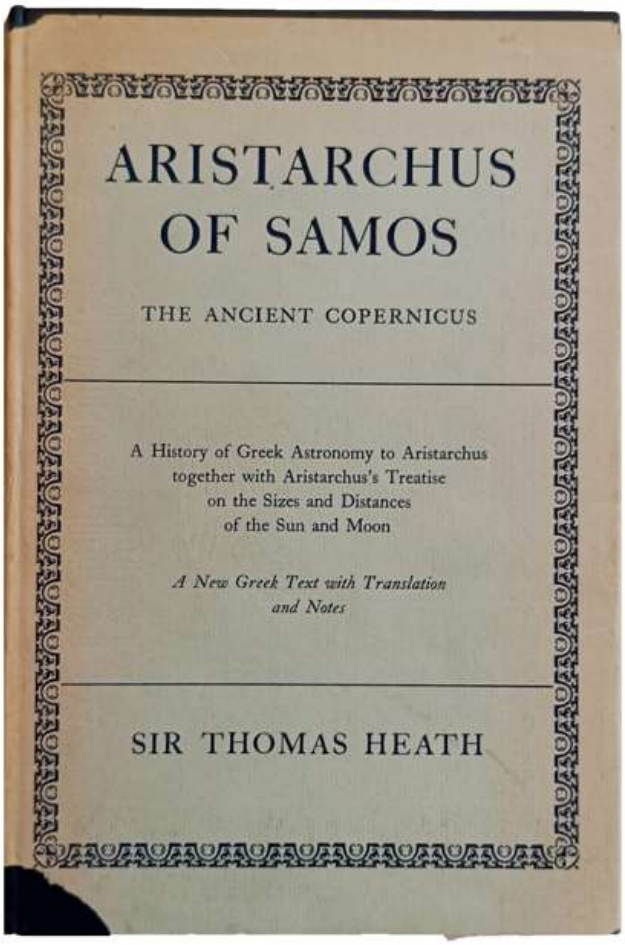


79. [**DESCARTES, René** (1596-1650)] **ARIEW, Roger** (1948-); **John COTTINGHAM** (1943-); **Tom SORELL** (1951-) (eds.). *Descartes' meditations. Background source materials*. Cambridge: Cambridge University Press, (1998). ¶ 8vo. xviii, 270 pp. Printed wrappers. Ownership signature of David C. Lindberg. S10659

$ 32

"Cottingham introduced trialism as an alternative interpretation of the mind–body dualism of Descartes. Although composed of two substances, mind and body, the human being possesses distinctive attributes in its own right (including sensations, passions, emotions), and these form a third category, that cannot be reduced to thought or extension. Cottingham has also argued that Descartes's view of animals as 'machines' does not have the reductionistic implications commonly supposed. Finally, Cottingham has explored the importance of Descartes as a moral philosopher, with a comprehensive picture of the good life that draws both on his scientific work (in physiology and psychology) and also on the theistic outlook that informs all his philosophy. Cottingham is co-editor and translator of the three-volume Cambridge edition of *The Philosophical Writings of Descartes*."

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.



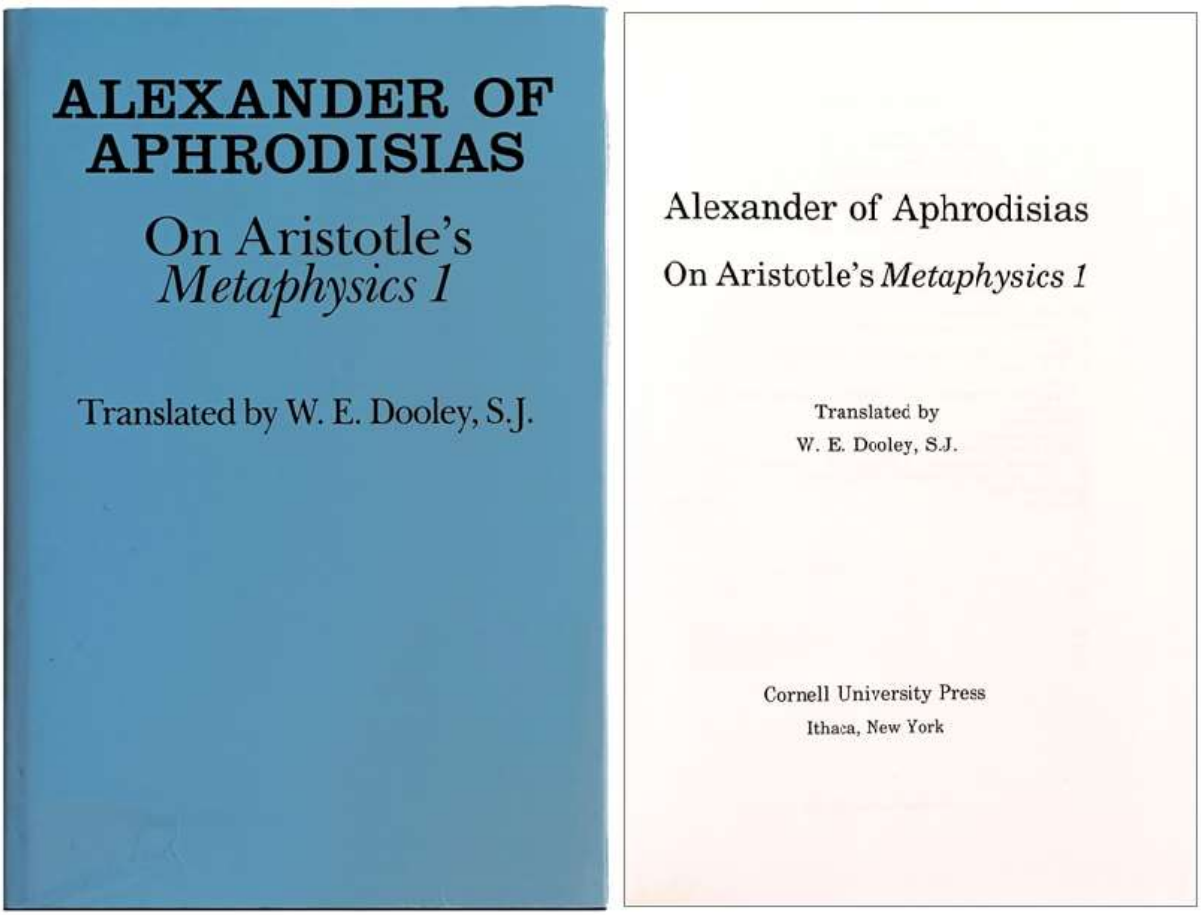
80. [**ARISTARCHUS of Samos** (c. 310 – c. 230 BC)] **Sir Thomas HEATH** (1861-1940). *Aristarchus of Samos: The Ancient Copernicus. A History of Greek Astronomy to Aristarchus together with Aristarchus' Treatise on the Sizes and Distances of the Sun and Moon. A new Greek text with translation and notes.* Oxford: Clarendon Press, (1966). ¶ Reprint. 8vo. vi, 425 pp. 34 figures, index. Navy blue cloth, gilt-stamped spine, dust-jacket; jacket spine ends missing pieces, front corner slightly torn. Bookplate. Very good in good jacket. S11029

$ 50

Aristarchus of Samos was an ancient Greek astronomer and mathematician who presented the first known heliocentric model that placed the Sun at the center of

the universe, with the Earth revolving around the Sun once a year and rotating about its axis once a day.

Sir Thomas Little Heath KCB KCVO FRS FBA was a British civil servant, mathematician, classical scholar, historian of ancient Greek mathematics, translator, and mountaineer. He was educated at Clifton College. Heath translated works of Euclid of Alexandria, Apollonius of Perga, Aristarchus of Samos, and Archimedes of Syracuse into English.



81. [**ARISTOTLE**] **Alexander of Aphrodisias**. *On Aristotle's Metaphysics 1. Translated by William E. Dooley*. Ithaca, NY: Cornell University Press, 1989. ¶ Series: *Ancient Commentators on Aristotle*. 8vo. 240 pp. Navy cloth, gilt-stamped spine title, dust jacket. Ink ownership signature of David C. Lindberg. Fine. S12066

$ 30

Translation of Alexander of Aphrodisias' *Hypommnema eis to meizon* . . . The full work was published in 5 volumes, this offered being the first issued volume.

"In Alexander's metaphysical writings, including his commentaries, we find some of the major points of ancient discussion concerning the core, not so much of metaphysics, but of Aristotelian metaphysics. At times, Alexander seems most focused on criticizing contemporaries from an Aristotelian perspective, and at times instead to defend Aristotelianism by elaborating in original ways that address possible criticisms."

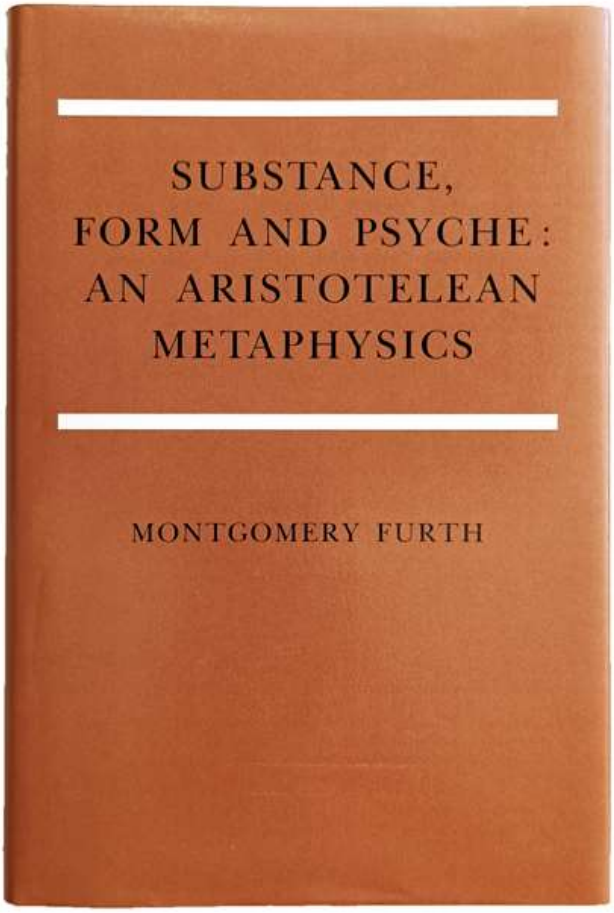
"As an example of the second, apologetic feature: in his commentary on the *Metaphysics*, we find an elaboration of the question whether metaphysics can be a demonstrative science. Alexander makes an effort to show that it is in fact a demonstrative science in the sense of Aristotle's *Posterior Analytics*, i.e. with its own genus or subject matter, axioms, and derived theorems. As part of this effort, he understands the subject matter of metaphysics, being qua being, as referring to all beings, insofar as they are existent (Bonelli 2001). He also reshapes the concept of common notions, in such a way that in metaphysics common notions may serve as axioms, i.e. provide its fundamental principles. Common notions, which started out, in Aristotle and later the Stoics, as shared starting points for inquiry and argument, are expanded by Alexander to incorporate features of dialectical starting points, points about which there is general agreement, and scientific axioms. They are not innate, but immediately evident to everyone, and serve as indemonstrable starting points for scientific knowledge — the prime example for metaphysics being the principle of non-contradiction (de Haas 2021)." – Frede, Dorothea and Marije Martijn, "Alexander of Aphrodisias", *The Stanford Encyclopedia of Philosophy* (Summer 2024 Edition).

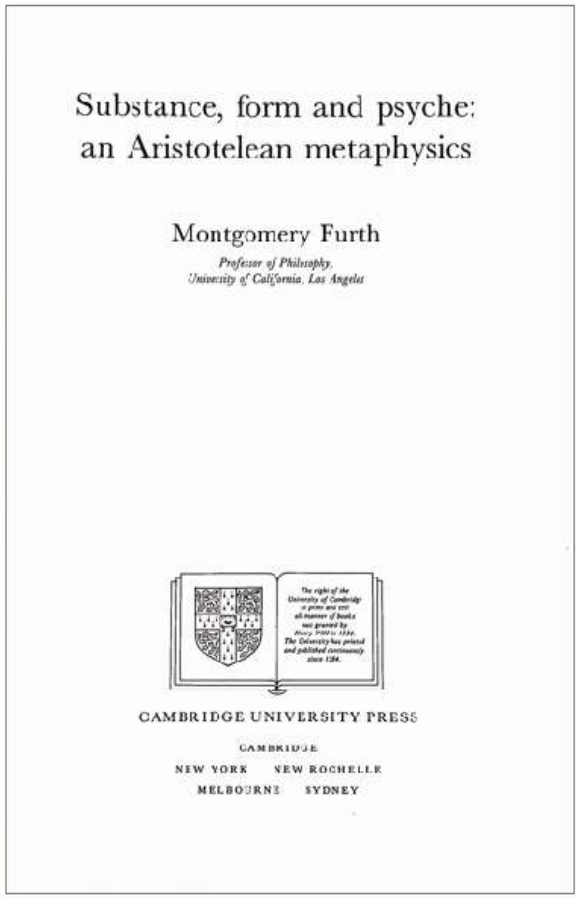
FROM THE CONTENTS: "In the first two chapters of Metaphysics 1, Aristotle asks what is philosophy and in particular philosophical wisdom (sophia), and how is it related to philosophy? He answers that it is a knowledge of causes, or rather of explanations, including God, who is a cause or explanation in one of the few distinguishable ways. The remaining eight chapters examine the account given of cause or explanation by his predecessors."

"Alexander of Aphrodisias was the greatest expositor and elabor ator of Aristotle's philosophy. But his commentary on this book has a curious feature: over half is devoted to the two chapters in which Aristotle discusses Plato. From this we learn not only about Alex ander, but also far more than we could from Aristotle's text itself about Aristotle, Plato and Plato's Academy. Aristotle's battery of objections against the theory of Ideas is spelled out, with fragmen tary quotations and paraphrases from four of his lost works, On the Ideas, On the Good, On Philosophy and On the Pythagoreans. There is an expanded account of the

'unwritten doctrines' which Plato developed late in his career, according to which the Ideas are numbers, namely the One and the Indefinite Dyad." – editors.

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.





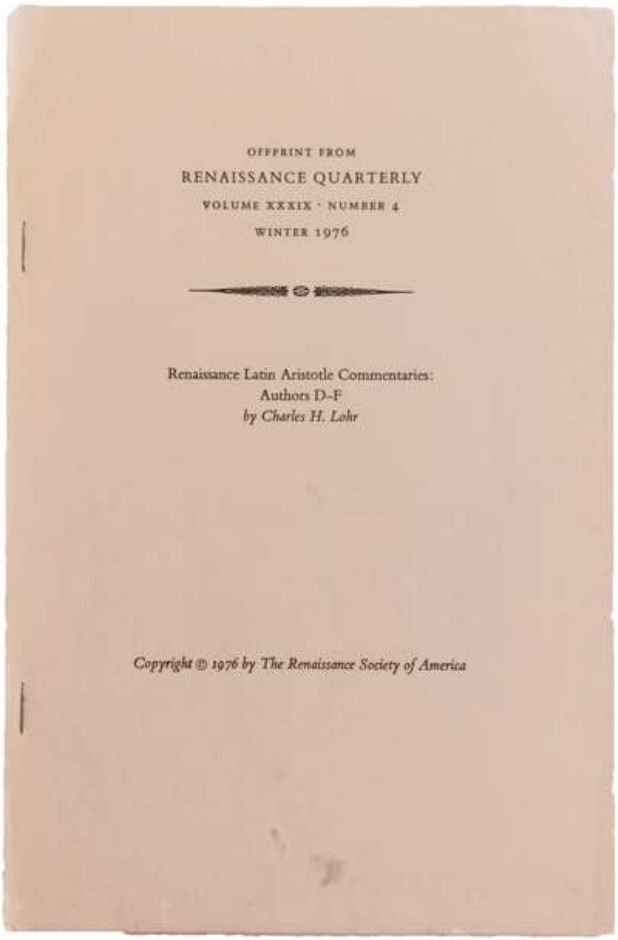
82. [**ARISTOTLE**] **Montgomery FURTH** (1933-1991). *Substance, Form and Psyche: An Aristotelean Metaphysics*. Cambridge: Cambridge University Press, 1988. ¶ FIRST EDITION. 8vo. xiv, 300 pp. Diagrams, indices. Brown cloth, black-stamped spine, dust-jacket; jacket foot slightly torn. Ownership signature. Very good. S10371

$ 30

"The importance of the study of nature, and particularly of biology, in Aristotle's philosophy should be news to nobody. Aristotle's conceptions of substance, causation and change are dominated by the idea that whole living creatures are the

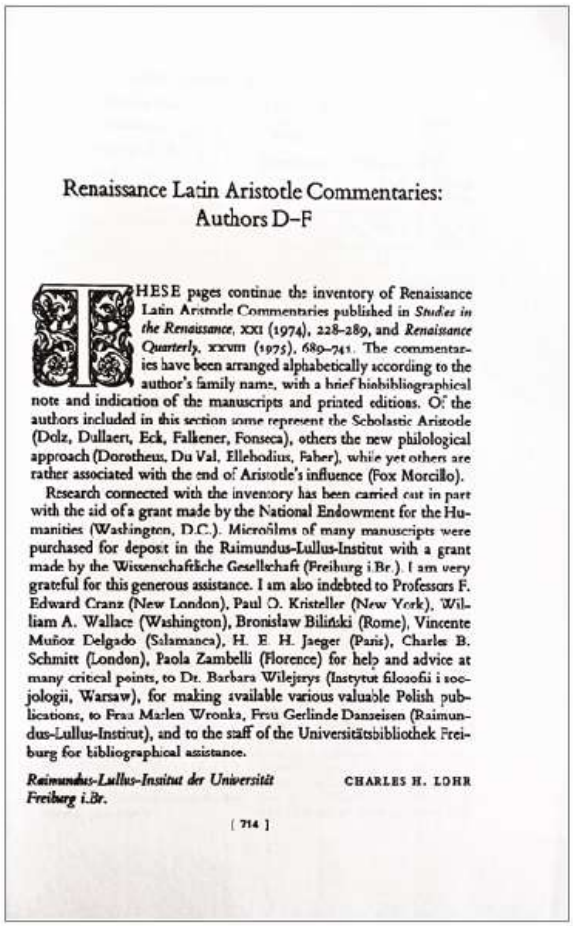
most fundamental objects of study. His ideas about the nature of the most appropriate modes of study run with this view of the world. Therefore Aristotle is a philosopher for whom metaphysics must be the sovereign study; but the method of metaphysics will be strongly influenced by biology. Metabiology' would be a more suitable term than 'metaphysics', were it not for the fact that the discovery of metaphysics-the thing and its name-ranks as one of Aristotle's most single achievements."

"In recent decades a number of leading Aristotelian interpreters, notably Peck, Balme, Grene and Pellegrin, have emphasized the importance of the biological works to any proper study of Aristotle. Such an estimate is demanded not simply by the huge compass of his biological writings, but also because of the evident centrality of biological concepts and examples in discussions which profess to treat quite generally of substance and reality. For Aristotle it is at best doubtful-and very possibly false-that elemental stuffs, animal limbs and, most important, artefacts are substances. Only complete living animals will certainly qualify as substances. . ."



OFFPRINT FROM
RENAISSANCE QUARTERLY
VOLUME XXXIX · NUMBER 4
WINTER 1976

Renaissance Latin Aristotle Commentaries:
Authors D–F
by Charles H. Lohr



Renaissance Latin Aristotle Commentaries:
Authors D–F

THESE pages continue the inventory of Renaissance Latin Aristotle Commentaries published in *Studies in the Renaissance*, XXI (1974), 228–289, and *Renaissance Quarterly*, XXVIII (1975), 689–741. The commentaries have been arranged alphabetically according to the author's family name, with a brief biobibliographical note and indication of the manuscripts and printed editions. Of the authors included in this section some represent the Scholastic Aristotle (Dolz, Dullaert, Eck, Falkener, Fonseca), others the new philological approach (Dorotheus, Du Val, Ellebodius, Faber), while yet others are rather associated with the end of Aristotle's influence (Fox Morcillo).

Research connected with the inventory has been carried out in part with the aid of a grant made by the National Endowment for the Humanities (Washington, D.C.). Microfilms of many manuscripts were purchased for deposit in the Raimundus-Lullus-Institut with a grant made by the Wissenschaftliche Gesellschaft (Freiburg i.Br.). I am very grateful for this generous assistance. I am also indebted to Professors F. Edward Cranz (New London), Paul O. Kristeller (New York), William A. Wallace (Washington), Bronisław Biliński (Rome), Vincente Muñoz Delgado (Salamanca), H. E. H. Jaeger (Paris), Charles B. Schmitt (London), Paola Zambelli (Florence) for help and advice at many critical points, to Dr. Barbara Wilejczyk (Instytut filozofii i socjologii, Warsaw), for making available various valuable Polish publications, to Frau Marlen Wronka, Frau Gerlinde Danzeisen (Raimundus-Lullus-Institut), and to the staff of the Universitätsbibliothek Freiburg for bibliographical assistance.

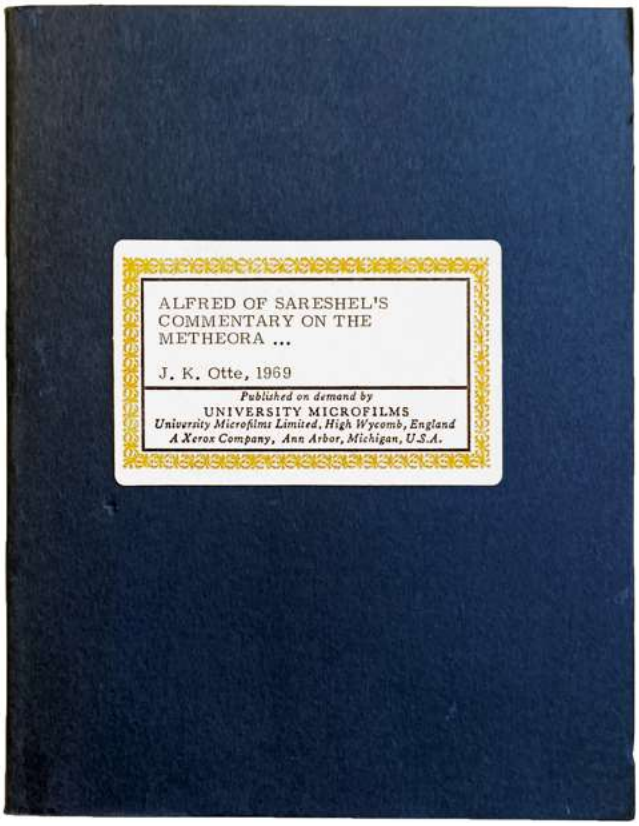
Raimundus-Lullus-Institut der Universität Freiburg i.Br. CHARLES H. LOHR

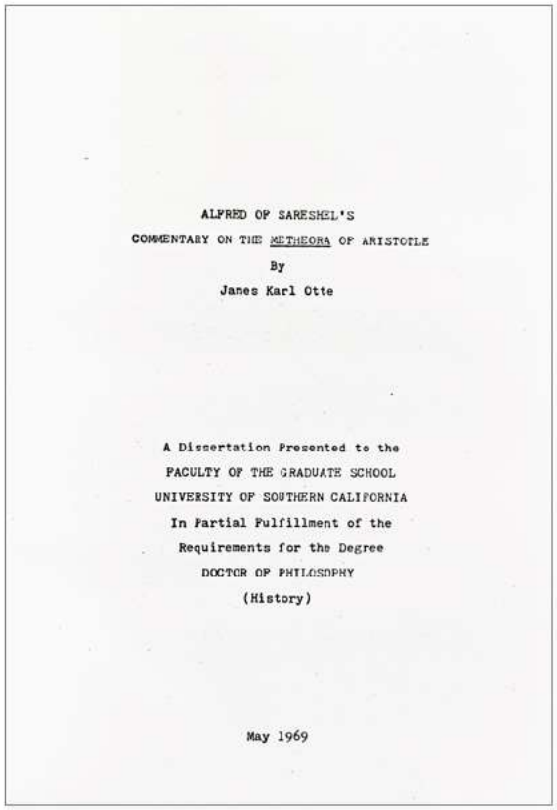
83. [**ARISTOTLE**] **Charles H. LOHR** (1925-2015). *Renaissance Latin Aristotle Commentaries: Authors D-F*. New York: The Renaissance Society

of America, 1976. ¶ Offprint. Series: *Renaissance Quarterly*, Vol. XXXIX, No. 4. 8vo. 714-46 pp. Stapled printed wrappers; front cover slightly scuffed. Very good. S10375

$ 3

Lohr "became one of the world's foremost authorities on Medieval Western Aristotelianism." "In an incredible academic accomplishment, he catalogued nearly all the Latin commentaries on the works of Aristotle from the Middle Ages to the Renaissance. "It was a great intellectual project and became an incredible work of reference," said Jesuit Father Joseph E. Lienhard, professor of theology and the journal's current managing editor. "He considered the collection to be the scholarly achievement of his life."" – *In Memoriam*, Lohr, Charles H. (Father), Jesuits.




ALFRED OF SARESHEL'S
COMMENTARY ON THE METHEORA OF ARISTOTLE
By
James Karl Otte

A Dissertation Presented to the
FACULTY OF THE GRADUATE SCHOOL
UNIVERSITY OF SOUTHERN CALIFORNIA
In Partial Fulfillment of the
Requirements for the Degree
DOCTOR OF PHILOSOPHY
(History)

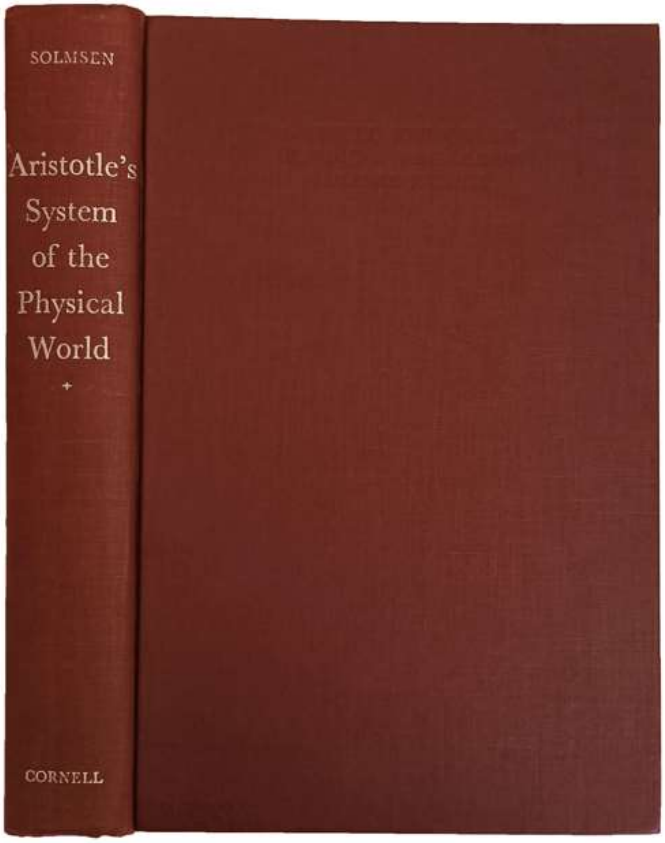
May 1969

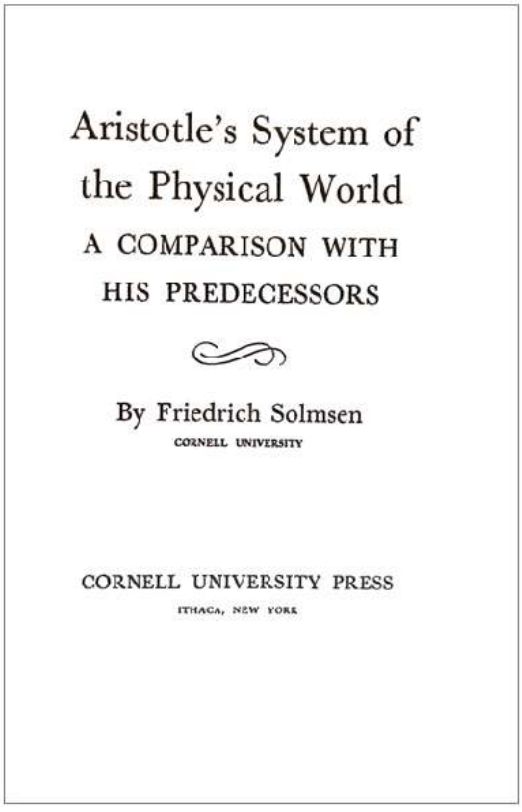
84. [**ARISTOTLE**] **OTTE, James Karl**. *Alfred of Sareshel's commentary on the Metheora of Aristotle. A dissertation presented to the faculty of the Graduate School, University of Southern California. May 1969*. Ann Arbor, MI: University Microfilms, 1972. ¶ 8vo. ii, 154 pp. Paper wrappers, printed paper label. Fine. S10669

$ 12

University Microfilms reprint. "In the long process of assimilation into Latin of the Greek and Arabic corpus of natural philosophy, there was a constant tendency for earlier material to be incorporated into later and thus lose its identity. But the

earlier works often persisted, even though in disguised form, and constituted a permanent element of our intellectual heritage. Sometimes modern scholarship has been able to rescue an earlier author from anonymity and to delineate his significance in the growth of Western thought. One such author is Alfred of Sareshel, also known as Alfredus Anglicus. The rediscovery of Alfred has been the work of many scholars, whose writings have shown Alfred to have been a translator from the Arabic, a commentator on Aristotle's natural philosophy, and the author of a treatise *De motu cordis* which was incorporated into the curricula of many universities in the thirteenth century. Alfred also emerges as one of the most important and oldest witnesses for the reception of the natural philosophy of Aristotle and for the oldest Greek-La tin translations. He has been called by D. A. Callus "a forerunner of the great commentators," and CI. Baeumker asserts that his knowledge of Aristotle is unmatched by any schoolman of the early thirteenth century. The purpose of this paper is to show Alfred's role in the reacquisition of Aristotle's natural philosophy by examining his commentary on Aristotle's *Metheora* to show specifically the sources for Alfred's commentary, Latin, Greek, Arabic; and to indicate how he employed them." – Otte.





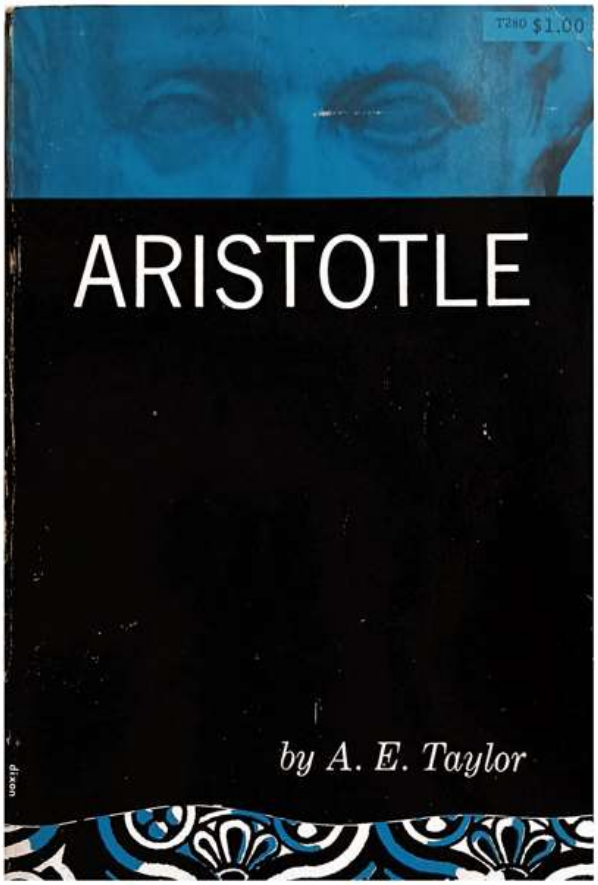
85. [**ARISTOTLE**] **SOLMSEN, Friedrich** (1904-1989). *Aristotle's System of the Physical World, a Comparison with his Predecessors.* Ithaca: Cornell University Press, (1960). ¶ First edition. Series: *Cornell Studies in Classical*

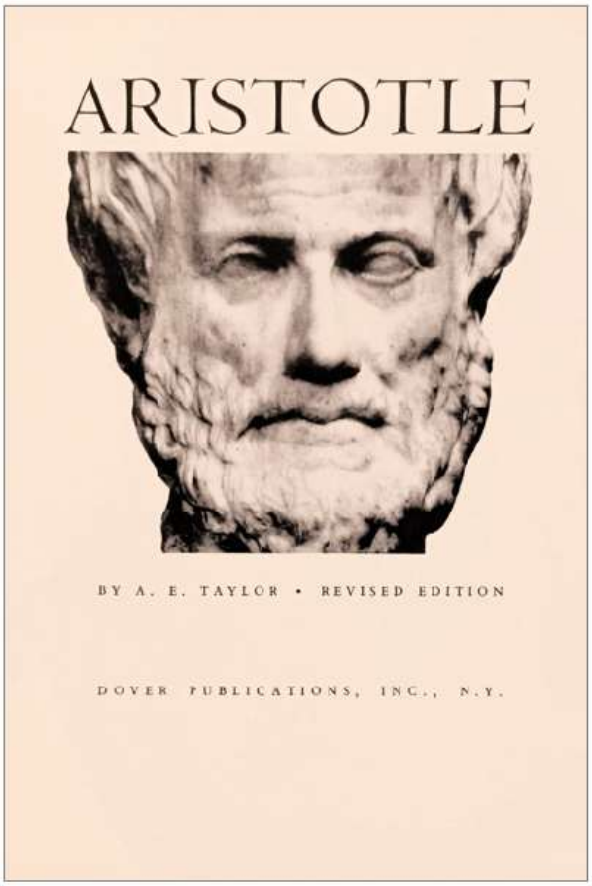
Philology, Vol. XXXIII. 8vo. xiv, 468 pp. Indexes. Maroon blind and silver-stamped cloth; lightly rubbed, else fine. Scarce. [S12397]

$ 50

Reviewed in *The Philosophical Review*, Vol. 71, No. 4, Oct., 1962. Hessenbruch, Arne, *Reader's Guide to the History of Science*, Routledge, Dec 16, 2013, p. 40.

Friedrich W. Solmsen was a philologist and professor of classical studies, producing some 150 books, articles, and reviews. He was influential in classical studies, including Greek tragedy, Aeschylus, Greek philosophy, Plato and Aristotle. For a long-time he was the Moses Slaughter Professor of Classical Studies at the University of Wisconsin–Madison.



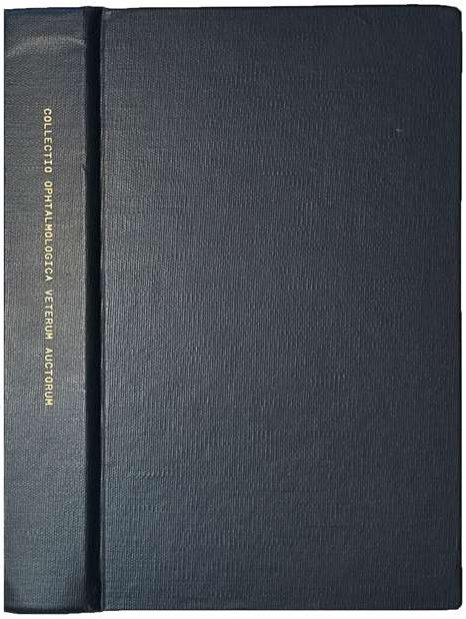


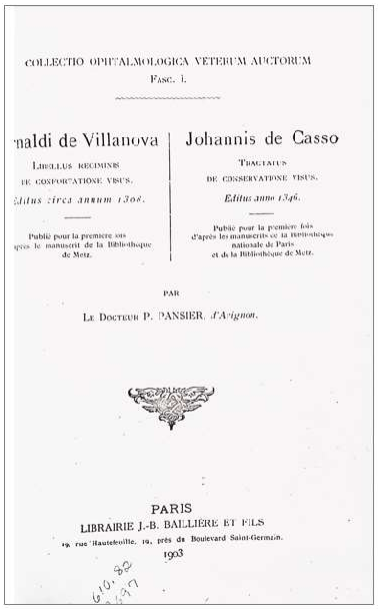
86. [**ARISTOTLE**] **A.E. TAYLOR** (1869-1945). *Aristotle. Revised edition.* New York: Dover, 1955. ¶ Sm. 8vo. 118 pp. Index. Printed wrappers. Ownership signature of Roger Hahn. Very good. RH1519

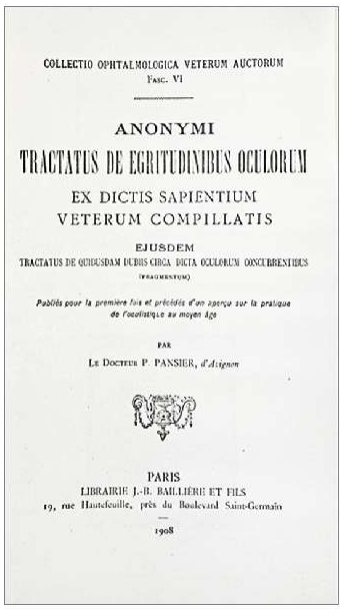
$ 4

Alfred Edward Taylor, "usually cited as A. E. Taylor, was a British idealist philosopher most famous for his contributions to the philosophy of idealism in his writings on metaphysics, the philosophy of religion, moral philosophy, and the

scholarship of Plato. He was a fellow of the British Academy (1911) and president of the Aristotelian Society from 1928 to 1929."







87. **ARNALDI DE VILLANOVA [Arnaldus de Villa Nova]** (c. 1240-1311)**; JOHANNIS DE CASO**. *Collectio Ophtalmologica Veterum Auctorum*, Fasc. 1. Edited by P. Pansier. [Photocopied facsimile]. [Paris: Librairie J. B. Baillière et Fils, 1903, 1908, 1909-33]. ¶ Thick 8vo. 379, [vi], 221, [6] pp. Navy blue cloth, gilt-stamped spine; spine slightly dented, rear cover a bit scuffed. Very good. S10378

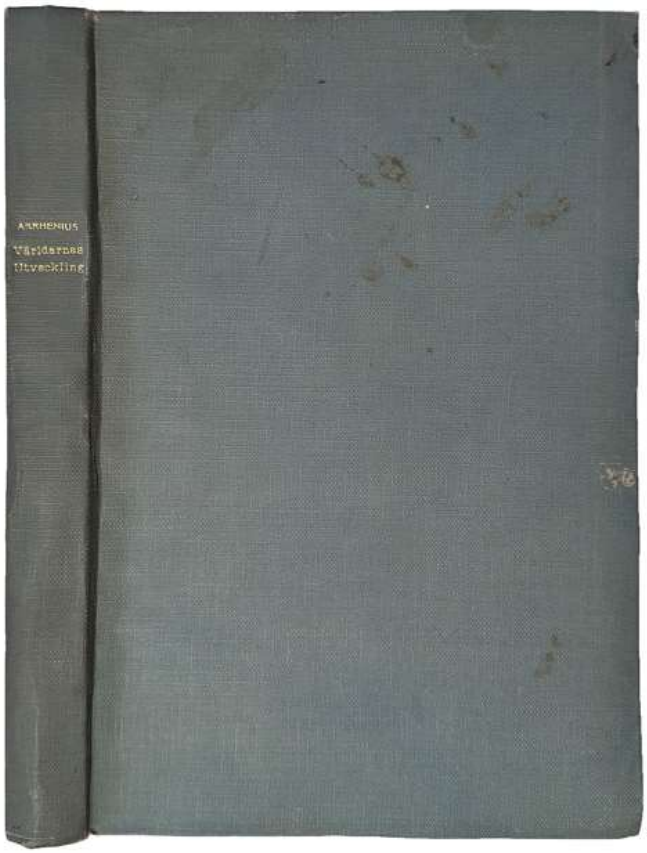
$ 20

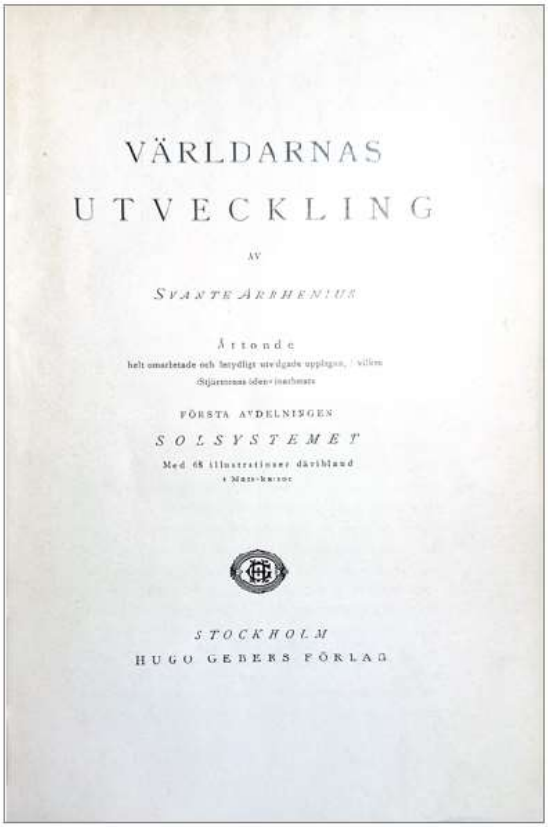
Photocopied facsimile of this study by Pansier of the ophthalmological contributions of Arnaldo de Villanova and others, including Johannis de Casso.

CONTENTS: I. Arnaldi de Villanova Libellus regiminis de confortatione visus. Johannis de Casso, Tractatus de conservatione visus; II. Congregatio, sive Liber de oculis quem compilavit Alcoatin, Christianus Toletanus; III. Epistola Ihesu filii Haly de cognitione infirmitatum oculorum, sive Memoriale oculariorum quod compilavit Ali Ben Issa; IV. Magistri David Armenici, Compilatio in libros de Oculorum Curationibus accanamosali . . . ; V: Magistri Zacharie, Tractatus de Passionibus Oculorum . . . 1143-1180; VI: Anonymi. Tractatus de Egritudinibus Oculorum ex dictis sapientium veterum compillatis; VII. Constantini monachi montiscassini Liber de oculis. Galieni Littere ad Corisium de morbis oculorum et eorum curis.

Dr. Pierre Pansier (1864-1934), ophthalmologist, was from Avignon. He developed a passion for the history of medicine, the history of charitable institutions, the

history of Avignon and Comtat Venaissin and the history of the Provençal language and folklore.



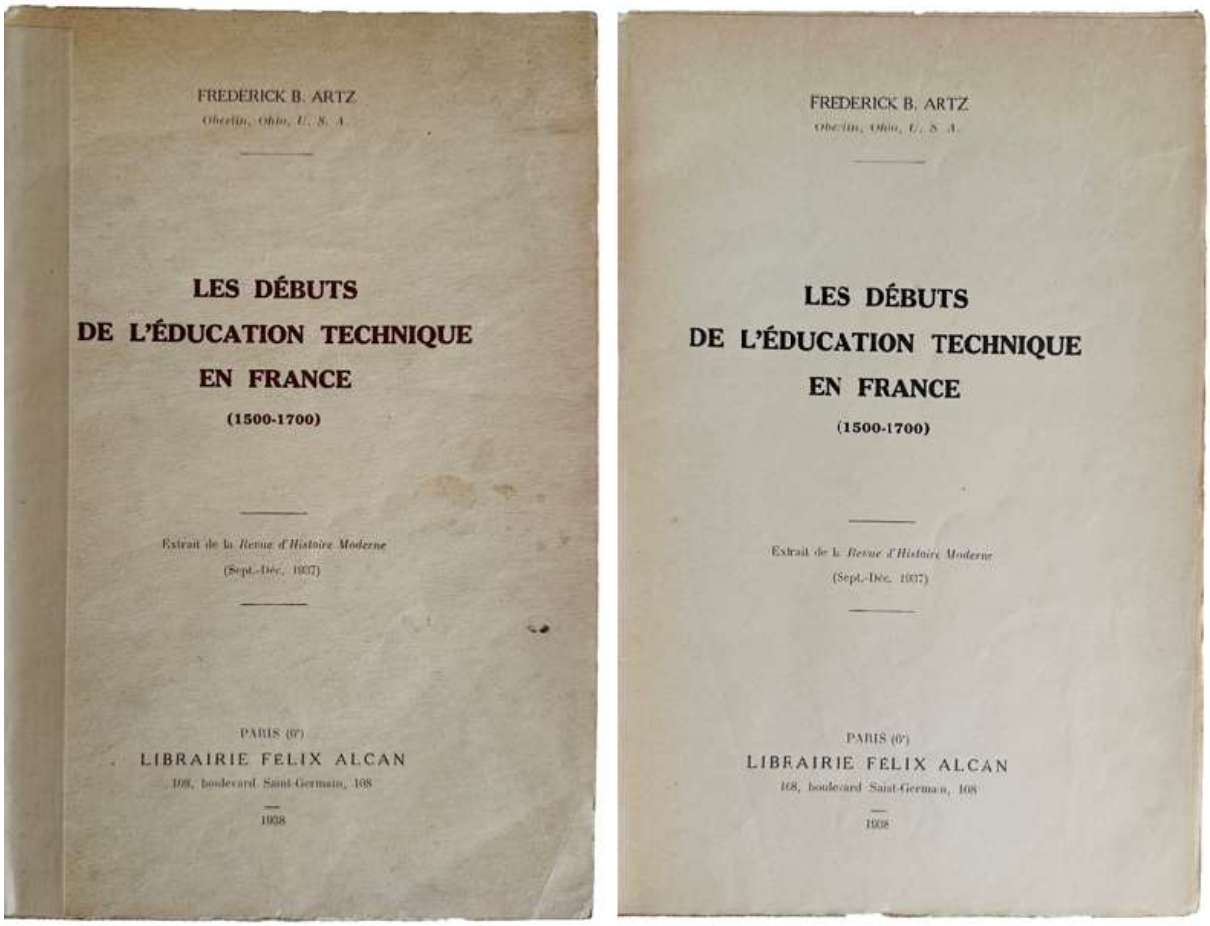

VÄRLDARNAS
UTVECKLING
AV
SVANTE ARRHENIUS
Årtonde
FÖRSTA AVDELNINGEN
SOLSYSTEMET
STOCKHOLM
HUGO GEBERS FÖRLAG

88. **ARRHENIUS, Svante** (189-1927). *Varldarnas Utveckling*. Stockholm: Hugo Gebers, (1924). ¶ 8vo. xiv, 291 pp. Swedish text. Photos, 68 illus., 2 Mars maps; pages uncut. Gilt stamped gray cloth; inner hinge starting, extremities slightly rubbed. Very good. [S7444]

$ 10

A much-expanded edition of this work, 'The development of the worlds' on the heavens, solar dust in the Earth's atmosphere, the Aurora Borealis, solar radiation, etc. A second section (315 pages) was issued in 1929 relating to the stellar world.

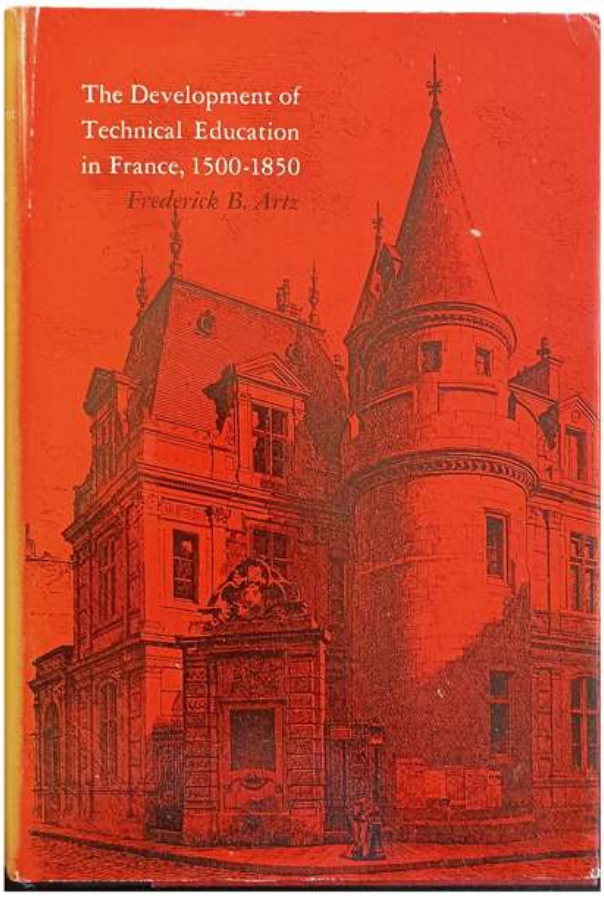
Svante August Arrhenius was a Swedish scientist. Originally a physicist, but often referred to as a chemist, Arrhenius was one of the founders of the science of physical chemistry. He received the Nobel Prize for Chemistry in 1903, becoming the first Swedish Nobel laureate.

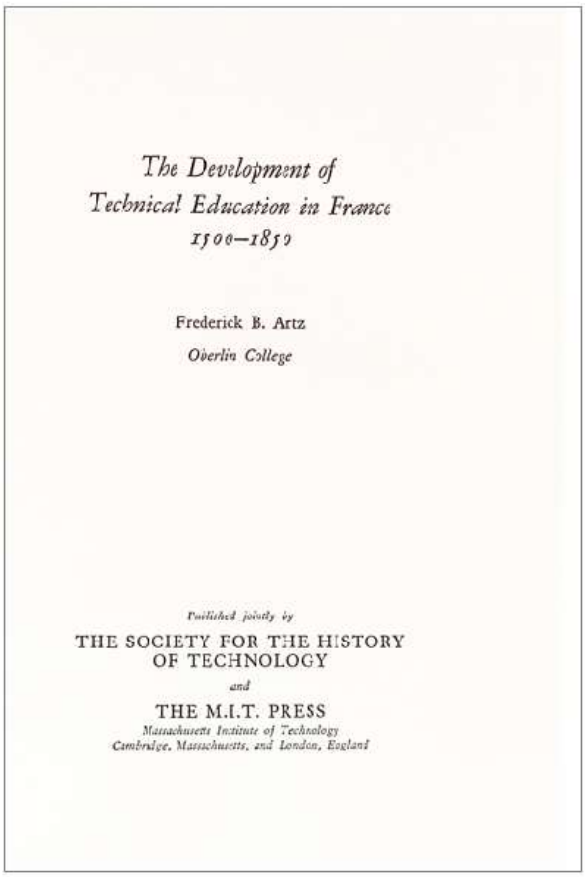


89. **ARTZ, Frederick B**. (1894-1983). *Les débuts de l'éducation technique en France (1500-1700).* Paris: Felix Alcan, 1938. ¶ Extract: *Revue d'Histoire Moderne*, 1937. 255 x 186 mm. 8vo. 55 pp. Printed wrappers, library over-boards. Guerlac stamp. Very good. [S1188]

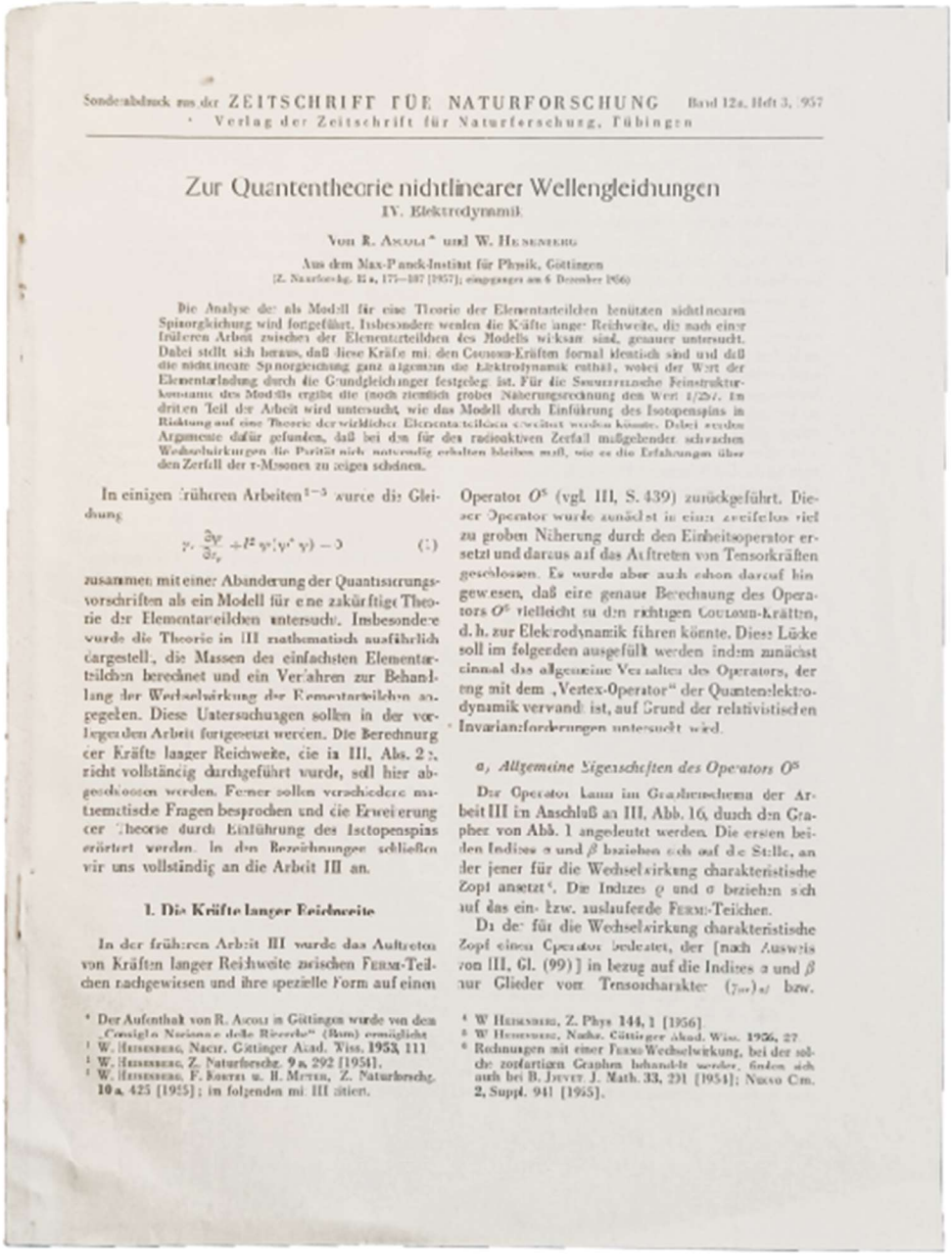
$ 10

Professor Frederick Binkerd Artz was a French and medieval historian at Oberlin College. He specialized in scientific and philosophic currents that can be traced from the Middle Ages to modern thought.





90. **ARTZ, Frederick B**. (1894-1983). *The Development of Technical Education in France 1500-1850*. Cambridge: Society for the History of Technology, (1966). ¶ 208 x 145 mm. 8vo. x, 274 pp. Index. Black cloth-backed red cloth, dust jacket; jacket spine faded. Very good. [S6581] $ 8



Sonderabdruck aus der ZEITSCHRIFT FÜR NATURFORSCHUNG Band 12a, Heft 3, 1957
Verlag der Zeitschrift für Naturforschung, Tübingen

Zur Quantentheorie nichtlinearer Wellengleichungen
IV. Elektrodynamik

Von R. Ascoli* und W. Heisenberg

Aus dem Max-Planck-Institut für Physik, Göttingen
[Z. Naturforsch. 12a, 177–187 [1957]; eingegangen am 6. Dezember 1956]

Die Analyse der als Modell für eine Theorie der Elementarteilchen benützten nichtlinearen Spinorgleichung wird fortgeführt. Insbesondere werden die Kräfte langer Reichweite, die nach einer früheren Arbeit zwischen der Elementarteilchen des Modells wirksam sind, genauer untersucht. Dabei stellt sich heraus, daß diese Kräfte mit den Coulomb-Kräften formal identisch sind und daß die nichtlineare Spinorgleichung ganz allgemein die Elektrodynamik enthält, wobei der Wert der Elementarladung durch die Grundgleichung festgelegt ist. Für die Sommerfeldsche Feinstrukturkonstante des Modells ergibt die (noch ziemlich grobe) Näherungsrechnung den Wert 1/257. Im dritten Teil der Arbeit wird untersucht, wie das Modell durch Einführung des Isotopenspins in Richtung auf eine Theorie der wirklichen Elementarteilchen erweitert werden könnte. Dabei werden Argumente dafür gefunden, daß bei den für den radioaktiven Zerfall maßgebender schwachen Wechselwirkungen die Parität nicht notwendig erhalten bleiben muß, wie es die Erfahrungen über den Zerfall der τ-Mesonen zu zeigen scheinen.

In einigen früheren Arbeiten[1–3] wurde die Gleichung

$$\gamma_\nu \frac{\partial \psi}{\partial x_\nu} + l^2 \psi (\bar{\psi} \psi) = 0 \qquad (1)$$

zusammen mit einer Abänderung der Quantisierungsvorschriften als ein Modell für eine zukünftige Theorie der Elementarteilchen untersucht. Insbesondere wurde die Theorie in III mathematisch ausführlich dargestellt, die Massen der einfachsten Elementarteilchen berechnet und ein Verfahren zur Behandlung der Wechselwirkung der Elementarteilchen angegeben. Diese Untersuchungen sollen in der vorliegenden Arbeit fortgesetzt werden. Die Berechnung der Kräfte langer Reichweite, die in III, Abs. 2 c, nicht vollständig durchgeführt wurde, soll hier abgeschlossen werden. Ferner sollen verschiedene mathematische Fragen besprochen und die Erweiterung der Theorie durch Einführung des Isotopenspins erörtert werden. In den Bezeichnungen schließen wir uns vollständig an die Arbeit III an.

1. Die Kräfte langer Reichweite

In der früheren Arbeit III wurde das Auftreten von Kräften langer Reichweite zwischen Fermi-Teilchen nachgewiesen und ihre spezielle Form auf einen Operator O^5 (vgl. III, S. 439) zurückgeführt. Dieser Operator wurde zunächst in einer zweifellos viel zu groben Näherung durch den Einheitsoperator ersetzt und daraus auf das Auftreten von Tensorkräften geschlossen. Es wurde aber auch schon darauf hingewiesen, daß eine genaue Berechnung des Operators O^5 vielleicht zu den richtigen Coulomb-Kräften, d. h. zur Elektrodynamik führen könnte. Diese Lücke soll im folgenden ausgefüllt werden, indem zunächst einmal das allgemeine Verhalten des Operators, der eng mit dem „Vertex-Operator" der Quantenelektrodynamik verwandt ist, auf Grund der relativistischen Invarianzforderungen untersucht wird.

a) *Allgemeine Eigenschaften des Operators O^5*

Der Operator kann im Graphenschema der Arbeit III in Anschluß an III, Abb. 16, durch den Graphen von Abb. 1 angedeutet werden. Die ersten beiden Indizes α und β beziehen sich auf die Stelle, an der jener für die Wechselwirkung charakteristische Zopf ansetzt[4]. Die Indizes ϱ und σ beziehen sich auf das ein- bzw. auslaufende Fermi-Teilchen.

Da der für die Wechselwirkung charakteristische Zopf einen Operator bedeutet, der [nach Auswahl von III, Gl. (99)] in bezug auf die Indizes α und β nur Glieder von Tensorcharakter $(\gamma_\mu)_{\alpha\beta}$ bzw.

* Der Aufenthalt von R. Ascoli in Göttingen wurde von dem „Consiglio Nazionale delle Ricerche" (Rom) ermöglicht.
[1] W. Heisenberg, Nachr. Göttinger Akad. Wiss. 1953, 111.
[2] W. Heisenberg, Z. Naturforschg. 9a, 292 [1954].
[3] W. Heisenberg, F. Kortel u. H. Mitter, Z. Naturforschg. 10a, 425 [1955]; im folgenden mit III zitiert.
[4] W. Heisenberg, Z. Phys. 144, 1 [1956].
[5] W. Heisenberg, Nachr. Göttinger Akad. Wiss. 1956, 27.
[6] Rechnungen mit einer Fermi-Wechselwirkung, bei der solche zopfartigen Graphen behandelt werden, finden sich auch bei B. Jouvet, J. Math. 33, 201 [1954]; Nuovo Cim. 2, Suppl. 941 [1955].

91. **ASCOLI, Von R.**; **Werner HEISENBERG** (1901-1976). *"Zur Quantentheorie nichtlinearer Wellengleichungen. IV. Elektrodynamik."* Offprint from: Tübingen: Zeitschrift für Naturforschung, Band 12 a, Heft 3, 1957. ¶ 4to. (177)-187 pp. Self-wraps. Very good. [S7157]

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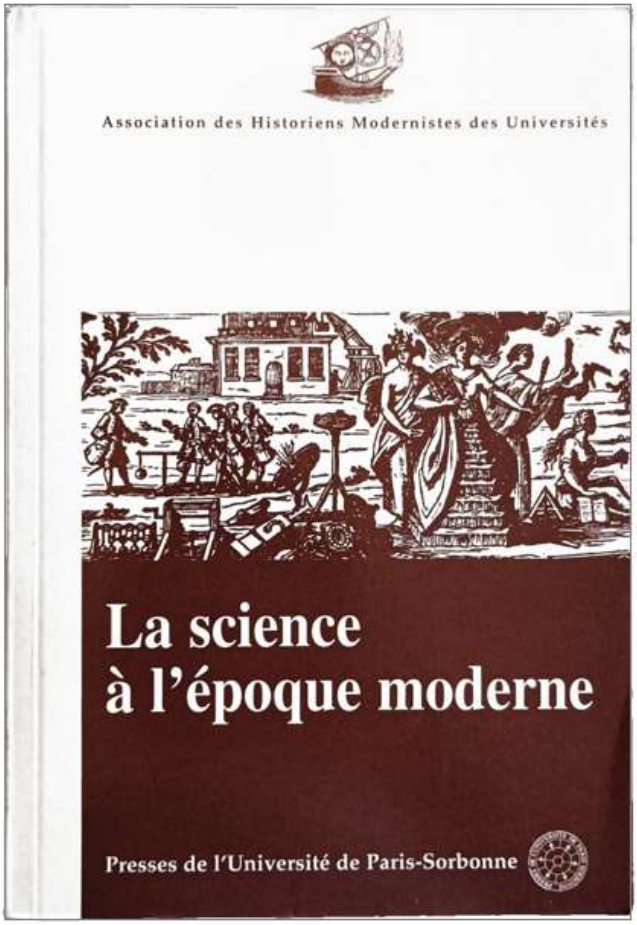
Heisenberg is famous for his work on quantum theory, and his founding of quantum mechanics. He won the 1932 Nobel Prize for physics.



92. **Association des Historiens Modernistes des Universités (France)**. *La Science a l'Epoque Moderne. Actes du Colloque de 1996. Bulletin no. 21*. Paris: Presses de l'Universite de Paris-Sorbonne, 1998. ¶ 8vo. 127 pp. Figs. Printed wrappers. Fine. RH1557

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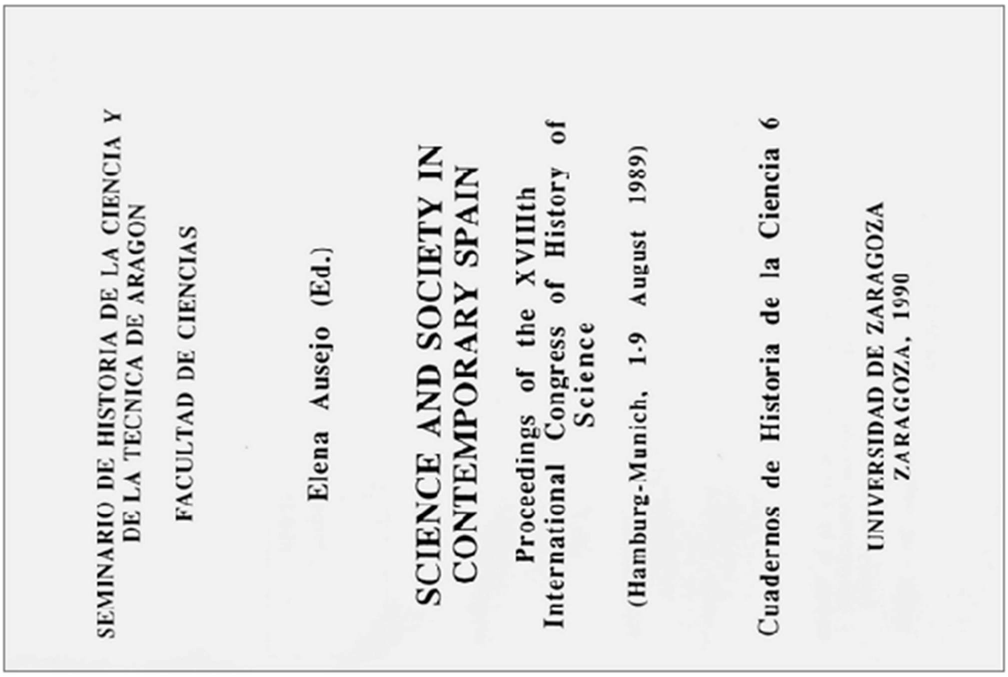
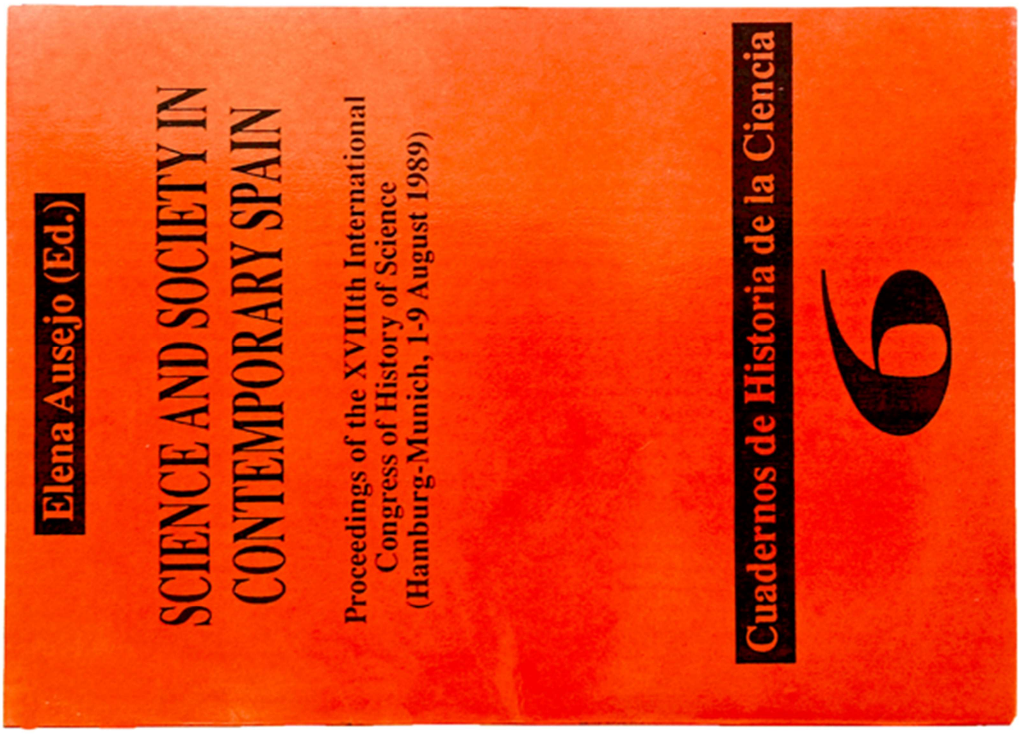
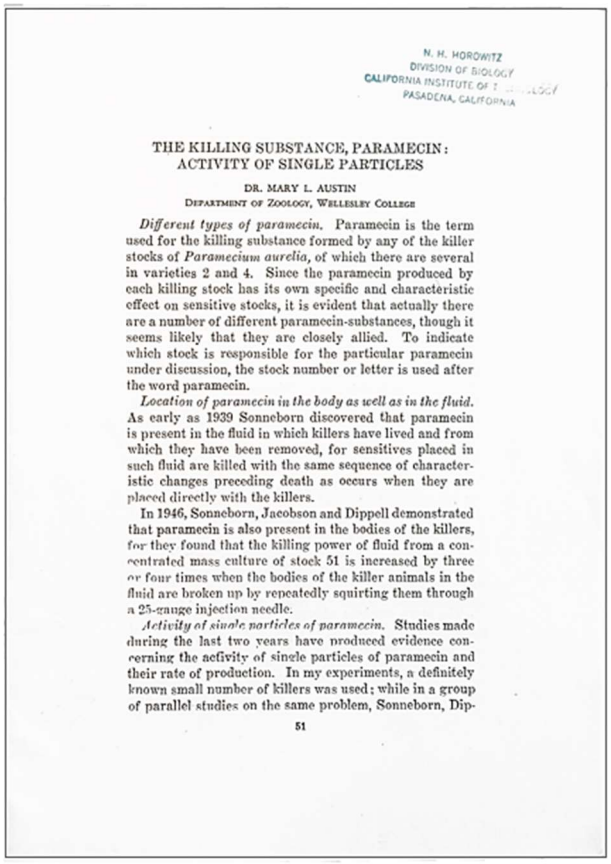




93. **International Congress of History of Science; AUSEJO, Elena** (1961-) [ed.]. *Science and Society in Contemporary Spain: Proceedings of the XVIIIth International Congress of History of Science (Hamburg-Munich, 1-9 August 1989).* Saragossa, Spain: Universidad de Zaragoza, 1996. ¶ Series: *Cuadernos de Historia de la Ciencia*, 6. 8vo. 81, [ads 1] pp. Original red printed wrappers. Burndy Library bookplate. Fine. RARE. [S11280] $ 12



N. H. HOROWITZ
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THE KILLING SUBSTANCE, PARAMECIN: ACTIVITY OF SINGLE PARTICLES

DR. MARY L. AUSTIN
DEPARTMENT OF ZOOLOGY, WELLESLEY COLLEGE

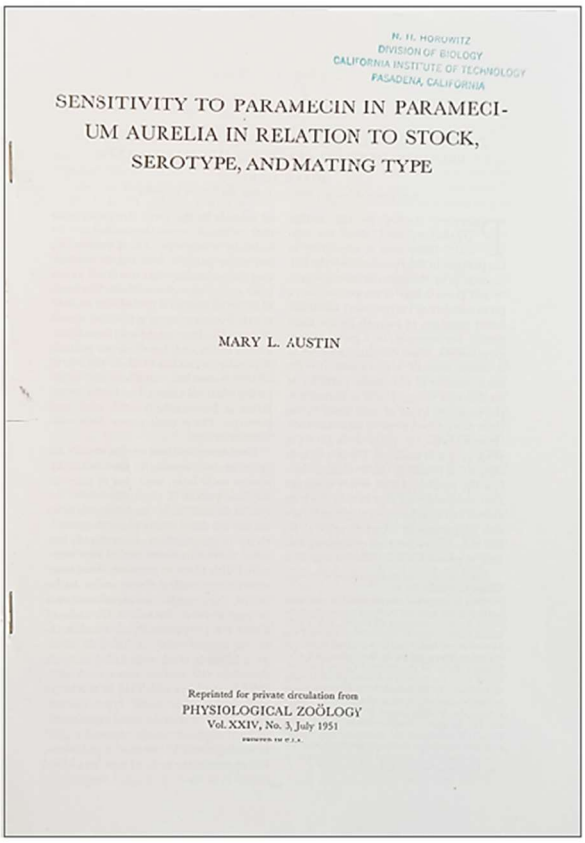
Different types of paramecin. Paramecin is the term used for the killing substance formed by any of the killer stocks of *Paramecium aurelia*, of which there are several in varieties 2 and 4. Since the paramecin produced by each killing stock has its own specific and characteristic effect on sensitive stocks, it is evident that actually there are a number of different paramecin-substances, though it seems likely that they are closely allied. To indicate which stock is responsible for the particular paramecin under discussion, the stock number or letter is used after the word paramecin.

Location of paramecin in the body as well as in the fluid. As early as 1939 Sonneborn discovered that paramecin is present in the fluid in which killers have lived and from which they have been removed, for sensitives placed in such fluid are killed with the same sequence of characteristic changes preceding death as occurs when they are placed directly with the killers.

In 1946, Sonneborn, Jacobson and Dippell demonstrated that paramecin is also present in the bodies of the killers, for they found that the killing power of fluid from a concentrated mass culture of stock 51 is increased by three or four times when the bodies of the killer animals in the fluid are broken up by repeatedly squirting them through a 25-gauge injection needle.

Activity of single particles of paramecin. Studies made during the last two years have produced evidence concerning the activity of single particles of paramecin and their rate of production. In my experiments, a definitely known small number of killers was used; while in a group of parallel studies on the same problem, Sonneborn, Dip-

51



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DIVISION OF BIOLOGY
CALIFORNIA INSTITUTE OF TECHNOLOGY
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SENSITIVITY TO PARAMECIN IN PARAMECIUM AURELIA IN RELATION TO STOCK, SEROTYPE, AND MATING TYPE

MARY L. AUSTIN

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Vol. XXIV, No. 3, July 1951

94. **AUSTIN, Mary L**. Group of 3 offprints. Includes: **AUSTIN**. *"The Killing Substance, Paramecin: Activity of Single Particles."* Offprint from: American Naturalist, vol. LXXXII, [ca. 1947. No place: *American Naturalist*, 1947. 8vo. 51-59 pp. Self wraps. Ownership rubber stamps of Norman Horowitz, California Institute of Technology. Fine.

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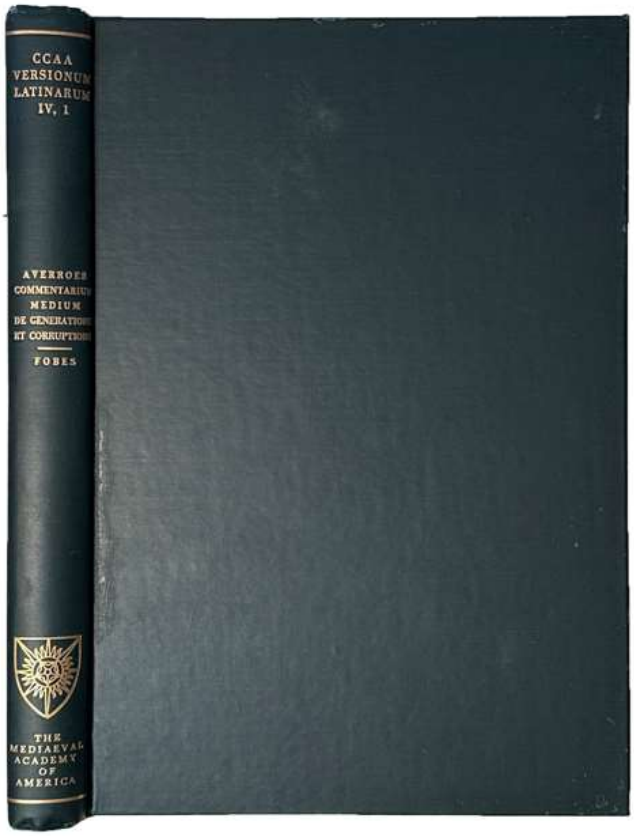
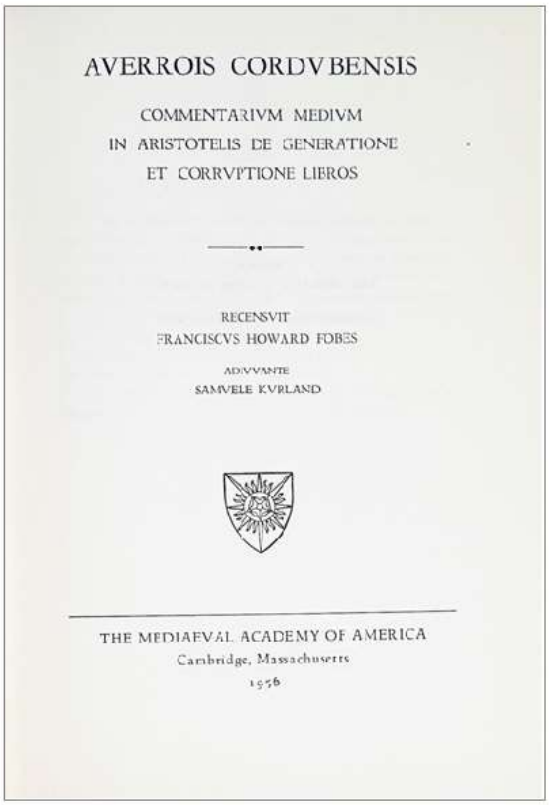
Mary L. Austin was with the Dept. of Zoology, Wellesley College.

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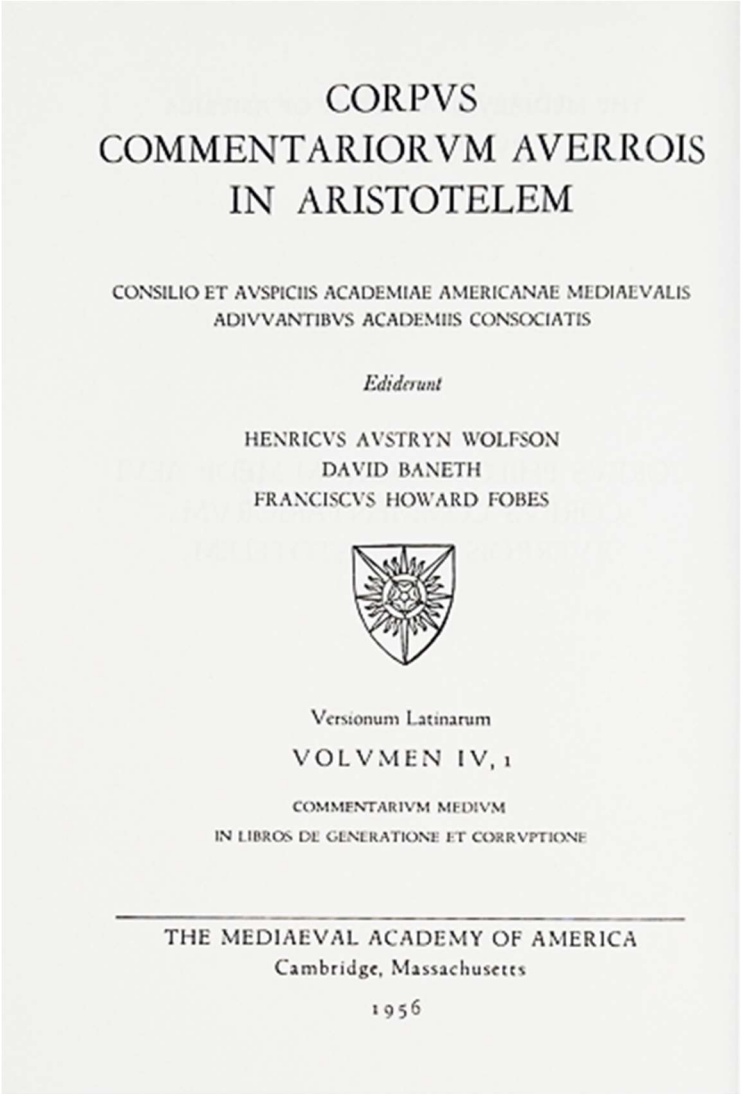

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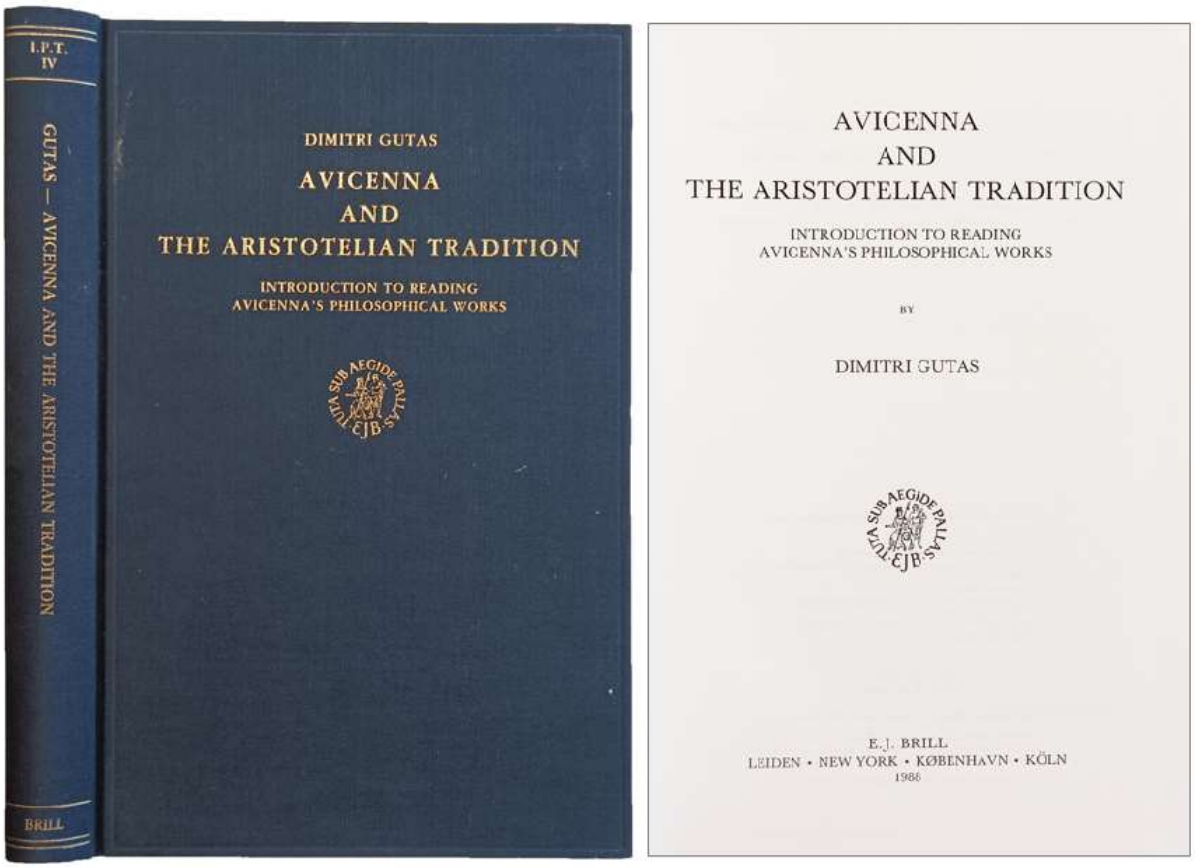
Francis Howard Fobes was Professor of Latin at Amherst College. He is remembered for his texts of Aristotle and for his translations.



96. [**AVICENNA**] **Dimitri GUTAS** (1945-). *Avicenna and the Aristotelian Tradition; Introduction to Reading Avicenna's Philosophical Works*. Leiden: E.J. Brill, 1988. ¶ Series: Islamic Philosophy and Theology; Texts and Studies, vol. IV. 8vo. xii, 341 pp. Blue cloth, gilt. Ownership ink signature of David C. Lindberg. Scarce. Fine. RH1423

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Within Arabic philosophy, Gutas has concentrated in particular on its greatest exponent, Ibn Sina (known as Avicenna in the medieval Latin world), on whom he wrote the fundamental Avicenna and the Aristotelian Tradition. Introduction to Reading Avicenna's Philosophical Works (Leiden 1988; second, revised and augmented edition, including an inventory of Avicenna's authentic works, Leiden 2013). – Author.

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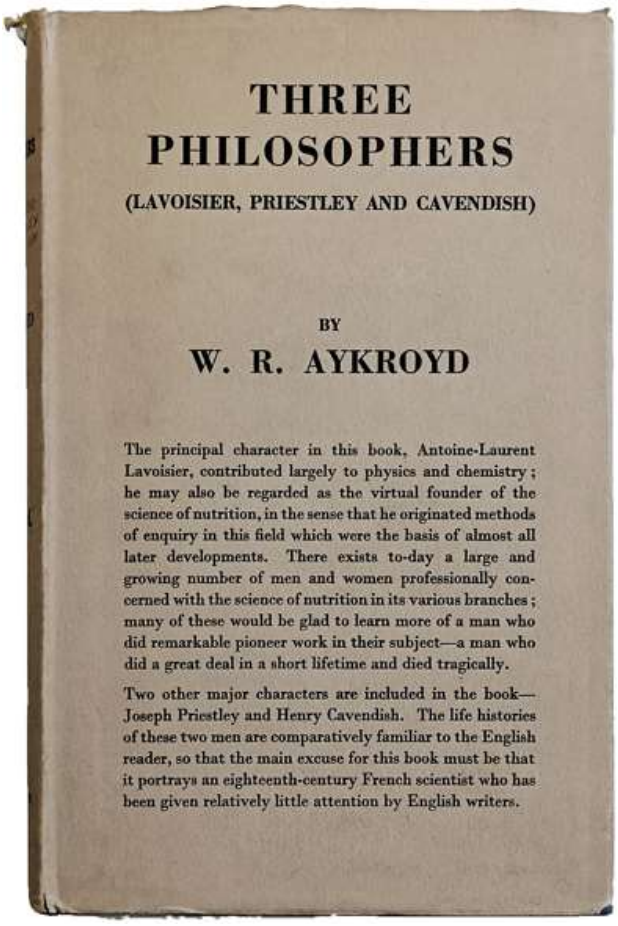
PROVENANCE: David C. Lindberg (1935-2015) was an American historian of science. His main focus was on the history of medieval and early modern science, especially physical science and the relationship between religion and science. Lindberg was the Hilldale Professor Emeritus of History of Science and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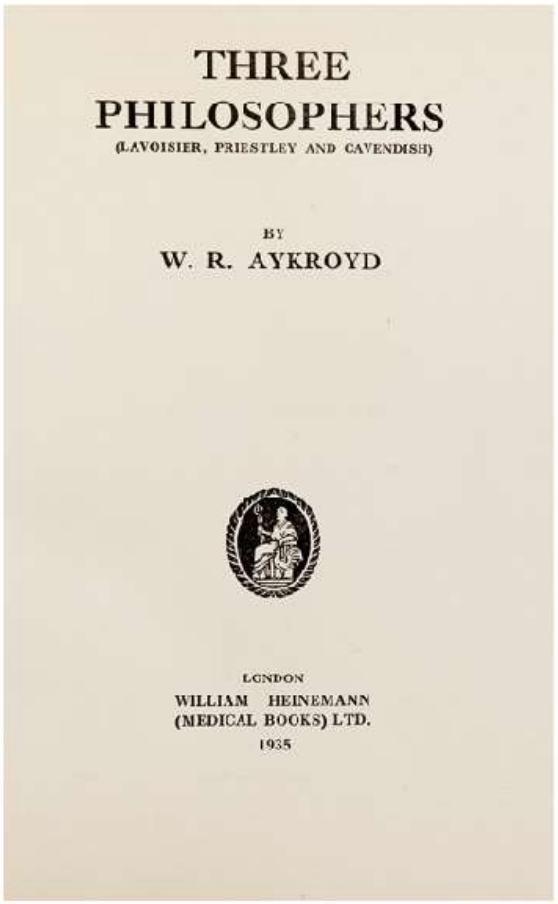
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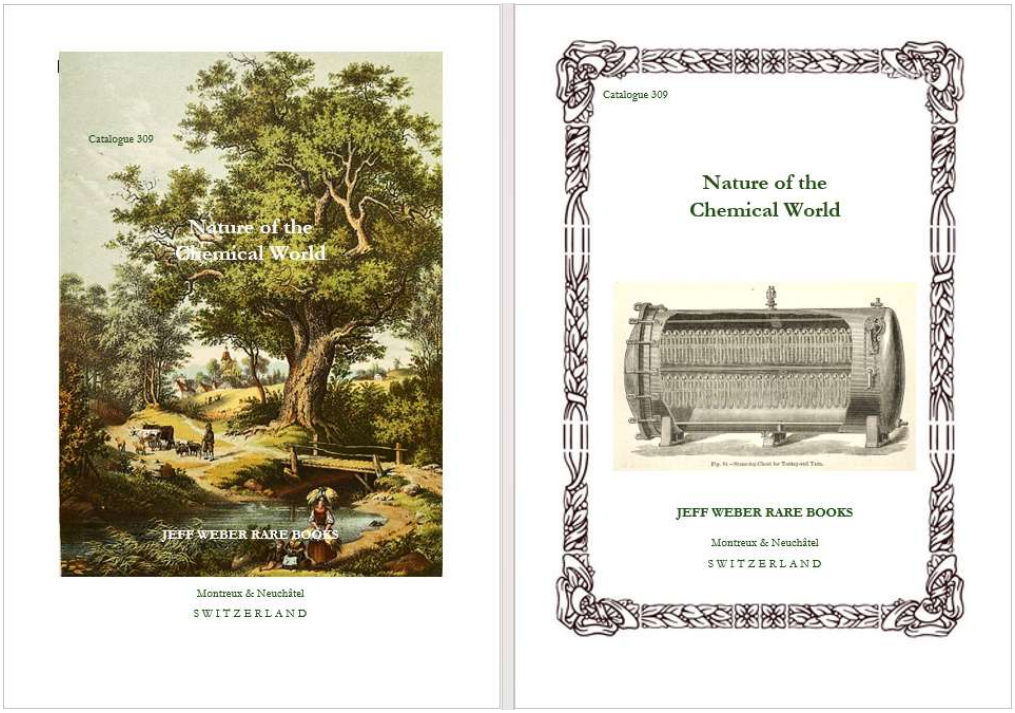

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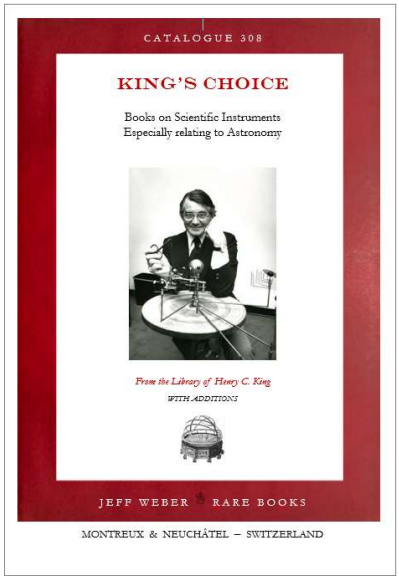

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