

THE ROYAL COMMISSION ON HISTORICAL MANUSCRIPTS

Report on the papers of
W I L L I A M C O C H R A N E
(1910-1972)
Physicist
deposited in the Archives of the
University of Glasgow

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THE ROYAL COMMISSION ON HISTORICAL MANUSCRIPTS
Quality House, Quality Court, Chancery Lane,
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1975

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No. 75/30

CSAC 26/3/75

THE ROYAL SOCIETY

THE ROYAL COMMISSION ON HISTORICAL MANUSCRIPTS

Joint Committee on Scientific and Technological Records

CONTEMPORARY SCIENTIFIC ARCHIVES CENTRE

Papers of

WILLIAM COCHRANE

(1910 - 1972)

Listed by: Jeannine Alton
Harriot Weiskittel

Deposited in the Archives of the University of Glasgow 1975

Description of the collection.

The collection was received from Mrs. Cherry Cochrane, with the exception of Items D.11 - D.16, which were received from the Department of Physics, Imperial College, London.

The papers cover almost the whole span of Cochrane's working life, from his school notebooks in 1921 to his work at St. Thomas's Hospital in 1971.

The very full lecture-notes which he kept as an undergraduate and graduate at Glasgow University (Section C, and note on p.5) are a useful record of the period. The lecture-notes and working papers in Section E are similarly of interest for the work on radio during the Second World War.

Unless otherwise stated, all items are manuscript. Titles and descriptions in inverted commas are those on the manuscripts.

Summary of the career of William Cochrane.

- b.1910 Glasgow.
1921 - 26 Hyndland School, Glasgow.
1926 - 34 Glasgow University; M.A. 1930; B.Sc. 1931; Ph.D. 1935.
1929 Demonstrator in Natural Philosophy, Glasgow.
1930 William Houldsworth Research Scholarship, Glasgow.
1932 - 36 Carnegie Trust Research Scholarship.
1934 - 39 Demonstrator, later Assistant Lecturer, Imperial College, London.
1939 - 40 work at Operational Research Headquarters, Fighter Command, R.A.F.
1940 - 42 work in Aerials Section, Telecommunications Research Establishment, Malvern, & other research establishments.
1942 - 43 Assistant to Sir George Thomson, Radio Board.
1943 - 45 work at Telecommunications Research Establishment, Malvern.
1945 - 52 work at Imperial College, London.
1946 married Nelly (Cherry) Procter.
1952 Senior Lecturer & Head of Department of Physics, St. Thomas's Hospital Medical School, London.
1960 Tutor to First-Year students, St. Thomas's.
1965 Tutor to Preclinical students, St. Thomas's.

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A.1 Biographical and Personal A.1 - A.15

- A.1 Misc. biographical information:
St. Thomas's Gazette (obituary of Cochrane p.31); letter from Sir George Thomson to Sir Edward Appleton, May 1943, listing Cochrane's work at Glasgow & Imperial College during 1930s; Cochrane's application for post at St. Thomas's with curriculum vitae to 1952; letter from father giving early history; photographs of Cochrane & assistant (c) 1932.
- A.2 Career at Glasgow University 1926 - 34.
Particulars of scholarships & bursaries, certificates of merit, attendance cards etc., also Cochrane's reports to Carnegie Trust on his researches. 1926 - 34
- A.3 Career at Glasgow University 1926 - 34.
Printed material: examination papers, curricula, lists of award-winners, conferment of Cochrane's Ph.D 1935. 1926 - 35
- A.4 Application for post of Assistant Lecturer in Physics in the Victoria University of Manchester; Ms & typed copies of application & testimonials.
Autograph testimonials to Cochrane from R.A.Houston, E.Taylor Jones, Thomas M.MacRobert. 1931
- A.5 Application for post of Assistant Lecturer in Physics, University College, Swansea. 1934
Application for post of Assistant in Natural Philosophy, University of St. Andrews. 1934
Application for post of Assistant Lecturer in Physics, University College of Nottingham, (undated note).
- A.5 Imperial College 1934 - 39
Letter from Sir George Thomson on Cochrane's appointment 1934.
Misc. official letters on promotion, salaries etc.
- A.7 Misc. receipts for fees at Imperial College. 1934 - 36
- A.8 Corresp. with Carnegie Trust. 1935 - 36
- A.9 War Service 1939 - 44
Letter from Sir John Cockcroft on Air Ministry training scheme for physicists July 1939, & Cochrane's subsequent service at various research establishments, conditions of service & pay. 1939 - 44
- A.10 War Service 1942 - 43
Corresp. with Sir George Thomson & Sir Lawrence Bragg on Cochrane's appointment as personal technical assistant to Thomson on Radio Board & his subsequent return to Telecommunications Research Establishment. 1942 - 43

- A.11 Imperial College 1945 - 51
Letter from Sir George Thomson on Cochrane's release from war service; misc. official communications on promotions, salaries etc.
- A.12 Application for Fulbright Scholarship. 1950
- A.13 Appointment at St. Thomas's Hospital Medical School.
Misc. correspondence. 1952
- A.14 Appointment at St. Thomas's Hospital Medical School.
Correspondence. 1959
- A.15 Correspondence re Physical Society. 1957 - 58

B. School Notebooks B.1 - B.6

- B.1 School exercise book. 1921
- B.2 School exercise book, 'Latin notes, begun 20th Oct. '24' 1924
- B.3 " " " " 'Physics, Dynamics, Statics' 1925
- B.4 " " " " 'Physics Notebook' 1925
- B.5 " " " " 'CHEMISTRY' 1924, 1925
- B.6 Notebook 'August 1925'; notes on mathematics, electricity & magnetism. 1925

C.Glasgow University 1926 - 34 C.1 - C.92

Throughout his university career, Cochrane kept an unusually full record of the lectures he attended and the class and laboratory exercises he performed, with dates and, usually, the names of the professors or lecturers concerned. It is therefore possible to obtain a detailed picture of the courses offered at the period.

The books are arranged chronologically, and are followed by the loose working papers.

Many of the books have notes at both front and rear, not always on the same subject.

C.1	'Chemical Laboratory Notebook. Bench 33A'	1926 - 27
C.2	'Chemistry'	1926 - 27
C.3	'Natural Philosophy (ordinary)'	1926
C.4	'Coordinate Geometry Ordinary Class I'	1926
C.5	'Ordinary Class II' (Coordinate Geometry)	1926
C.6	'Physical Laboratory Notebook'	1926
C.7	'Chemistry (continued) <u>Ordinary</u> '	1927
C.8	'Natural Philosophy Ordinary (continued)'	1927
C.9	'Ordinary Maths (continued)'	1927
C.10 - C.11	'Mathematics Inter Hons', 'Calculus' (Professor MacRobert) 2 books	1927
C.12 - C.15	'Mathematics Inter Hons' (Coordinate Geometry) (Mr. N.MacArthur) 4 books	1927 - 28
C.16 - C.18	'Natural Philosophy Class C' 2,3,4. (book 1 missing) (Dr. Houston) 3 books	1927 - 28
C.19 - C.25	Logic. 7 notebooks numbered 1 - 7 and dated. (Mr. Haydock and others)	1927 - 28
C.26 - C.28	'Nat. Phil. Class A' 3 books numbered and dated. Mechanics (Mr. Cochrane, Mr. McFarlane), Hydrodynamics (Mr. Shearer)	1928 - 29
C.29 - C.32	'Mathematics Advanced Honours', and 'Calculus' 4 books numbered and dated. (Professor MacRobert, Mr. MacArthur)	1928
C.33 - C.35	'Mathematics Advanced Honours' 3 books numbered and dated. Coordinate Geometry. (Mr. MacArthur)	1928 - 29

C.36 - C.40 'Moral Philosophy' 5 books numbered and dated. (Professor Bowman, Mr. Phillips, Mr. Campbell)	1928 - 29
C.41 'Analytical Geometry'. Problems.	1928
C.42 Misc. notes on Geometry & Electricity.	1929
C.43 - C.45 'Nat. Phil. Class A' 3 books numbered and dated. Thermodynamics. (Professor E. Taylor Jones)	1929
C.46, C.47 'Maths. Adv. Hons.', 'Complex Variable & Calculus' (Professor MacRobert)	1929
C.48, C.49 Differential Equations. 2 books numbered and dated. (Mr. MacArthur)	1929
C.50, C.51 'Nat. Phil Class A', 'Hydrodynamics by Mr. Shearer' 2 books.	1929
C.52 'Properties of matter by Mr. McFarlane & Electricity by Prof. Jones'	1929
C.53 'Electricity given by Mr. McFarlane'	1929
C.54 'Attractions by Mr. Cochrane & Light by Dr. Houston'	1929 - 30
C.55 'Mechanics given by Mr. Cochrane in Natural Philosophy Class A'	1929 - 30
C.56 - C.58 'Analysis by Dr. Hislop', 'Maths, Adv. Hons.' 3 books	1929 - 30
C.59 Misc. notes on Vectors	1930
C.60 - C.63 'Examples in Maths.' 4 books	1930
C.64 'Spherical Harmonies' (Professor MacRobert)	1930
C.65, C.66 'Electricity by Prof. Jones' 2 books	1930
C.67 - C.69 'Coordinate Geometry by Mr. McArthur' 3 books	1930
C.70 Misc. mathematics	1930
C.71, C.72 German, notes & vocabulary book	1930 - 31
C.73 - C.76 Botany 4 books	1930 - 31
C.77 Notes on books & articles on light 14/2/31	1931
C.78 'Notes on Wave Mechanics etc. 11/3/31'	1931
C.79 'Notes re Cathode Rays etc. 13/3/31'	1931
C.80 'Natural Philosophy Dept. - Lab. notes'	1931 - 34
C.81 'Quantum Mechanics etc. 30 July 1931'	1931
C.82 Notes on books & articles on electricity.	n.d.

- C.83 'Electricity Notes' n.d.
- C.84 Vacant
- C.85 large notebook, '17th March 1943' (with some later loose pages).
Notes on galvanometers, neon discharge tube photometer, oscillators,
aluminium cell, etc. 1943
- C.86 - C.92 Loose working papers.
- C.86 'Notes taken in Chemistry Laboratory given by Dr. MacMillan,
Mr. Culloch' 1926 - 27
- C.87 3 Examination answer books, 'Statistics Mr. Arthur' 1932
- C.88 3 " " " " Notes on books & articles read. (c) 1933
- C.89 2 " " " " Misc. notes & calculations. n.d.
- C.90 Thesis: Diffraction of Cathode Rays by Thin Films.
Ms. drafts & notes. (c) 1934
- C.91 Paper on Wave Mechanics: drafts, diagrams, notes (incomplete),
correspondence. 1934
- C.92 Large black folder: notes on astronomy & spherical trigonometry,
lecture notes, class exercises, teaching material. 1930 - 31

D. Imperial College. 1934 - 39 D.1 - D.66; 1946 - 52, D.67 - D.80

Dr. Cochrane left a large number of notes and working papers on various aspects of thermodynamics, entropy, the theory of gases etc. relating to his work as Demonstrator and Lecturer at the College. The papers were very disordered and few bore dates; where a numbered sequence of pages, a format of paper, or a clear indication of the content permitted, they have been grouped together, but some remain unidentified.

D.11 - D.16 refer to 6 envelopes of notes, translations, photographs etc. left by Cochrane in the Department of Physics, Imperial College. This material was sorted and identified by Professor Moses Blackman FRS, Professor of Physics, Imperial College; each envelope contains his descriptive note on its contents, and only a brief indication is given in the list below.

- D.1 2 Examination answer books, 'Wave Mechanics'.
Lectures by Mr. Harding. 1934

W.C. C.S.A.C. 26/3/75	8.
D.2 Exercise book, notes & calculations.	n.d.
D.3 " " " " " " "	n.d.
D.4 " " ", notes on books & articles read	1934
D.5 " " ", 'The Interference of Röntgen & electron waves. M.v.Laue.Berlin 1935'	1936
D.6, D.7 2 black exercise books, 'Thermodynamics I,II', with some loose pages & photographs.	n.d.
D.8 Exercise book, inscribed inside 'Record of Students' Work', but contains notes on books read (many translated from German by Cochrane), notes & calculations.	1938
D.9 Notes for examination questions on thermodynamics.	n.d.
D.10 Notes on books & articles read.	n.d.
D.11 Envelope I Notes, photographs, translations of papers in German. Professor M.Blackman notes that the booklets labelled A.1 and A.2 'are more interesting; they contain notes relevant to Cochrane's work on electrolytic deposition of nickel on copper, and also comments on work by Frisch and his co-workers which impinged on this work'.	
D.12 Envelope II Notes & photographs on electron diffraction.	
D.13 Envelope III 12 Examination answer books of notes on electron diffraction, diffraction by crystal lattices - perhaps for lectures.	
D.14 Envelope IV Notes on books & articles read.	
D.15 Envelope V Notes & translation of books & articles, some perhaps done while at Glasgow.	
D.16 Envelope VI Notes on vibrational properties of coupled oscillators; includes work on Laue Zones by research student M.A. Cayless. Professor M.Blackman notes 'both Cochrane and I discussed this work with Cayless.'	1947
D.17 'Thermodynamics'	
D.18 'Stefan's Law', and 'Wien's Displacement Law'	
D.19 'Radiation & Quantum Theory'	
D.20 'The Pressure of Radiation'	
D.21 'Wire under Tension'	
D.22 'Planck's Radiation Formula'	
D.23 'Eqns. of State for Gases'	
D.24 'Kelvin's Scale of Absolute Temperature'	

- D.25 'Jean's Theory of Gases'
- D.26 Notes on heat & energy (3 pp)
- D.27 Coefficients of expansion
- D.28 'Number of independent Vibrations of a Continuous Medium'
- D.29 Unidentified
- D.30 2 Examination answer books, 'Thermo'
- D.31 Examination answer book, 'Theory of Solutions'
- D.32 Misc. notes & calculations, probably for lectures.
- D.33 'Persulphuric Acid' (2 pp)
- D.34 'Aluminium'
- D.35 'Mechanics'
- D.36 'Electrical Units'
- D.37 'The Zeeman Effect'
- D.38 'Relative Motion of a Particle'
- D.39 Misc. notes, pages numbered 12 - 18, on Quantum Theory.
- D.40 Misc. notes, pages 1 - 4, on particles.
- D.41 'Degrees of Freedom in Box, which is a Perfect Reflector' (pps 2 and 3)
- D.42 Misc. notes, pages numbered 1 - 7, 11
- D.43 Misc. notes.
- D.44 'Homogeneous Mixture. Say salt dissolved in water', pages 1 - 18 and some unnumbered pages.
- D.45 'Homogeneous mixture of Two Compts. e.g. salt dissolved in water', pages 56A - 69
- D.46 'The Alchemists'
- D.47 'General Dynamical Theory of Seismographs', pages 1 - 11
- D.48 'Seismometry and Seismophysics': paper on earthquakes, delivered to Physical Society.
- D.49 - D.55 Work on gases, some delivered as lectures and dated 1937
 - D.49 Notes on mixtures, pages 48 - 56, last page inscribed 'end of 7th lec. 26/2/37'
 - D.50 'Gases which react chemically', some pages numbered, p.10 inscribed 'end of lecture 16/3/37'
 - D.51 'For a perfect gas' (3 pp)

- D.52 'Entropy of a gas', pages numbered 1 - 4 and some unnumbered pages.
 D.53 Notes on gases, some pages numbered.
 D.54 'Gaseous mixtures', pages numbered 51 - 72
 D.55 'Mixture of gases which react chemically', pages numbered 70 - 85
- D.56 'Carnot's Theorem', pps 1 - 3
- D.57 Notes on heat & pressure, pps 1 - 7
- D.58 Notes on heat & gases, pps 2 - 6
- D.59 'Thermo 1938', pps 1 - 52 1938
- D.60 'Elasticity', pps 1 - 59 and some unnumbered pages.
- D.61 'Integrals', pps 1 - 22
- D.62 'Thermodynamics 14 Feb. 1939', pps 1 - 50, and some unnumbered pages 1939
- D.63 'Electricity', series of partly numbered sequences, perhaps for lecture course.
- D.64 Notes for discussion on crystal growth, correspondence. 1938
- D.65 Notes, drafts & working papers on X-ray scattering, perhaps for lectures.
- D.66 Misc. notes on small-angle scattering.
- D.67 'Counting Circuits', lecture & misc. working papers 1946
- D.68 Notes of books & articles on Boron Chambers & methods of neutron measurement. (c) 1945
- D.69 Misc. notes for lectures on Equipartition, Radiation, Electromotive Force, Statistics etc. 1947
- D.70 Misc. notes & diagrams 'Wide Angle Radⁿ Interference' etc. (c) 1948
- D.71 Misc. notes, perhaps for lectures: 'Dielectric Constant', 'Nernst Calorimeter', 'Thyatron Experiment', 'Elementary notes on Transmission Lines', 'Nodal Points', 'Notes on Transmission Lines', 'Artificial Line', 'Lecher Wires'. n.d.
- D.72 Misc. notes, perhaps for lectures: 'Elementary Notes on Circuits', 'Multivibrator' and others. n.d.
- D.73, D.74 Unidentified working papers. 2 folders.
- D.75 Notebook inscribed 'Electron diffraction... May 1936' in another 1936, 1953 hand. Misc. notes on topics in nuclear physics, radiation, thermodynamics, and note on Electrostatic Risks dated 27 July 1953
- D.76 Notebook dated 20 Sept. 1945. Notes on books & articles read, plan for lectures on 'Nuclear Reactions' 1952 1945 - 52

- D.77 Notebook dated 31 Oct. 1945. Notes on books & articles read, experiments & calculations, variously dated. 1945 - 57
- D.78 - D.80 Imperial College notebooks of students' work and experiments. 1946 - 48
- D.78 'W.H.Hobain Oct. 1946 Physics Practical' (Thermodynamics & Spectroscopy)
- D.79 'W.R.Loosemore Feb. 1947 Practical Physics'
- D.80 'R.H.Eldridge Practical Physics 1947 - 48' (Spectroscopy)

E. War Service 1939 - 45 E.1 - E.36

The Section covers Cochrane's work at various research establishments on radio signals etc., mainly at T.R.E. Malvern 1940 - 42, and 1943 - 45. There are notebooks and working papers, and lectures delivered as an Instructor.

- E.1 Black notebook, 'Oct. 1940', on transmission lines (at Swanage) 1940
- E.2 Stationery Office Notebook, 'Notes on Electricity', with some extra pages interleaved. 1940
- E.3 S.O. Notebook, with loose pages on 'Tube lines', 'Rough Notes for Elementary Lectures', expenses vouchers. 1940
- E.4 S.O. Manifold Book. 1940
- E.5 Loose pages of reports & notes on 'Influence of Crystal Form on the Interference pattern of the Space Lattice', 'Theory of Goniometer', 'Preliminary Report on Ground & Kite & balloon calibration' 11/11/40. 1940
- E.6 S.O. Manifold Book, with some loose pages of notes & letters 1940 - 43
- E.7 S.O. Notebook, notes on 'Signal-Noise Ratio' etc. (at Swanage) 1941
- E.8 S.O. Notebook, notes on circuits, plane waves etc. " " " 1941
- E.9 S.O. Notebook, 'TX Lines' 1941
- E.10 S.O. Manifold Book, notes on circuits. (at Swanage) 1941
- E.11 S.O. Notebook, misc. notes 1941 - 42
- E.12 loose notes & reports (included in E.11) on 'Mutual Impedance of Half-Wave Aerials', 'Application of Radiolocation to Ship Navigation' etc. 1941 - 42

E.13 S.O.Notebook.	1941 - 42
E.14 S.O.Notebook.	1942
E.15 S.O.Manifold Book.	1942
E.16 Royal Air Force Notebook, notes & diagrams	1942
E.17, E.18 2 Royal Air Force Notebooks	1943
E.19 S.O.Notebook, 'Bury 10/7/44'	1944
E.20 Science Exercise Book, 'Bury Fourier Series etc. Bk. I'	1944
E.21 " " " " 'Bk. II'	1944
E.22 " " " " 'Bk. III'	1944
E.23 " " " " 'Bury. Fourier Series. Private Notes'	1944
E.24 S.O.Notebook	n.d.
E.25 Work on Radio. Research Records 2310, 2311 (by Cochrane) 18 March 1942, and later notes on Frequency Modulation, radar circuits, RDF.	1942
E.26 - E.28 'Radar. Wireless Lectures' given by Cochrane at TRE, Malvern. 3 folders.	1943 - 44
E.29 - E.34 Work on aerials at TRE, Malvern	1944 - 45
E.29 'Various Polar Diagram Calculations'	
E.30 'Aerials Panel' (committee meetings)	
E.31 'Aerials Write-up'	
E.32 'Aerials Write-up'	
E.33 'Sketches for Aerials Write-up'	
E.34 Misc. notes & diagrams	
E.35, E.36 Work on transmission lines & wave guides, at TRE, Malvern. Notes & lectures given by Cochrane. 2 folders.	1945

F. St. Thomas's Hospital 1952 - 72 F.1 - F.11

F.1 Black notebook, 'Radioactivity' etc.	n.d.
F.2, F.3 2 Exercise books 'Heat', 'Light'	n.d.
F.4 3 sets of notes, perhaps for lectures, on 'Entropy and Probability'	n.d.
F.5 Extended set of notes for lectures on Thermodynamics 47pp.	n.d.
F.6 Misc. notes on gases, entropy & other subjects.	n.d.
F.7 Notes & calculations on Nomogram.	n.d.

- F.8 Misc. bibliographies & reading-lists for St. Thomas's students;
loose working papers & calculations n.d.
- F.9 Misc. notes & working papers n.d.
- F.10 Green notebook, with some loose papers, mainly notes on
Ionising Radiation, dated 11 Oct. 1971 1971
- F.11 Blue ledger notebook, mainly notes on books & articles on
X-ray scattering. Dec. 1971

G. Publications and Broadcasts. G.1 - G.6

- G.1 Offprint of article 'The transformation of the nitrogen isotope
of mass 15 into carbon and helium by bombardment with protons'
(Proc. Roy. Soc. Lond.A, 199, 1949) by W.Cochrane & A.G.Hester,
with Ms. note by Cochrane on the contribution of the co-authors.
- G.2 Article 'Electricity' for Chambers's Encyclopaedia. Corresp. with
editors & Ms. draft of article (170pp.) 1961 - 64
- G.3 Diagrams for article 'Electricity' in Chambers's Encyclopaedia.
- G.4 Drafts for articles 'Electron Diffraction', 'Electron Diffraction
& the Electron Microscope' 1961 - 64
- G.5 Correspondence with Sir George Thomson, and Macmillan & Co.Ltd.
re Thomson & Cochrane, Electron Diffraction, reprints, export
sales etc. 1949 - 61
- G.6 Correspondence re Cochrane's contribution to broadcast in
'Science Survey' on electron diffraction, with Frank Twyman &
Sir Edward Appleton; includes corrected script prepared for
broadcast. 1947

H. Correspondence. H.1 - H.4

- H.1 Misc. scientific corresp. with colleagues. 1936 - 57
- H.2 Corresp. with Sir George Thomson, with his Ms. draft for
Preface to Electron Diffraction.
- H.3 Corresp. with Max von Laue & Georg Menzer Dec. 1936 - April 37 1936 - 37
- H.4 Misc. corresp. with colleagues & students 1950 - 61

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