

CONTEMPORARY SCIENTIFIC ARCHIVES CENTRE

under the guidance of the Royal Society's

British National Committee for the History of Science, Medicine and Technology

Catalogue of the papers and correspondence of

SIR EDWARD VICTOR APPLETON, G.B.E., K.C.B., F.R.S.

(1892 - 1965)

Deposited in the Library of the University of Edinburgh

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1981

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GENERAL INTRODUCTION

PROVENANCE AND HISTORY OF THE COLLECTION

The material was received in several instalments and from several sources: from Lady Appleton, from Mr. W.R. Piggott, and from the Appleton Room and other locations in the Library of the University of Edinburgh where it had been transferred over a period of time after Appleton's death in 1965. In the intervening period, some of the papers had been inspected by Appleton's colleagues and friends, and by historians of science, some of whom left notes of identification on a few of the documents. In particular, Professor C.S. Gillmor consulted some of the material in the course of his work on the Project for the History of Ionospheric Physics of Wesleyan University, Connecticut; Professor Gillmor's notes and identifications have been quoted with acknowledgement in some of the catalogue entries.

Probably also during this period Appleton's correspondence with B. van der Pol was partly catalogued (see E.117 - E.144 and the accompanying explanatory note). Some of the other letters, mainly those dating from Appleton's time in Edinburgh, also bear numbers of unknown origin and not apparently forming part of any chronological or topical sequence; since they are often in ink or ball-point pen, these numbers remain on the documents but are not relevant to the present arrangement of the material.

There was however no attempt after Appleton's death to sort or list the whole range of the papers, and the system adopted in this catalogue is entirely the responsibility of the present compilers.

ADDITIONAL MATERIAL

A number of notebooks, and additional folders of research notes, working papers and correspondence, were located in Edinburgh University Library and received when the main sequence of item numbers had been allocated, and the catalogue was already in typescript.

The notebooks have been intercalated in Section B in their approximate chronological order. The research notes are listed at the end of the main sequence of such material in Section C with cross-references in the index and in the body of the

text to the topics to which they refer. As well as supplementing research topics already identified, the additions include fairly substantial material on ionospheric storms which had not previously appeared as a separate heading on Appleton's folders; this topic has accordingly been added to the index to Section C.

A folder of notes relating to lectures given for the Diploma Course on the Ionosphere at Edinburgh has been added to Section D and appears at D.69 - D.71.

CAREER AND WORK OF E.V. APPLETON

Born in Bradford in 1892 of modest origins, Appleton became one of the pioneers of ionospheric research and an important figure in scientific and public life in Britain.

After education in primary and secondary schools in Bradford, Appleton won a scholarship to St. John's College, Cambridge, where he was awarded first-class honours and several prizes in both parts of the Tripos (1913, 1914). He began research at the Cavendish Laboratory with Lawrence Bragg, but during his service in the Army Signal Corps in the First World War he developed the interest in valves and 'wireless' signals which informed his subsequent research career. He returned to Cambridge and the Cavendish Laboratory in 1919, continuing to work on valves and, with B. van der Pol, on non-linearity, and on atmospheric phenomena. In 1924, in collaboration with M.F. Barnett, he performed a crucial experiment which enabled a reflecting layer in the atmosphere to be identified and measured; subsequent research indicated the existence of more than one reflecting layer, and Appleton was awarded the Nobel Prize for Physics in 1947 for his investigations into the ionosphere in the 1920s. From 1924 to 1936 Appleton was Wheatstone Professor of Physics at King's College, London, directing research teams and, in 1932, heading an expedition to Tromsø in northern Norway as part of the programme of observations scheduled for the Second Polar Year. He was elected Fellow of the Royal Society in 1927, and was President of the International Union of Scientific Radio (U.R.S.I.) 1934-52. In 1936 he succeeded C.T.R. Wilson in the Jacksonian Chair of Natural Philosophy at Cambridge, where he continued collaborative research on many ionospheric problems, including solar and lunar tides

in the E layer; from September 1936 he served on the freshly re-constituted Committee for the Scientific Survey of Air Defence (the 'Tizard Committee'). In October 1938 he accepted appointment as successor to Sir Frank Smith as Secretary to the Department of Scientific and Industrial Research, where he remained throughout the Second World War (he was made K.C.B. in 1941) and until 1948 when he was appointed Principal of Edinburgh University. He took up the appointment in May 1949 and remained in office until his sudden death in 1965. He was twice married.

Although Appleton's career from 1938 was passed primarily in administration, he never lost his interest in ionospheric research. During his tenure of the Secretaryship of the D.S.I.R., he kept up his contacts with the Radio Research Board and with individual colleagues such as R. Naismith and W.R. Piggott; his position in U.R.S.I. kept him in touch with data and research in progress at observatories throughout the world; and, though he had no laboratory or research department at Edinburgh as he had initially hoped might be the case, he worked with a succession of assistants and with the famous 'Ionospheric Young Ladies' - mathematical students - to maintain a steady output of research papers right to the end. Clark, Sir Edward Appleton, p.217, mentions 87 papers produced from Edinburgh, and many biographical accounts of Appleton describe the 'little black books' in which he jotted down his own ideas and made notes at conferences and discussions.

Fuller accounts of Appleton's life and work can be found in the Memoir by J.A. Ratcliffe (Biographical Memoirs of Fellows of the Royal Society, 12, 1936, 1 - 21) and R.W. Clark, Sir Edward Appleton, Pergamon Press, 1971.

DESCRIPTION OF THE COLLECTION

The collection, though extensive, deals almost exclusively with Appleton's scientific work. There is very little personal or private correspondence and almost no surviving material, other than lectures, speeches and addresses, relating to his public life as scientific administrator or university principal.

The collection is presented in Sections as outlined in the List of Contents. Sections A - F are manuscript, mainly by Appleton himself but including collaborative work and correspondence from colleagues. Section A contains the surviving material relating to Appleton's career, though it is unfortunately not a complete

record. There is, however, a good run of diaries and engagement books, and these, together with the scientific notebooks in Section B, comprise the legendary - not to say mythical - 'little black books' which Appleton always carried with him to record his past, present and future activities.

The main documentation of Appleton's scientific research is in Section C. The considerable time-lapse already alluded to between Appleton's death and the receipt of the papers, and the fact that they had had to be moved several times, added greatly to the problems of sorting. Very few of Appleton's own named folders survived, and they were so crammed with material that it was thought best to divide the papers into more manageable units while preserving the original folder and title or description. Most of the material, however, was received as loose papers. Appleton's handwriting was fine and showed little variation, at least until the arrival of the ballpoint pen; he very rarely dated his notes and although he would sometimes give them a heading he usually had several research projects in hand simultaneously and would refer to more than one phenomenon or theory in the course of each sequence of notes. Eventually, after advice had been sought from scientists and historians of science, the material was assigned wherever possible to a specific theme, and the title 'General Ionospheric Topics' was coined to cover papers which could not be more closely identified. Every effort was made to ascribe and date the papers, and any of Appleton's own descriptions have been retained and appear in inverted commas in the catalogue entries. Section C thus consists of Appleton's own notes, drafts and correspondence with colleagues, and background information specifically related to them. The further extensive background data of observations, charts, curves and analyses compiled under Appleton's direction by assistants mainly at Edinburgh appears in Section F. Both these Sections (C and F) are preceded by an outline list of topics.

Section D contains manuscript or typescript drafts for shorter talks or writings; although it is not a complete record it includes several items not listed in the published bibliographies, the material for the paper 'Appleton's last note on the E-region anomaly' prepared for publication by L.M. Muggleton and published in Journal of Atmospheric and Terrestrial Physics, 1971, and a folder of articles on problems of radio reception contributed by Appleton in the 1930s to Wireless World, World Radio and other journals.

Section E contains a little personal correspondence, and all the scientific correspondence not included in Section C. Of interest are the exchanges with Van der Pol, 1921 - 24, on oscillations and non-linearity, the long and frequent correspondence with W.J.G. Beynon, R. Naismith and W.R. Piggott, as well as material relating to Ambrose Fleming, J. Larmor and C.T.R. Wilson. Section G consists of Appleton's extensive collection of reports and published papers by others, some being preprints or of limited circulation.

LOCATIONS OF FURTHER MATERIAL

Lady Appleton retains copies of Appleton's speeches and writings, which will be left to Edinburgh University Library on her death.

Edinburgh University Library holds a substantial sequence of 396 letters by Appleton to J.A. Ratcliffe, 1925 - 36 (ref. Gen.1985), and various diplomas and scrolls of honorary degrees conferred on Appleton (ref. P.C. 61 - 62). There is a permanent display of medals and awards in the Appleton Tower of the University.

The Institution of Electrical Engineers (Savoy Place, London) houses a film in which Appleton describes his ionospheric research, made for the Institution by British Movietone Ltd. in 1962, and a typescript text of the film.

Sir Granville Beynon, Sir Bernard Lovell and Mr. W.R. Piggott retain among their personal papers correspondence and other material relating to their contacts with Appleton, and have given permission for this to be noted here. Sir Bernard Lovell's papers are held at the John Rylands Library of the University of Manchester.

Professor C.S. Gillmor holds a collection of photocopies of letters written by Appleton, which he has assembled from many sources.

ACKNOWLEDGEMENTS

We are grateful for help and information from many sources,
and in particular to:

Lady Appleton, for making the material available, for her
unflagging encouragement, and for comments on the draft catalogue;

Mr. W.R. Piggott, for making available the 1932 letter from
J.A. Fleming included in E.39;

Mr. R.W. Clark, for information and for allowing quotations
from his biography of Appleton;

Professor C.S. Gillmor, Wesleyan University, Connecticut,
Professor W.T. Sullivan, University of Washington, Seattle, Dr. D.J. King, Mr. G.
Gardner and Mr. Smith, all of the Appleton Laboratory, for help in identifying and
assigning material;

Professor W.E.J. Farvis, for information;

Professor M.M. Gowing, for comments on the draft catalogue;

Mrs. M. Edwards, for her usual accurate typing of the catalogue,
and for her more than usual patience with additions and alterations to the draft.

Jeannine Alton

Julia Latham-Jackson

SECTION A BIOGRAPHICAL AND PERSONAL A.1 - A.94

A.1 - A.4 Biographical and bibliographical

A.5 - A.59 Career, honours and awards

A.60, A.61 Press cuttings

A.62 - A.94 Diaries and notebooks

See Section H for photographs, recordings and non-print material illustrating Appleton's life and work.

A.1-A.4 Biographical and bibliographical

A.1 Miscellaneous biographical information, articles on Appleton and his work, obituary tributes, etc.

A.2-A.4 Bibliographical information.

Typed lists of papers and addresses by Appleton, currently held by Lady Appleton and which will go to the Appleton Room, Edinburgh University, at her death.

A.2 Bibliography of publications, 1918-33, 1934-48, 1949-65.

A.3 Addresses and speeches, mainly scientific topics, 1931-65.

A.4 Addresses and speeches delivered as Principal, Edinburgh University, 1949-65.

A.5-A.59 Career, honours and awards

The material, which is presented chronologically, is sparse for many periods of Appleton's life.

A.5 Letter from Appleton to 'Edward' in 1962 describing his award of The Wiltshire Prize for Geology and Mineralogy in his Cambridge Tripos, 1913.

2 letters from Rutherford, 1922, recommending Appleton for 'The King's Professorship' (N.B. Appleton became Wheatstone Professor at King's College, London, only in 1924), and 1925, accepting his resignation as Assistant Demonstrator at the Cavendish Laboratory.

Biographical and personal

- A.6 Letter from C.T.R. Wilson offering to propose Appleton for election to The Royal Society, 1926.
- Congratulations from Rutherford on award of prize by Radio Engineers of U.S.A., 1929.
- Letter of thanks from H.G. Lyons on work at Tromsø and contributions to Polar Year, 1934.
- A.7 Miscellaneous items of biographical interest.
- Includes postcard, 1928, re Appleton's golf handicap (24), photograph of his house, menu of dinner at Athenaeum, 1936, with signed sketch (? of J.J. Thomson) by Sir William Llewellyn P.R.A., humorous sketch of Halley Stewart Laboratory.
- A.8 Invitation to serve on the re-constituted Committee for the Scientific Survey of Air Defence (the 'Tizard Committee'), September 1936.
- Included here is a mock-heroic poem referring to the last meeting of the previous C.S.S.A.D. on 15 July 1936.
- A.9 Hon. D.Sc., Oxford, 1940.
- Presentation address by Public Orator.
- A.10 Grant of Knight Commander, Order of the Bath, 1941.
- A.11 2 pp. ms. draft of letter by Appleton to 'Dear Barlow' (Sir Alan Barlow) on relations between D.S.I.R. and other government departments especially the Treasury Establishment Section. n.d. but Appleton refers to his four years in the Civil Service, so 1943.
- A.12 Hon. D.Sc., Leeds, 1945.
- Presentation address, Appleton's ms. notes for speech at ceremonial banquet.
- A.13 Hon. D.Sc., Cambridge, 1946.
- Presentation address.
- A.14 United States Medal for Merit, 1946.
- Certificate and citation.

Biographical and personal

- A.15 Visit to Norway, September 1946.
Typescript accounts from newspapers of Appleton's visit, synopses of lectures and interviews, press-cuttings, etc.
- A.16 Photocopies of two ms. letters by Appleton to the Master, St John's College, Cambridge (E.A. Benians)
re Appleton's visit to Massachusetts Institute of Technology, arrangements to meet St John's men there, etc., 1946.
- A.17 Society of Dyers and Colourists, March 1947.
Dinner menu.
- A.18 Honorary Life Member, Institution of Radio Engineers, Australia.
Certificate May 1947
- A.19 Admission as Honorary Freeman, Bradford.
Brochure of arrangements June 1947
- A.20 Cross of Freedom, Norway.
Certificate June 1947
- A.21 Fellowship, Royal Society of Edinburgh.
Diploma July 1947
- A.22 Nobel Prize for Physics, November 1947.
Tagged folder, with some loose material, of press releases and cuttings.
- A.23 Valdemar Poulsen Gold Medal, Academy of Technical Sciences, Copenhagen.
Certificate of award. 1948
- A.24 Album of signatures of Members of Advisory Council and Chairmen of the Research Boards of the Department of Scientific and Industrial Research, associated with Appleton in his work for D.S.I.R. 1939-49, given to him on his resignation.

Biographical and personal

A.25-A.29 Material relating to Edinburgh University.

- A.25 Copy of Appleton's letter re Abden House (official residence of Principal), December 1948.

Press-cutting re Appleton's appointment as Principal.

- A.26 Correspondence and papers re Appleton's proposals for post-graduate research at Edinburgh.

Includes: Appleton's 'Proposal for the institution of a post-graduate radio-physics research group in Edinburgh University'.

4 pp. typescript, April 1949.

Letter re proposal from N. Feather, April 1949.

'Developments in electrical engineering'.

1 p. typescript, June 1949 (not signed).

'Report on the development of a post-graduate school in electronics and communications in the University of Edinburgh', by W.E.J. Farvis, 3 pp. typescript and plans, June 1949.

Letter from W. Jackson re similar work at Imperial College, June 1949.

Report on Imperial College school, by W.E.J. Farvis, September 1949.

- A.27 Continuing correspondence, re possible setting up and financing of an ionospheric laboratory in conjunction with Edinburgh research, from Sir Gordon MacMillan, W.R. Piggott, R.L. Smith-Rose, October 1949.

- A.28 Correspondence with University Grants Committee (Appleton's carbons only), 1952-60.

Correspondence 1955-60 deals mainly with the expansion of the University and the George Square development, and includes various briefings and submissions to the U.G.C.

- A.29 Correspondence re George Square development, with former graduates opposed to the scheme. Appleton's carbons only, not indexed.

- A.30 Miscellaneous items of biographical interest.

Humorous or mock-heroic poems about Appleton and his activities (1951, 1953), and other verses.

Biographical and personal

- A.31 Award of Emblem of Honour, Norwegian Polytechnic Society.
Press-cutting only. 1952
- A.32 Ms. letter from Appleton to his parents, describing his return sea-voyage from Australia, his daughter's engagement, etc. October 1952.
(quoted in Clark, Sir Edward Appleton, p.199).
- A.33 Honorary D. Litt., Liverpool.
Presentation address. 1953
- A.34 Honorary Membership, Institution of Electrical Engineers.
Typescript presentation address. 1956
- A.35 Technical High School, Hanover, 125th Anniversary.
Letter and photograph. 1958
(Appleton had been unable to attend.)
- A.36 Royal Society Tercentenary Programme. 1960
- A.37 Ring-back plastic binder of press-cuttings, photographs and material relating to visit to Cincinnati, March 1957, to participate in Centennial Program of Academy of Medicine and Fiftieth Anniversary of Graduate School of Arts and Sciences, Cincinnati.
See also H.39.
- A.38 Icelandic Order of the Falcon.
Certificate. 1963
- A.39-A.57 Letters of condolence received on Appleton's death, 1965.
- A.39 A
- A.40 B
- A.41 C
- A.42 D-E
- A.43 Edinburgh University societies, organisations, clubs, etc. (not indexed)
- A.44 Edinburgh and Scottish organisations, schools, societies, etc. (not indexed)

Biographical and personal

- | | |
|------|---|
| A.45 | F-G |
| A.46 | H |
| A.47 | J |
| A.48 | K-L |
| A.49 | Mac |
| A.50 | M |
| A.51 | N |
| A.52 | P-Q |
| A.53 | R |
| A.54 | S |
| A.55 | T |
| A.56 | U-W and unidentified |
| A.57 | Letters from institutions, societies, firms, organisations, etc.
(not indexed) |
| A.58 | Correspondence with Royal Society <u>re</u> establishing an Appleton Memorial Lecture to be given at the triennial assemblies of U.R.S.I.

Includes information about the lectures, and programme for discussion meeting held at the Society 5-6 December 1974, to mark the 50th anniversary of radio investigations of the ionosphere.

Various dates, 1966-75. |
| A.59 | Miscellaneous items of biographical interest.

Includes: Letter <u>re</u> arrangements for change of name of Radio and Space Research Station, Slough, to the Appleton Laboratory, 1973.

Photographs of the 'Appleton Crater' on the moon.

Photocopy of front pages of 'Field Telephones and Telegraphs', by E.J. Stevens, 1918. The 'Note to the Fifth Edition' acknowledges the help of 'Lieut. E.V. Appleton'.

(The book was purchased by Mr. A. Gardner of the Appleton Laboratory who sent the photocopy to Lady Appleton.) |

Biographical and personal

A.60, A.61 Two folders of press-cuttings relating to Appleton and his activities.

See also A.22, A.37.

A.62-A.94 Diaries and notebooks, 1936-65

These are small pocket diaries, containing notes of engagements, addresses and telephone numbers, personal and financial notes, titles of books read or to be read, epigrams, notes and anecdotes for speeches, etc. In addition, some contain jottings of scientific observations, experiments or formulae and a note is made of these cases in the list below. Generally speaking, however, these are personal diaries as distinct from the scientific notebooks in Section B.

A.62	1936	Includes some scientific notes
A.63	1938	Includes a little scientific material
A.64	Cambridge University Diary, 1938-39	
A.65	1939	Includes scientific notes and observations
A.66	1940	
A.67	1941	
A.68	1942	
A.69	1942	Includes scientific notes and observations
A.70	1943	
A.71	1944	
A.72	1944	
A.73	1945	
A.74	1946	
A.75	1947	
A.76	1947	Mainly financial

Biographical and personal

- | | | |
|------|------|---|
| A.77 | 1948 | |
| A.78 | 1949 | |
| A.79 | 1949 | |
| A.80 | 1950 | |
| A.81 | 1951 | |
| A.82 | 1951 | September-December only, loose pages removed from a larger diary. Mainly scientific notes |
| A.83 | 1952 | Includes scientific notes, and engagements in Australia |
| A.84 | 1953 | |
| A.85 | | Edinburgh University Diary, 1953-54. Includes scientific notes and ideas |
| A.86 | | Edinburgh University Diary, 1954-55. Includes a few scientific notes |
| A.87 | | Edinburgh University Diary, 1955-56 |
| A.88 | | Edinburgh University Diary, 1956-57. Not used. |
| A.89 | | Edinburgh University Diary, 1957-58 |
| A.90 | | Edinburgh University Diary, 1958-59 |
| A.91 | | 1959-60 |
| A.92 | | 1960-61 Includes some scientific notes |
| A.93 | | Edinburgh University Diary, 1960-61 |
| N.B. | | There are no surviving diaries for 1962 and 1963 |
| A.94 | | Edinburgh University Diary, 1964-65. Not used. |

SECTION B

SCIENTIFIC NOTEBOOKS B.1 - B.60

These books have a twofold origin. Some are laboratory notebooks in the usual sense, documenting experimental work with dates and descriptions, and sometimes kept partly by research assistants and collaborators as well as by Appleton himself.

Others are more diverse, and belong to the category of 'little black books'. Appleton's lifelong habit of keeping small notebooks in his pockets was well known and commented on by his biographers, who often quote from them. The description 'little black books' is clearly no more than a generic term, since very few are black and some are quite large. Nevertheless they have many features in common; few are dated, and Appleton seems to have kept several of them in play at the same time so that each book might remain in sporadic use for years, entries being made at the front, back, or on odd blank pages in the middle. Conversely, certain books are hardly used at all. The content is heterogeneous and includes notes for experiments to be performed, theories to be tested or papers to be written, diagrams, calculations and 'thinking aloud', notes on the literature, of lectures or discussions at conferences, of points to be raised at meetings, quotations, anecdotes, epigrams or longer paragraphs for inclusion in Appleton's speeches or writings - not all of them on scientific subjects.

To a small extent, the material is similar to the diaries in Section A, but the notebooks in Section B differ in containing only Appleton's ideas on scientific or general topics with no details of engagements or chronology.

Dated material, or that to which a date can be tentatively assigned on internal evidence, is presented as a sequence. Undated material is placed at the end of the sequence (B.48 - B.57).

All the material is in Appleton's hand unless otherwise stated.

Continued

Scientific notebooks

Further research material in the form of loose notes and narratives, graphs and data, and exchanges of correspondence, is in Section C. Additional notebooks can be found at C.310, C.311 (Tromsø expedition), C.256 (radar), C.384-C.388 (valves), D.67, D.68 (lecture material), H.1.

Attention is drawn to B.58 - B.60, which comprise two bound volumes and one folder of press-cuttings recording developments in 'wireless', radio and television. Appleton began the first of these (B.58) during the First World War and continued somewhat less methodically until about 1939.

Scientific notebooks

- B.1 Hardback notebook, inscribed inside 'Victor Appleton St John's College, Cambridge. Magnetism and Electricity'.
- Both ends of book used.
- Notes and calculations, perhaps of undergraduate work (Appleton usually signed himself 'E.V. Appleton' after 1919).
- Some notes on negative ions, ionisation, etc. may be of later date.
- B.1A Army notebook, few pages only and front cover remaining.
- Notes on differential equations, perhaps for lectures as Instructor in R.E. Signals during First World War.
- B.1B Army notebook, inscribed on cover 'E.V. Appleton ii Lieut R.E. Electricity Notes'.
- Both ends of book used.
- At front of book, notes on electricity and magnetism, perhaps for lectures during First World War.
- In middle of book, sequence of pages (some numbered) of experiments on 'Oscillator with Leaking Grid Condenser', at Cambridge, 1920-21 (not all in Appleton's hand).
- At rear of book, press-cuttings on valves, electricity, etc., mainly during First World War.
- B.2 Hardback notebook of graph paper, inscribed on cover and inside 'E.V. Appleton. Cavendish Laboratory 1919'.
- Both ends of book used.
- Notes and calculations on electricity, perhaps from lectures by C.T.R. Wilson.

Scientific notebooks

- B.2A Red softbacked notebook, inscribed inside 'E.V. Appleton. St. John's College, Cambridge'. 1919
- Both ends of book used.
 - Notes (some dated 1919) of experiments on oscillating circuits.
 - Notes on glassblowing.
 - Notes of work planned, including 'Van der Pol's coils'.
 - Narrative of experiments conducted.
- B.3 Hardback notebook. 1919-22
- Notes of experiments and ideas on oscillators and circuits, some with various dates, December 1919-October 1922.
 - Notes for 'Further Experiments on Atmosphericics'.
 - A few notes at rear of book.
- See also B.4.
- B.4 Miscellaneous pages of notes and calculations, originally tucked into B.3.
- B.5 Hardback drawing book of graph paper, n.d., c.1920.
- Both ends of book used.
 - At front: graphs and calculations of valves and oscillators.
 - At rear: 12 monthly graphs, labelled January-December.
- B.5A Black ring-bound notebook.
- Notes and narratives of experiments on atmosphericics and on Aperiodic Impulses. The work begins July 12 [1920] and continues to April 17 [1921].

Scientific notebooks

- B.6-B.8 Sequence of three small hardbacked notebooks, numbered 1, 2 and 3 by Appleton. The first is also dated 'April 2nd 1923' and the third has an indistinct date 1925. All three books were used on and off for several years and contain similar material. They may well be the origin of the description 'little black books'.
- B.6 Small notebook '1', dated 'April 2nd 1923' and inscribed inside 'E.V. Appleton, St. John's College, Cambridge. Please return'.
Some entries dated 1924.
Notes and ideas on research carried out or projected on triode, circuits, etc., notes on the literature, or of discussion with Van der Pol ('Balth').
Back cover and page contain lists of papers 'Published', 'Possible' and 'Projected'.
- B.7 Small notebook '2', no inscription.
Notes and ideas for research, 'Suggestions for articles' (on oscillators), headings for discussion meeting, work on absorption, 'Points for short wave paper', notes possibly of conference contributions by Bohr, Chapman and others.
Includes some material on Tromsø (c.1931) and a note 'Good wave-traps in W.W.' (Watson-Watt) dated '16/9/32'.
This book also contains a note (undated) 'Could an aeroplane get us direction of vector?' quoted in Clark, Sir Edward Appleton, p.48.
- B.8 Small notebook '3', with an indistinct date 1925 on cover.
Notes and ideas for research, notes on a paper by Watson-Watt, notes for 'Progress Report RRB' (Radio Research Board) dated '2/6/27', notes on URSI meeting, note 'Try spark method of Breit and Tuve', other notes dated 1928, 1932, narrative on aurora referring to 'Tromsø last year' (c.1932), drawings of spectra, etc.
- B.9 Soft-backed notebook, front only used.
Calculations and graphs of experiments with oscillators. n.d.

Scientific notebooks

- B.10 Notebook, inscribed 'E. V. Appleton' on cover.
Notes on the literature, mainly on oscillators. n.d., but book was bought in Haarlem, where Appleton is known to have visited Van der Pol in 1924.
- B.11 Black notebook inscribed 'E.V. Appleton Atmospherics' on cover.
Miscellaneous notes, tables, calculations, plan for paper 'On the Nature of Atmospherics' (Part I published with R.A. Watson-Watt Proc. Roy. Soc., 103, 1923), drafts for paper or note on oscillations in discharges.
At rear of book is draft for Appleton's farewell speech on leaving Cavendish, 1924.
- B.12 Hardback notebook, inscribed inside 'E.V. Appleton. Wheatstone Laboratory, King's College, London. Ionization of Gases. Digests of Papers'.
Only a few pages used, at front of book.
- B.13 Thick notebook, inscribed on cover 'Atmospheric Data' (not in Appleton's hand); inside 'Wheatstone Laboratory' in Appleton's hand, 'May 1925' in another hand.
Early entries begin December 1924 in Appleton's hand headed 'Tests of Constancy of 2LO intensity from fading experiments'.
Entries continue with dated experiments to 25/8/27, not in Appleton's hand but with occasional notes by him.
See also B.14.
- B.14 Miscellaneous loose pages of notes and calculations originally tucked in B.13, some dated 1926.
- B.15 Hardback notebook, inscribed 'Edward V. Appleton, Captain R.E.' presumably acquired during service in 1914-18 War.
Detailed observations and comparison of various stations, almost all in Appleton's hand or with comments by him.
Inside front cover is a detailed list of experiments numbered 1-77, dated March 1926 to November 1928, which form the contents of the book.
Also includes some narratives and summaries of the experiments by Appleton.
Work continues to July 1929, on Modulation Frequency Tests.

Scientific notebooks

- B.16 Thick notebook, inscribed inside 'Simultaneous Measurements in Downcoming Rays'.
 Inside front cover is a list of experiments numbered 47-62, dated December 1927 to August 1928 (not all were completed), of reception data received at Cambridge, Peterborough, King's College.
 See also B.17.
- B.17 Miscellaneous loose pages of notes and calculations originally tucked into B.16, various dates 1928.
 Includes a letter re research from A.L. Green, 1928.
 (Appleton published a collaborative paper with Green in Proc. Roy. Soc., 128, 1930.)
- B.18 Thick notebook, inscribed 'E.V. Appleton' on page edges.
 Mainly notes on the literature, latest date 1927.
 Only a few pages used, at front of book.
- B.19 Hardback notebook, inscribed inside 'N.P.L. Transmissions on Short Waves'.
 Inside front cover is a list of experiments, dated August-November 1928, recorded at King's College, Peterborough and Cambridge.
 The records are not in Appleton's hand but almost all have comments by him.
 Towards rear of book is a later test (numbered 92), July 1929, and a narrative 'Notes on Test' by Appleton.
 See also B.20.
- B.20 Miscellaneous loose pages of notes on tests, and tabulated results, February 1928-April 1929, originally tucked into B.19.
 Also included is a sheet of records for Tromsø, 1951.

Scientific notebooks

- B.21 Hardback notebook, inscribed on cover 'Daily N.P.L. Transmissions 100 λ ' and inside (not in Appleton's hand) 'N.P.L. Transmissions on 100 Metres Daily, Commencing November 18 1929 from 12 to 12.30 p.m.'
- Daily log of experiments and notes, all in Appleton's hand, for 33 days (to 20 December), with observations for January 16 1930, and earlier notes from 1928 and 1929, and a narrative summarising results.
- Inside rear cover is a log of the experiments numbered 1-35 (not all completed).
- B.22 Hardback notebook, inscribed inside 'Month's Run. February 23 1931 to March 21. Measurements of Critical Frequency'.
- Records all in Appleton's hand. Some shorter notes continue to 3 June.
- B.23 Hardback notebook. n.d., c.1931.
- Includes notes on 'Dielectric Constant of Ionised Gas', polarization, work of Tonks, 'Notes for Discussion'.
- At rear of book, extended narrative on 'Probe Analysis'.
- B.24 Large ledger-type notebook inscribed on cover 'E. V. Appleton. Magneto-Ionic Theory'. n.d.
- Calculations, only a few pages used. Includes a few loose pages.
- B.24A Black ring-back notebook.
- Lectures on Fourier analysis and statistics, n.d. c.1932.
- B.25 Hardback 'Minute Book', pages numbered 1-197 (only 1-107 used).
- Notes of very heterogeneous nature, probably begun c.1930 and continuing to 1948.
- Includes notes on the literature, notes for experiments or of discussions, ideas on various aspects of ionospheric research.
- p.85 contains very brief notes for 'Bakerian Lecture' (given in 1937).

Scientific notebooks

- B.26 Hardback notebook, inscribed inside 'Notes on Atmospheric Electricity, pp.1-25. K.G.E. (K.G. Emeleus), 1934'.
Notes on the literature, on experiments and hypotheses, conclusions.
All in the hand of K. G. Emeleus.
- B.27 Large ledger-type notebook.
Notes on mathematics, some labelled 'Lecture II', etc., perhaps for lectures at Cambridge, c.1936.
See also B.28.
- B.28 11 pp. notes on integrals, sent with a covering note November 1935 by G. Cook, and originally tucked into B.27.
- B.29 Large ledger-type notebook, n.d.
Mainly notes on atomic and particle physics, perhaps for lectures at Cambridge.
- B.30 Thick black notebook. n.d.
Miscellaneous notes, calculations and references, on recombination, 'Correct magneto-ionic formulae', critical frequencies.
Latest reference 1937.
Only a few pages used, at front of book.
- B.31 Small softcover notebook, inscribed inside 'E.V. Appleton, 16 Old Queen St ... S.W.1.'
Notes on the literature, many research ideas on a wide variety of topics in ionosphere, latest dated reference 1941.
- B.31A Hardback notebook of graph paper.
Both ends of book used.
Miscellaneous notes, narratives and calculations probably made over a considerable period (latest date 1940).
Includes work on electron density (c.1935-36), recombination, theories of Massey, Pekeris, Eckersley, Chapman, Booker, etc.
At rear of book, ideas and questions for research.
See also B.31B.

Scientific notebooks

- B.35 Loose papers originally tucked into B.34.
- Includes: 5 pp. ms. letter by Appleton to 'Mr. Piggott, Mr. Gorwyn', 21 January 1945, discussing research on energy flux.
- 3 pp. note 'The obliquity factor in diffraction problems', by P.M. Woodward, 1 June 1945.
- Note from R. L. Smith-Rose on 'radiolocation of the moon', 5 September 1945.
- B.36 Black notebook, first page headed 'F₂ Layer anomalies'.
- Notes, tables and references, latest dated reference 1944 though work may continue later.
- Only a few pages used, at front of book.
- B.37 Hardback notebook, inscribed on cover 'Solar noise. Galactic noise'.
- Notes, observations, drafts, notes for discussion, comments on others' work or papers, etc.
- Related especially to work with J.S. Hey, 1946. See also C.323-C.357.
- B.38 Hardbacked notebook.
- Monthly comparative charts of average noon critical F₂ layer frequency on 5 disturbed and 5 quiet days for 1948 (at Washington station).
- 1 loose page graph of observations.
- Inside rear cover, brief notes of 'Points for investigation'.
- B.39 Black loose-leaf ring-back notebook.
- Typed-up series of notes on the literature, data and graphs, research ideas, etc., with some ms. notes.
- Includes Appleton's note of 'Points requiring attention', 28 December 1951, and a note to Mrs. Pritchard, 25 February 1952.

Scientific notebooks

- B.40 Small black notebook, inscribed inside 'E.V. Appleton'.
Notes made on journey to Australia for URSI meeting and other engagements, 1952.
Includes personal notes, list of articles and speeches required during trip, notes of papers read or contributions heard at conference, diagrams and research ideas.
Both ends of book used.
- B.41 Hardback notebook, University of Western Australia, inscribed on cover 'E.V. Appleton (Univ. of Edinburgh) Ionosphere'.
Notes, research ideas, notes of discussion meetings, on various topics including recombination, sunspot cycle, etc.
n.d., c.1952.
- B.42 Red loose-leaf ring-back notebook.
Notes, diagrams, ideas, comments on papers and theories by others; p.1 has heading 'I.G.Y.' (International Geophysical Year) and may refer to preparations for the 1957 meetings, or to earlier URSI meetings at which the idea was discussed.
Includes notes, perhaps for reports, on E layer and F layer studies, and notes on rockets.
- B.43 Spiral-bound notebook.
Notes and diagrams of papers, contributions, etc. at URSI meeting, Boulder, Colorado, August-September 1957.
- B.44 Small hardback notebook, inscribed inside 'E.V. Appleton ... Edinburgh'.
Notes for speeches and talks, several intended for a medical audience.
Some scientific notes, and several references to I.G.Y.
Latest dated reference 1960.
- B.45 Red loose-leaf ring-back notebook.
Various notes and diagrams.
Included is a note from C.S. Gillmor 'These notes by EVA are mostly in 1954 prob. at Mixed Commission on Ionosphere meeting + some notes possibly in few years after '54'.

Scientific notebooks

- B.46 Black notebook.
Notes for speeches and lectures, on general and scientific topics.
Includes headings for 'Granada Lecture' (given in 1959), latest dated reference 1960.
- B.47 Small red notebook.
Hardly used. Latest datable reference 1962.
- B.48 Small red spiral-bound notebook, n.d.
Notes and drafts on electron density, Sq curves, etc.
Notes and anecdotes for speeches.
- B.49 Soft-cover notebook, n.d.
Mainly notes on linear equations.
Only a few pages used, at front of book.
- B.50 Small black loose-leaf ring-back notebook, n.d.
Includes sequence of 17 numbered pages relating to work on $(fE)^2$ values at Edinburgh.
- B.51 Black hardback notebook, n.d.
Miscellaneous notes, diagrams, calculations and narratives, of various periods, and including work on solar noise, 'relaxation time of the F₂ layer', 'Points on E and F', 'Distortion in the E layer', 'The Continuity Equation', etc.
Work probably begins c.1940 and continues to c.1953.
- B.52 Green notebook, inscribed 'F₂ Layer Theory'.
Notes and calculations, with 2 loose pages inserted.
Only a few pages used, at front of book.
- B.53 Spiral-bound New York University notebook, inscribed on cover, 'E.V. Appleton, Univ. of Edinburgh'.
Notes and calculations, draft headed 'Paper on Anomalous Equatorial Belt', with 2 loose pages inserted.
Only a few pages used, at front of book.

Scientific notebooks

- B.54 Spiral-bound notebook, n.d.
Notes and drafts on several topics.
Includes 'Some Notes on Methods of Investigating E and F₁ Layers', 'Formation of negative ions', notes for experiments, etc.
- B.55 Small hardback notebook, n.d.
Miscellaneous notes, calculations, ideas; notes and anecdotes for lectures.
- B.56 Spiral-bound notebook, n.d.
Miscellaneous scientific and university notes, last date 1950.
- B.57 Grey spiral-bound notebook.
Miscellaneous notes and drafts, on 'constant time error', 'A Study of the E Layer', 'A Possible Explanation of the α^1 phenomenon', and other topics.
n.d., but includes loose pages of photographs dated December 1957.
- B.58-B.60 Press-cuttings.
- B.58 Large Army 'Register of Requisitions' book, containing press-cuttings from technical journals, chiefly The Electrician, on meetings, research papers, discoveries and research. 1916-18.
Some loose cuttings are tucked into rear of book.
- B.59 Large green ledger-type book, containing press-cuttings on developments in radio and television, approximately 1927-39.
- B.60 Folder of similar material, mainly 1930s.

SECTION C RESEARCH TOPICS C.1 - C.425

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INTRODUCTION TO SECTION C

The material in this Section is very diverse. It includes notes and ideas by Appleton, comments and suggestions exchanged with research assistants, collaborators and colleagues, drafts for discussion meetings or for papers and talks, data (charts, graphs, diagrams) and correspondence.

The alphabetical sequence in which the material is presented is intended as no more than a guide. Some of the titles, such as 'Absorption', 'Atmospheric Spectrum', 'Ionized Air', 'Recombination and attachment', 'B - determinations', etc. correspond to Appleton's own file-headings, but others were adopted for the purpose of this catalogue on the advice of scientists and historians of science. In some cases, the headings cover brief exchanges only, while others describe extensive folders and a wide spread of material and time. Within each topic, the papers are in a chronological sequence, though this is frequently tentative; undated papers come at the end of each sequence.

A very substantial proportion of the material was received as loose papers, rarely dated by Appleton and showing little variation in his handwriting over the years which might have permitted closer dating. Although efforts have been made, and advice taken, to assign work to some identified field of study or period of time, it has not always been possible to do so with any certainty. Material of this kind has been grouped under the title 'General Ionospheric Topics' (C.106 - C.165). It includes especially the collaborative work undertaken during Appleton's service as Principal of Edinburgh University 1949-65, when he pursued several lines of enquiry simultaneously with the help of a series of assistants and colleagues at Edinburgh (particularly Mrs. A.G. Pritchard, later Turnbull, A.J. Lyon, C.P. Bell, and the 'Ionospheric Young Ladies' from the Department of Mathematics) as well as postal discussion with his lifelong colleagues W.R. Piggott, and W.J.G. (later Sir Granville) Beynon.

It should be noted that the data and correspondence in this Section consist only of material either specifically related to the topic in hand, or kept in a named folder by Appleton himself. The correspondence folders in Section E contain similar material; see especially correspondence with W.J.G. Beynon (E.9 - E.16), R. Naismith (E.71 - E.82), W.R. Piggott (E.87 - E.98), B. van der Pol (E.117 - E.144).

Section F contains extensive additional data, prepared by or under the direction of Appleton in the furtherance of various research projects. Section G includes data and reports sent to him from observatories and ionospheric stations worldwide. These Sections should therefore be regarded as supplementary to Section C. In addition, the notebooks in Section B often provide the embryo of Appleton's research ideas.

ADDITIONAL MATERIAL

Items C.389 - C.425 represent notes, working papers and correspondence which were received too late for inclusion in the main sequence. Many were in Appleton's original bulky folders or binders, which have been retained together with their titles, but the contents have been divided into more manageable units.

The material is presented in the alphabetical order of the index of topics and cross-referenced to the items which it supplements. Appleton's work with W.R. Piggott on ionospheric storms was hardly represented in the collection as first received. It has now been listed as a separate topic in the index and the material appears at C.410 - C.421.

Research topics

- C.1-C.7 ABSORPTION c.1935 - c.1948
- Contents of a folder so described by Appleton.
- C.1 'Absorption of Wireless Waves in Ionized Atmosphere'
 6 pp. ms. notes and calculations, no author or date.
- C.2 'Collisional frequency of electrons in the ionosphere'
 Typescript and ms. draft paper by F.T. Farmer and
 J.A. Ratcliffe, n.d. c.1935
 (These two items are in Appleton's original folder.)
- C.3 Two notes by A.R. Meetham, 1942
 'Absorption and scattering of radio waves by electrons'
 1 p., 13 May.
 'Absorption of radio waves by thermal motion of electrons'
 2 pp. 9 July, sent with a covering letter saying
 'it is far less intuitive than my note of May 13', 10 July
 Included here is 1 p. note by W.R. Piggott on 'Dr. Meetham's
 paper', 4 August 1942.
- C.4 'Note on the Geophysical Effects of an ionospheric irruption'
 4 pp. ms. note by Appleton, n.d.
 Brief 1 p. note from Piggott, on absorption, December 1941.
 2 pp. ms. note to Piggott by Appleton, on absorption
 formula, March 1944.
- C.5 Papers relating to CX/WP 54.
 These refer mainly to papers on 'Ionospheric Absorption
 Measurements' and 'Suggestions for an Absorption Programme'
 received by the Combined Communications Board Wave
 Propagation Committee and discussed at its meeting on
 16 May 1945.
 Included here are 4 pp. ms. comments by Piggott on the
 CX/WP 54 papers, on behalf of Radio Research Board.

Research topics

- C.6 Miscellaneous drafts for papers on absorption.
 Short sequences only, n.d.

 1 p. 'Measurements of Oblique-Incidence Absorption', by
 G.McK. Allcock, 1948.
- C.7 Miscellaneous ms. graphs, mainly 1934-39.

 Ms. graph by Piggott of reflection coefficient.

 Included here is a 5 pp. ms. note on 'Evaluation of
 integral', n.d. The note has the name and address
 of G.F.C. Searle (d.1954). See C.396.
- See C.389 - C.404 for additional material on absorption.

Research topics

- C.8-C.28 ATMOSPHERICS c.1921-45
- Notes, drafts and correspondence.
- The early material was described by C.S. Gillmor as 'work on pulse characteristics of receivers, and problems of receiving atmospherics'. The later material (from c.1929) is mainly on the effects of thunderstorms.
- C.8-C.16 Notes and drafts
- C.8 'On the energy spectra of atmospherics'
- 2 typescript drafts for a paper so titled, 14 pp. (second copy lacks p.1). n.d.
- Perhaps not by Appleton, but with ms. corrections in his hand.
- (In Appleton's original folder, inscribed 'X-Spectrum Analyses', which also includes C.S. Gillmor's note quoted above.)
- C.9 Appleton's ms. drafts for sections of a paper under the general title 'Effects of X's on Receivers'. n.d.
- See also C.10.
- C.10 Loose pages of notes and shorter narratives, originally found inside C.9 on energy spectra and atmospherics. n.d., but one page is dated 1931, and one page ends 'To be Continued. I find it takes time to elicit facts from my MSS and don't want to delay posting to you. E.V.A.' (Addressee unknown).
- C.11 Shorter ms. notes, graphs and calculations, many on verso of Cambridge undergraduates' exercises.
- Included here is a list of signatures (including A. J. Eley, N.F. Mott, J.D. Ewen) of those attending a class.
- C.12 Similar material, mainly on conductors, perhaps of later date.
- C.13 'Note on the difference between British and tropical thunderstorms'
- 1 p. duplicated typescript prepared by Appleton for the Atmospherics Committee, Radio Research Board, C.B. Paper no.76, n.d.
- p.2 only of typescript draft paper on atmospherics, n.d.
- Photographs.

Research topics

- C.14 Drafts, figures, graphs, etc. for paper on thunderstorms, no author or date, c.1930-31.
(Not in Appleton's hand.)
- C.15 Folder of reports, offprints, etc., annotated or with intercalated notes by Appleton.
- C.16 'Atmospheric spectrum'
Original folder so titled, including ms. translations of articles on atmospherics, D.S.I.R. and U.R.S.I. reports, National Defense Research Committee report by Jansky and Bailey (1943), etc.
- C.17-C.28 Correspondence
- C.17 C.R. Burch n.d., 1925
- C.18 F.W. Chapman 1933-34
Correspondence, notes and drafts, mainly re his collaborative paper with Appleton 'The lightning flash as a source of atmospheric', Nature, 135, 1934.
- C.19 T.L. Eckersley 1925
Including a typescript research paper on 'Energy of Atmospherics'. Eckersley's letter is addressed to Admiral Jackson and bears a ms. note 'E.V.A. Pl. see & return R.A.W.W.' [Watson-Watt].
- C.20 A.N.R. Goldie 1929
'About the Spectrum of Atmospherics'
3 pp. ms. paper + graph, by A. Haubert 1945
- J.T. Henderson 1933
- C.21 A.G. Lee 1925
Post Office reception methods.
- H. Narinder 1933
- C.22 J.A. Ratcliffe n.d.
Enclosing notes comparing grating and oscillator.

Research topics

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|------|---|------|
| C.23 | F. Schindelbauer | n.d. |
| | Correspondence, photographs, offprints, 1928-29,
etc. of observations at Potsdam. | |
| C.24 | B.J. Schonland | 1934 |
| | With a copy of his lecture on lightning discharge. | |
| C.25 | G.C. Simpson | 1933 |
| | Critical comment on Appleton's and Naismith's
paper 'Weekly measurements of upper atmospheric
ionization', <u>Proc. Phys. Lond.</u> , 45 (see corres-
pondence from Watson-Watt below). | |
| | M. Taylor | 1931 |
| C.26 | H.A. Thomas | 1943 |
| | <u>re</u> Working Committee on Radio Noise.
Includes 'Comments on proposed noise investigation', and
a copy of the draft report of the working committee. | |
| C.27 | R.A. Watson-Watt | 1934 |
| | Very critical comment on Appleton's and Chapman's
paper, 'The lightning flash as source of an atmospheric',
<u>Nature</u> , 134, and referring to previous work and
publications by Appleton, Watson-Watt and Herd
(<u>'On the nature of atmospherics'</u> , <u>Proc. Roy. Soc.</u> , III).
Includes press-cutting of an article by Watson-Watt
on atmospherics, 1930. | |
| C.28 | Unidentified ms. notes, sent from '282 Fulham Road'. | |

Research topics

- C.29-C.35 CRITICAL FREQUENCY c.1932-c.1946
- C.29 Ms. data, graphs and calculations of E and F layer critical frequencies, based on test runs at King's College, London, 1932.
- Almost all in Appleton's hand, but includes 2 pp. on 'F layer critical wavelength', by G. Builder, February 1932.
- C.30 h't measurements on six frequencies.
- Dated graphs, various dates 1932-33, sent to Appleton by J. Zenneck.
- C.31 Ms. notes and graphs by Appleton, with miscellaneous graphs of equivalent heights, etc., some in the hand of L.J. Ingram and dated 1934.
- C.32 Folder inscribed (not in Appleton's hand) 'Critical Frequencies for F₁ and F₂, 1934. Slough Records'.
- Detailed ms. charts, almost all in the hand of L.J. Ingram.
- C.33 Ms. charts and graphs of critical frequencies for E and F layers, no station given, various dates 1935-36.
- C.34 Critical frequency values for January 1936 (no station given), with a letter to -. Gander from R. Naismith.
- C.35 Miscellaneous ms. charts and graphs, mainly of critical frequencies, for various stations and dates.
- Includes: vertical incidence curves at Slough and Tromsø, c.1936.
- graphs for 1944, 1945-46 (in Appleton's hand), etc.
- See C.405 for additional material on critical frequency.

Research topics

C.36-C.55

E LAYER

Drafts, notes, data, correspondence.

Much of this material was originally crammed into a folder inscribed 'Abnormal E Paper', with a ms. note added later by Appleton 'Mr. Lyon to see. These are approx. 20 year-old notes!'

The bulk of the material refers to work in the 1930s, including Appleton's collaborative papers with R. Naismith and L. J. Ingram (C.36-C.45).

The later folders (C.46-C.50) refer to his work in the 1950s with A. J. Lyon and A. G. Pritchard and to his last article on the subject, which was unfinished at his death (C.50). Additional data, notes, etc. dealing with various research projects on the 'E Layer' but not included with this specific material, can be found in 'General Ionospheric Topics' in Section F.

Correspondence on E-layer research appears at C.51-C.55.

Notes and drafts for Appleton's last paper on the E-layer, unfinished at his death, are at D.62-D.64.

C.36

Miscellaneous ms. drafts and notes for papers by Appleton, n.d.

'On the seasonal and sunspot-cycle variation of abnormal Region-E ionization'

'Note on E-persistence'

'Variation of Abnormal E with solar activity'

'Scattering in the E Layer' (2 pp. note 'written to stimulate discussion in the Ionosphere group', n.d., but refers to an article by T.L. Eckersley 1940 of which a copy is included).

(These items are in Appleton's original folder described above.)

C.37

Miscellaneous longer drafts for papers, n.d., some accompanied by comments by R. Naismith and L. J. Ingram.

N.B. Not all of these refer exclusively to E-layer but deal also with equivalent height, critical frequency, etc.

Includes: 7 pp. sequence 'The Nature of Electric Wave Reflection'

pp.5-6 of a sequence

8 pp. sequence, 1937, heavily corrected and annotated, 'Some Notes on the Interpretation of P'f records'

Research topics

- C.37 (cont'd). p.9 only of a paper on abnormal E
pp.11-18 of a sequence, with corrections and annotations by Appleton and Ingram, 'Critical Frequency Phenomena for Region F₂'
5 pp. 'Further notes'
- C.38 Miscellaneous pages and figure for a paper on E-layer.
- C.39-C.43 Sequence of drafts, data and correspondence exchanged chiefly with R. Naismith, mainly on research, analyses of results and drafting of collaborative papers on E-layer. Naismith's material is usually dated and Appleton's notes, comments and suggestions have been tentatively assigned a place on internal evidence.
- C.39 1936
- C.40 1937
- C.41 1938 Includes copy of a telegram from Booker.
- C.42 1939 Includes a letter from H.W. Newton, a copy of a report by Naismith on 'Ionospheric conditions during the annular eclipse of 19 April 1939', and comments by W.R. Piggott, W.G. Beynon.
- C.43 1940 Includes a note by A.R. Meetham.
- C.44 'Comparison of Slough and Washington E-layer critical frequencies'
Tables and calculations by Appleton for 1935-47.
- C.45 Notes and communications on various problems in E-layer research, sent to Appleton by W.R. Piggott, most dated 1947.
- C.46-C.50 Drafts for papers and research notes, 1954-65, on collaborative work on E-layer with A. J. Lyon and A. G. Pritchard.
- C.46 'An approximate theory of ionospheric layer formation'
5 pp. typescript, by A.J. Lyon, August 1954.
- C.47 'The rate of electron disappearance in the E Layer of the Ionosphere'
11 pp. typescript, n.d., with 1 p. ms. note attached
'Possible causes of Phenomenon'.
- C.48 Drafts for paper by Appleton, Lyon and Pritchard, 'Some anomalies in the E layer of the Ionosphere'. Typescript.
'Draft lay-out', 5 pp.
Introduction and text, 5 pp. +40 pp.
3 pp. concluding summary of results, dated October 1955.

Research topics

C.56-C.105

F LAYER c.1936-60

Appleton's original labelled folders do not appear to have survived for the early research; those which are included here (C.94, C.97-C.99) are mainly from the Edinburgh period. Much of the material in this sequence has been assembled from loose papers. Appleton's own research ideas, discussion papers and drafts occupy C.56-C.81 followed by an approximately chronological sequence of data and correspondence (C.82-C.105).

C.56-C.81

Drafts and ideas for research on F-layer

C.56

5 pp. sequence headed 'Results', listing nine points for comment and further investigation.

With some annotations, probably by R. Naismith.
n.d. c.1936-37.

C.57

4 pp. sequence headed 'Criticism of Martyn and Pulley' (1936 paper), listing twelve points of comment.

With some annotations, probably by L.J. Ingram.

C.58

2 separate sheets of 'Further Notes', similar subject and date.

C.59

2 pp. typescript outline for two papers on F-layer, 'Paper I - Regularities' and 'Paper II - Irregularities'. n.d. c.1937.

C.60

2 pp. sequence headed 'Further Points', listing twelve points for investigation (1-8 in Appleton's hand, 9-12 in that of R. Naismith).

With an additional page of notes on the subject by Naismith. n.d. c.1937.

C.61

5 pp. typescript paper on electron density, no author or date, with 2 pp. ms. note by Appleton attached, on electron production. c.1937.

C.62

'F₂ Region Ionisation Anomalies'

1 p. typescript note, n.d. c.1940.

C.63

'Notes on F₂ Anomaly'

1 p. ms. note, n.d.

C.64

'A New Approach to the Elucidation of F₂ Layer Phenomena'

2 pp. note, n.d. (written on wartime paper).

Research topics

- C.65 'Outline of a Theory of the F₂ Layer'
2 pp. note, n.d.
- C.66 'A Sketch of a general theory of F₂ Layer ionisation'
3 pp. note, 1 p. graph, n.d.
- C.67 'Possible explanation of world variation of F₂ ionisation'
1 p. typescript note, with a secretary's note 'Copies sent to Mr. Naismith, Dr. Beynon and Mr. Piggott 13/9', no year given.
Note on eclipse observations, September 1941.
- C.68 'Discussion of Goodall diagrams'
3 pp. typescript note, signed and dated 9 February 1941.
- C.69 1 p. typescript note on solstice observations, signed and dated 3 July 1941.
- C.70 'Note on the F₂ Layer "Kink"'
1 p. note reporting W.R. Piggott's observation and suggesting lines of investigation, typescript, signed and dated 22 January 1942.
- C.71 1 p. typescript note to W.R. Piggott on F₂ equinox values, signed and dated 11 January 1946.
- C.72 'Some Notes on F₂ Layer Anomalies'
6 pp. ms. sequence listing eleven points for discussion.
- C.73 8 pp. typescript version of above, with an additional twelfth point missing from ms.
n.d., but circulated 17 November 1947 (see C.74 below).
- C.74 'Some Further Notes on F₂ Layer Morphology'
Unfinished 2 pp. ms. notes to 'continue the discussion of F₂ Layer morphology dealt with in the following communications ...', listing Appleton's writings on the subject 1944-47 including C.73 above.
- C.75 'Further notes of F₂ anomaly'
1 p. ms. note listing four points, n.d.

Research topics

- C.76 'Third Note on the Morphology of the F₂ Layer of the Ionosphere'
4 pp. ms. draft.
(Appleton's first and second notes on the morphology of the F₂ Layer were confidential D.S.I.R. documents 1943, 1944 respectively. No third note is listed in the bibliography of his writings.)
- C.77 14 pp. ms. draft for paper on various aspects of F₂ Layer, latest reference 1939.
- C.78 'Studies of the F₂ Layer of the Ionosphere II. The Sunspot-Cycle Variation of Ionisation in the F₂ Layer'
16 pp. typescript draft with ms. notes by Appleton and Mrs. Pritchard, and 1 p. comments in another hand expressing caution.
(Appleton published Part I of 'Studies of the F₂ Layer' in *J. Atmos. Terr. Phys.*, 1 in 1950 but no Part II is listed in the bibliography of his writings.)
- C.79 'Storm phenomena and the solar cycle variations of the noon F₂ layer ionisation'
10 pp. typescript draft, an early version of the paper by Appleton and Piggott (*Physics of the Ionosphere*, 1954), with a ms. note by Piggott 'original draft replaced by now'.
- C.80 'Anomalous Diurnal Behaviour in F₂ Layer Ionisation'
4 pp. miscellaneous notes, drafts, ideas and calculations. n.d., perhaps c.1960.
- C.81 Shorter ideas, drafts and notes on F Layer, none dated but extending 1939-55.
- C.82-C.105 Data and correspondence
- C.82 Research notes from R. Naismith, L.J. Ingram, some annotated by Appleton. c.1936-37.
- C.83 2 pp. note on F₂ values in storms. c.1939.
Related graphs and data from Slough, 1938-39, sent by R. Naismith.
- C.84 Correspondence, reports and data from R. Naismith on various F₂ projects, 1940-42.
- C.85 Miscellaneous fF₂ charts and tables, compiled at Slough, mainly seasonal variations, covering various years and stations. 1932-40.

Research topics

- C.86 Notes and graphs, all by Appleton, on various F Layer phenomena, various dates 1935-42.
Also included here are unidentified tables of observations of E₁ F₁ and F₂ layers, December 1942-January 1943.
- C.87 Correspondence and data on F₂ Layer from W.R. Piggott, 1947.
- C.88 Correspondence and data from R. Naismith, 1948.
- C.89 Correspondence on F₂ from A.F. Wilkins, 1948, and an unsigned letter commenting on Appleton's F₂ research. c.1948.
- C.90 Tables of noon fF_2 values, plotted with geographic latitude, for September 1948 at various stations.
- C.91 Various data on ionospheric results on F₁ and F₂ Layers, at Tromsø, 1935-49.
Sent to Appleton with covering letters, 1950, and some bearing Appleton's ms. note 'Mrs. Pritchard'.
- C.92 Data on monthly mean values at Slough, 1943-50.
Monthly mean values for several stations, 1943.
- C.93 Data, notes, charts, calculations, by Appleton and others, mainly related to F Layer 'Jumps'. (Data run 1935-51.)
- C.94-C.96 Contents of Appleton's original folder labelled 'F₂ Paper II', including Appleton's own notes, correspondence exchanged with Mrs. Pritchard, related data and graphs, mainly 1950-54.
- C.94 Appleton's notes, some dated 1951. (In the original folder.)
- C.95 Correspondence with A.G. Pritchard, September 1951.
With accompanying data and graphs compiled by Mrs. Pritchard, chiefly of fF_2 noon values for June 1947 and June 1948, referred to in the correspondence.
- C.96 Appleton's letters, notes and instructions on research sent to Mrs. Pritchard, 1950-54.
N.B. These are dated notes, presented chronologically. They span the period of Appleton's journey to Australia in 1952, some being written from the boat train, the boat, or Sydney, and they show his determination to maintain active research.
See also C.97 below.

Research topics

- C.97 Original folder inscribed, in Mrs. Pritchard's hand, 'EVA's Instructions', but mainly containing Appleton's own notes, ideas and calculations. Very miscellaneous, none dated.
- C.98 Appleton's letters, notes and instructions on research sent to Mrs. Pritchard.
Similar material to C.97 but not dated and more fragmentary.
- C.99 Original folder inscribed, in Mrs. Pritchard's hand, 'Midnight Heights F₂ Layer'.
Tables and charts prepared by Mrs. Pritchard for various dates and stations.
Also included here is a letter from W.R. Piggott enclosing data, 1953.
- C.100-C.102 Contents of folder labelled in the hand of A.G. Turnbull (formerly Pritchard) 'I.G.Y. fF₂ Bartels Diagram'.
The work relates to various projects based on an analysis of data assembled during the International Geophysical Year, and in particular to Appleton's paper presented at the U.R.S.I. meeting at Brussels, September 1959 on 'The Daily Variability of F₂ Layer Maximum Ionisation during the I.G.Y.'
Appleton's chief collaborators in this work were A.G. Turnbull and C.P. Bell, and the 'Ionospheric Young Ladies' who prepared data and tables.
Much of the material in 'General Ionospheric Topics' also refers to these projects, and there is additional data in Section F.
Appleton also presented at the Brussels meeting a paper on 'Equatorial anomalies in the F₂ layer of the Ionosphere', published in the Proceedings.
- C.100 Appleton's own notes and diagrams.
Included here is a copy of the abstract of his paper 'The Daily Variability ...' on the coding system employed, with a ms. note 'For IYL to see, especially the coding system'.
- C.101 Correspondence with Mrs. Turnbull, forwarding and discussing results, charts, etc.
Not all dated, but continues to 1959 and includes a letter from Appleton, September 1959, discussing the Brussels meeting and further research projects.

Research topics

- C.102 Data and charts, including samples of 'Bartels diagrams'.
 (In original folder.)
- C.103 Later papers on F₂ Layer, 1959-60.
 Includes: Duplicated copy of Appleton's paper 'The relation
 between h_m (F₂) and M(3000)F₂ factors', given
 at U.R.S.I. meeting in Brussels, September 1959.
 Duplicated copy of Appleton's paper 'A New Use
 for N(h) Data, with a letter from J.O. Thomas,
 1960.
 Duplicated copy of note 'A New Theory of F₂
 Layer Variation', n.d., c.1959-60, on Appleton's
 work on β (the attachment coefficient).
 See also C.298-C.300.
 'Notes on the F-layer'
 5 pp. typescript, with a few ms. annotations by
 Appleton. No author, dated September 1960.
- C.104 Folder of reports and papers on F₂ layer, some drafts or early versions
 of U.R.S.I. reports.
 Various dates 1939-58.
- C.105 Folder of material on storms.
 Includes some copied by Mrs. Pritchard, some annotated
 by Appleton, etc.

Research topics

C.106-C.165 GENERAL IONOSPHERIC TOPICS c.1935-64

Under this heading are grouped all data, notes and correspondence which were not included in Appleton's named folders, but were received as loose and disordered papers. Most of them relate to his period at Edinburgh University, when he conducted collaborative research on a number of ionospheric projects simultaneously.

His consistent collaborator was A.G. Pritchard (later Turnbull) whose data comprise many different topics; for the period c.1949-54 he also worked closely with A.J. Lyon (see especially C.134-C.156) and c.1957-59 with C.P. Bell (see C.157-C.165) whose correspondence and accompanying data have been left in sequence. Appleton also consulted other colleagues at Edinburgh as well as continuing his collaboration with former colleagues; this correspondence appears in Section E. See, *inter alia*, correspondence with A. Aitken, W.J.G. Beynon, W.R. Piggott.

It will be seen that there is considerable overlap with other topics (notably 'E Layer' and 'F Layer'); material in this sequence must be regarded as essentially complementary. The only difference is in the provenance, and the absence of a specific folder designation by Appleton.

Appleton's own ideas, drafts and notes appear at C.106-C.131, and the remainder of the material (data and correspondence) is presented in approximate chronological order at C.132-C.165.

C.106-C.131 Drafts and ideas for research

C.106 'Future ionospheric programme'

3 pp. typescript, with a note to W.R. Piggott dated 31 December 1941 'I think the attached will interest you, as showing our ideas about future work in October 1935'.

C.107-C.111 Typescript sequence of notes, instructions, research ideas, comments on results or papers by others, etc.

The notes, which deal with several topics, are addressed to various collaborators at Edinburgh and Slough. The majority are Appleton's own notes, but some copies or extracts of letters or information sent by others are included.

Some of the notes are typed copies of ms. notes or letters elsewhere in the collection. They run approximately 1948-54 and may have been typed up as a sequence at a later date.

Research topics

- C.107 1948-50
- C.108 1951
- C.109 1952
- C.110 1953
- C.111 1954
- C.112 'Memorandum on Edinburgh Work on the F₂ Layer'
7 pp. typescript, January 1955.
- C.113 'Edinburgh Work on Ionospheric Changes and Magnetic Bays',
sent to 'Mr. Lyon for information'.
2 pp. ms. and typescript versions, March 1955.
- C.114 'Note by E.V.A.'
6 pp. typescript, January 1958.
- C.115 'Study of Recurrence Tendencies in Ionospheric Storms'
5 pp. typescript, May 1958.
- C.116 'Summary of Edinburgh findings on the equatorial anomaly'
2 pp. typescript, November 1962.
- C.117 'Ionospheric Work'
2 pp. typescript, December 1962.
- C.118 'Sunspot-Cycle Study of Abinger Y Variations'
1 p, typescript, January 1963.
- C.119 'Sunrise in the Ionospheric F Layer. Brief summary of results
Summer 1963'
8 pp. typescript, with a little accompanying data from
Mrs. Turnbull.
- C.120 Undated drafts and ideas for papers.
Includes: List of 7 titles for papers on the E Layer.
2 pp. notes for paper on electron density.
Notes for paper on equatorial anomaly, c.1959-60.

Research topics

- C.121 Shorter undated notes and drafts; some may date from the 1930s.
Includes: 'The Structure of the Atmosphere'
'Thunderstorm Theory'
'Dispersion'
3 pp. note on radio experiments.
List of eight points on E and F Layer problems.
- C.122 Shorter undated notes and drafts (continued).
Includes: 'Further Notes on Chapman's Theory'
'Note on Rechlin Ionospheric Forecasts' (dated 1 April 1942).
Note on magnetic storms.
'Note on correlation between stations' (Slough and Johannesburg).
- C.123 Shorter undated notes and drafts (continued).
Includes: Graphs and notes on F₂ Layer.
Note on seasonal variations.
Note on methods of recording.
- C.124-C.126 Appleton's instructions to collaborators and assistants at Edinburgh.
- C.124 Tables of values at various heights, for International Quiet Days only, calculated for September 1953, with Appleton's notes on method of tabulation to be used.
- C.125 Miscellaneous notes and instructions for 'I.Y.L.' (Ionospheric Young Ladies), some dated 1958, 1959, 1964.
- C.126 Miscellaneous shorter exchanges with A.G. Turnbull, some dated 1952, 1962, 1963.
- C.127 Charts and graphs by Appleton of sunspot activity for F₂ at Huancayo; data run 1938-44.
Also includes later similar data for fE in another hand.
- C.128 Folder inscribed 'Comparison of Huancayo and Tananarive'.
Tabulated data on various values, almost all in Appleton's hand, for 1951-54.
- C.129-C.131 3 folders of unidentified notes, data and jottings, almost all in Appleton's hand or with annotations by him.

Research topics

- C.132-C.165 Data and correspondence
- C.132-C.135 Ms. and typescript notes on ionospheric winds.
- C.132 'A digest of recent papers', no author, c.1953.
- C.133 'Notes on oscillations in the atmosphere', by W.R. Piggott, 1952.
- C.134 Ms. notes and narrative on the subject by A.J. Lyon, n.d.
- C.135 Typescript draft for substantial paper, no author, but with ms. additions in A.J. Lyon's hand, 44 pp. +7 pp.
 Appendix, 2 pp. Corrigenda.
- C.136 Correspondence with A.J. Lyon, November-December 1953.
 Includes Lyon's 'research notes' and Appleton's comments.
- C.137 Appleton's notes and instructions to A.G. Pritchard, November-December 1953.
 Typescript.
- C.138 Material relating to circular letter sent by Appleton, February 1954, to ionospheric stations asking for information about equipment, timing and frequency of readings, in connection with 'Edinburgh studies of the diurnal variations of the critical frequencies of the various layers of the atmosphere'.
 Includes: Draft letter requesting information.
 List of ionospheric stations throughout the world.
 Replies to letter, giving or enclosing information, presented in order of stations above, some incorporating correspondence with Appleton.
 Tabulated summary of information compiled by A.J. Lyon.
- C.139 Research notes, summaries of results, notes on the literature, narratives, etc.
 1 p. by Appleton, all the rest in the hand of A.J. Lyon.
 One piece only dated 1952, others undated, c.1952-54.
- C.140 Exercise book of critical frequency curves, by A.J. Lyon (few pages only used, at front of book).

Research topics

- C.141 Correspondence, data and research notes exchanged by Appleton and A. J. Lyon, 1954, some from Slough where Lyon worked during the summer.
Some of Appleton's notes are addressed to A. G. Pritchard jointly with Lyon.
- C.142 Correspondence, data and drafts exchanged by Appleton and A. J. Lyon, 1955.
Similar to above; includes references to W. J. G. Beynon's findings (see C.143, C.144 below) and some undated notes by Appleton.
- C.143 Correspondence and data, August-November 1955.
From W. J. G. Beynon, on his research findings (mainly on E layer), discussed with A. J. Lyon in C.142 and C.144.
See also E.16.
- C.144 Data and notes from A. J. Lyon, referring to Beynon's research and results.
Includes various narratives on 'The Beynon anomaly'.
n.d., c. September 1955.
- C.145 Notes and drafts for a paper or papers, on seasonal, diurnal and latitude variations.
All the work is in the hand of A. J. Lyon, and takes the form of various sequences, some bearing dates in 1954 and 1955, some with annotations or amendments by Appleton.
The sequences have been tentatively grouped where possible by pagination, paper size and type, etc.
- C.146 Accompanying data, some dated 1949-52.
- C.147 Further drafts and correspondence with Lyon, on research and publications.
Includes 1 p. ms. 'Abstract' by Appleton, for paper on E-layer. n.d. but perhaps refer to collaborative papers on E-layer 1957 and 1961.
- C.148 Later correspondence from A. J. Lyon 1956-58 and undated.
- C.149 Envelope of data and figures, inscribed by Lyon 'Old Draft of Paper II and odd figures I suggest omitting now' (perhaps refers to 1961 paper on E-layer).

Research topics

- C.150-C.156 Charts and data containing background information and research results, mainly by A. J. Lyon but also by Mrs. Pritchard and others, often referred to in the correspondence above.
- C.150 Charts by A. G. Pritchard, with a note by Lyon 'S2. fE and Latitude'.
Miscellaneous curves and notes by Lyon.
- C.151 Folder initialled 'AJL' (Lyon) of miscellaneous data, graphs and tables for various projects on sunspots, diurnal and seasonal variations, etc. Data compare various stations, mainly 1947-53.
Almost all by Lyon, but includes a little by Mrs. Pritchard.
- C.152 Folder labelled 'F layer' in Lyon's hand.
Charts, graphs, calculations, all by Lyon.
- C.153 Charts, data and notes by Lyon, mainly dealing with E-Layer.
Similar material to above, but received as loose papers.
- C.154 Folder inscribed 'fE and R' in Lyon's hand.
Charts and graphs by Lyon and Mrs. Pritchard.
- C.155 Folder inscribed 'E Seasonal' in Lyon's hand.
Extensive charts and graphs, almost all by Lyon, but some by Mrs. Pritchard and a few annotations by Appleton.
- C.156 Folder of notes and graphs, by Lyon, Mrs. Pritchard and others.
Similar to above, but more miscellaneous material, received as loose papers.
- C.157-C.165 Correspondence, data and research notes, 1957-59.
These are mainly exchanged between Appleton and C.P. Bell, at that time a research student working with W.E.J. Farvis in the Department of Electrical Engineers at Edinburgh.
In early 1957, a serious road accident interrupted Bell's research, and during his convalescence and recovery he assisted Appleton with data analyses and mathematical calculations for various projects, and in particular with research on seasonal variations in critical frequencies in atmospheric layers.
Some of the correspondence refers to the progress of Bell's recovery.
Comments and notes by Farvis can be found in C.157, C.165.

Research topics

- C.157 Correspondence and data, October-December 1957.
Includes Appleton's letter discussing arrangements for Bell to do 'a certain amount of computational work', and explaining research projects, and some notes by Farvis.
- C.158, C.159 Correspondence and data, 1958.
Mainly on γ values modified to remove seasonal variation, and includes graphs and tables by Bell and Appleton.
Also included are a 5 pp. note by Appleton on his sunspot research (27 January) and material on 'Bartels diagrams'.
- C.158 January-May
- C.159 June-December
- C.160 Appleton's own notes and calculations, mainly on seasonal variations in E Layer.
n.d., but related and referring to work with C.P. Bell, c.1958.
- C.161 Correspondence and data, January-March 1959.
- C.162 Folder inscribed 'Travelling Wave Aerials (Rhombic and Delta)' in Bell's hand.
Two drafts for a paper, and series of figures, on 'Rhombic and Delta Aerial Arrays', by C.P. Bell.
- C.163 Tables, graphs, etc., by Bell, Appleton and others.
Mainly on removal of seasonal variation.
- C.164 Tables, graphs, etc., by Bell, Appleton, Mrs. Pritchard.
Mainly on F₂ research. Some annotated by Appleton.
- C.165 Graphs, notes, calculations, notes on the literature, on research methods by harmonic analysis, etc., all in the hand of W.E.J. Farvis.
Includes copies of some of Appleton's letters to Bell, and 2 pp. 'Substance of EVA lecture (I.G.Y.) with comments on work by Appleton and Bell.

Research topics

- C.166-C.181 IONISATION c.1931-38.
- C.166 Folder inscribed 'F-region Ionisation KCL [King's College London] December 1931-May 1932' (not in Appleton's hand).
Data in various hands, with some loose pages inserted at front of folder. Includes work by Appleton, Naismith, Builder and others.
- C.167-C.179 Contents of bulky folder, inscribed by Appleton 'Ionized Air'.
- C.167 Notes and research ideas, by Appleton or commenting on calculations, etc. by others. n.d.
(In Appleton's original folder.)
- C.168 'The effect of high frequency electric fields on ionised gases'
Paginated 26-53, headed (4a).
Perhaps a section of a major paper or report, describing the work of the King's College team.
No author or date, latest reference 1930.
- C.169 Ms. 'Discussion of Results', 8 pp., sent to E.C. Childs, December 1931 and with some ms. comments by him.
- C.170 10 pp. ms. comments by Childs on 'Discussion'. n.d.
- C.171 Ms. comments by F.W. Chapman with a note by Appleton 'The following notes were written by Mr. Chapman after reading my screed'. n.d.
- C.172 Correspondence and research notes from D. Boohariwalla, 1931.
(Appleton published collaborative papers with Boohariwalla 1932, 1935.)
- C.173 Correspondence, notes, data from E.C. Childs, 1931-32.
On various research projects; includes 2 pp. note 'Investigations of Collisional Friction. Some suggestions for future work', by Childs, July 1931.
- C.174 Correspondence and drafts from J. Goodier, 1931-32.
Includes various drafts for Goodier's thesis, and for report by Appleton and Goodier to the Radio Research Board, both under the title 'The Dielectric Constant of Ionised Air'.

Research topics

- C.175 'Dielectric constant of ionised air'.
2 pp. typescript note, headed 'A.W. Russell'.
- C.176, C.177 Correspondence 1931-32 (and one letter 1927).
- C.176 S. Benner 1932
F.W. Chapman 1931
K.K. Darrow 1932
Enclosing a letter from L. Tonks
D. Dye 1927
- C.177 K. Emeleus 1931, 1932
D.R. Hartree 1931
L. Tonks 1931, 1932
- C.178 Correspondence from P.G. Gane 1936
Mainly about Gane's thesis on 'The frictional coefficient for electrons moving in ionised air', of which a copy is included.
- C.179 'The Forced Vibration of Electrons in Gases'
8 pp. ms. draft for paper, no author or date, latest reference 1931.
- C.180 Miscellaneous notes, etc. on ionisation (not included in Appleton's original folder).
'Further Notes for the Discussion'
5 pp. typescript, by Appleton, n.d. c.1931.
'Representative Character Figures of Upper Atmosphere Ionisation'
2 pp. typescript, no author, c.1938.
Photocopied material re Heaviside.
- C.181 Progress reports on Appleton's research, prepared for Radio Research Board.
1933 (King's College, London)
n.d., c.1934 (King's College, London)
n.d., c.1936 (Cavendish Laboratory, Cambridge)

Research topics

- C.182-C.191 LUNAR TIDES c.1936-49
- Drafts, data, correspondence.
- Most of the early material relates to the papers by Appleton and K. Weekes published in various journals, 1938, 1939.
- The correspondence continues to 1949, some of it relating to the paper by Appleton and W.J.G. Beynon, 'Lunar oscillations in the D-layer of the ionosphere', Nature, 164, 1949.
- Appleton's notes, drafts, and exchanges with his principal collaborator, K. Weekes, appear at C.182-C.186, correspondence with other colleagues follows at C.187-C.191.
- C.182 Ms. drafts for a paper or papers on tides, almost all by Appleton, but some in Weekes's hand.
- C.183 Ms. notes and narratives by Appleton on tides.
- C.184 'Lunar tides in the upper atmosphere'.
Draft for slide lecture, n.d.
- C.185 Ms. notes, narratives, data, lists of points to be included in papers, etc., by Weekes.
- C.186 Correspondence from Weekes, 1937, 1939.
Included here is a ms. report by Weekes for the Department of Scientific and Industrial Research, on 'An Investigation of the E-region of the Ionosphere', endorsed 'Approved Rutherford Oct. 12/1937'.
(Rutherford died on 19 October 1937.)
- C.187-C.191 Correspondence
In alphabetical order.
- C.187 J. Bartels 1938
W. J. G. Beynon 1949
re paper for Nature, and including data.
- C.188 L. J. Comrie 1938
J. Egedal 1936
Including a draft note.

Research topics

C.192-C.198

MAGNETIC STORMS c.1920-47

Appleton's own notes and drafts appear at C.192-C.194.
Data, correspondence with colleagues, etc. follow at
C.195-C.198.

C.192-C.194

Notes and drafts

C.192

'Wilson's Theory of Thunderstorms'

5 pp. ms. notes, probably taken c.1920 and with
annotations added later in blue pencil.

Also included is a sequence of ms. notes by another, on
same subject, and a reprint of C.T.R. Wilson's Phil. Trans.
paper 'Investigations on lightning discharges and on the
electric field of thunderstorms', 1920.

C.193

'Some Conclusions by E.V.A.'

Ms. notes and data, using Tromsø data, 1932, 1933.

'Note on variation of magnetic storminess'

1 p. only, refers to Tromsø.

'Note on Magnetic and Ionospheric Phenomena'

1 p., n.d.

'Magnetic Storms and Ionospheric Changes'

1 p., n.d.

C.194

'Magnetic Storms and Magnetic Activity'

1 p., n.d., refers to Tromsø.

'Remarks on Dr. Chapman's note on radio fade-outs and the
associated magnetic disturbances'

(note published in J. Geophys. Res., 43, 1938.

'The Relation between Magnetic and Ionospheric Storms'

2 pp., n.d. (written on wartime paper).

Miscellaneous shorter notes and drafts.

Research topics

- C.195-C.198 Correspondence and data
- C.195 Correspondence from E.H. Rayner (National Physical Laboratory)
re forecasting magnetic storms, 1926.
- Data and reports on occurrence and prediction of magnetic
 storms, sent to Appleton by N.P.L. 1926-28.
- Also included here is a report on a magnetic storm in Japan,
 1926.
- C.196 Correspondence, data, photographs, etc., exchanged by Appleton,
 R. Naismith and L.J. Ingram, 1936.
- C.197 Correspondence and reports from Naismith, 1937, 1940.
- Includes Naismith's report on 'Great Magnetic Storm
 1940'.
- C.198 Correspondence with W.R. Piggott, 1947.
- Includes 11 pp. draft 'Note on the problem of the currents
 which flow during a sudden ionospheric disturbance'.

Research topics

C.199-C.221 MAGNETO-IONIC THEORY c.1925-1943

With the exception of C.221 the material was crammed into a bulky folder inscribed 'Some observations on the polarization of downcoming wireless waves'.

The folder also has a later note 'Magneto-Ionic Theory' by C.S. Gillmor, to whom is also owed the identification of W. Altar (see C.214-C.216).

Appleton's own notes and drafts, which are almost never dated, appear at C.199-C.213.

Correspondence and data exchanged with colleagues appear at C.214-C.220.

C.199-C.213 Notes and drafts for papers by Appleton

All ms., none dated.

C.199 'Propagation of waves in an ionized gas under the influence of a magnetic field'

16 pp.

(In original folder.)

C.200 'The propagation of wireless waves through an ionized gas in a magnetic field'

Section 2 of a paper, paginated 4-9.

C.201 'Propagation of electromagnetic waves through an ionized gas in a magnetic field'

Variously paginated and annotated draft.

C.202 'Notes on magneto-ionic theory'

5 pp., much of it occupied with Lorentz's theory and the problem of negative and positive signs for the rays.

See Clark, Sir Edward Appleton, p.59, for a reference to this misunderstanding of Lorentz's postulation of the positive instead of the negative electron.

C.203

'Changes made in magneto-ionic theory by the introduction of the $\frac{1}{3}$ '

Research topics

- C.204 'The magneto-ionic Theory'
6 pp., developing Lorentz's Theory.
'Notes on application of Lorentz'
1 p.
'Results Lorentz notation'
1 p.
- C.205 'Note on Dispersion Problem'
- C.206 'The Influence of the Earth's magnetic field on Wireless Transmission'
Both of these are ms. with a partial typed version attached.
- C.207 'The effect of the earth's magnetic field in the case of long-wave reflection'
1 p.
'Résumé of results'
1 p.
'Notes on the Reflection Coefficient'
2 pp.
'Discussion of results'
3 pp., for section 6 of a paper, on downcoming waves.
- C.208 'Note on Magneto-ionic Theory'
2 pp.
'Note on Splitting of Echos'
1 p.
'Special case'
1 p.
'Field Equations'
3 pp.
'Calculation of Magneto-Ionic Parameters'
1 p.

Research topics

- C.209, C.210 Drafts for two U.R.S.I. reports by Appleton.
- C.209 'Introduction to the Reports on the Propagation of Waves and on Directional Wireless Experiments'
2 pp., 1926
With a letter from R.L. Smith-Rose.
- C.210 'The influence of the earth's magnetic field on wireless transmission', presented at U.R.S.I. General Assembly, Washington, 1927.
Typescript and published versions.
The typescript draft has a ms. note by Appleton, who lent it to A.J. Lyon for work at Edinburgh, 1955.
- C.211 Loose pages of notes, calculations and narratives, one bearing date 26 April 1929, one with reference to detection of an aeroplane, 1936.
- C.212 Shorter and more fragmentary notes and calculations.
- C.213 Miscellaneous data, graphs, photographs. Not all by Appleton, some dated 1931.
- C.214-C.220 Correspondence and data
- C.214-C.216 W. Altar
3 folders as follows:
- C.214 3 letters on research in progress, March-May 1926, after a visit by Altar to Appleton in London and his return to Vienna.
- C.215 'Wellenausbreitung in ionisierten Gasen unter dem Einfluss eines Magnetfelds'
Ms. narrative and calculations, variously paginated.
Professor C.S. Gillmor describes this document as 'very important for the history of the ionosphere' and gives its date as 'late 1925 - early 1926'. (Private communication 4 December 1978.)
The document was registered for copyright by Dr. Altar, 1978.
There are brief notes by Appleton on the title sheet, and 2 pp. ms. notes by him at the end.
- C.216 Notes, narratives and calculations by Altar, n.d.
5 bundles.
2 photographs.

Research topics

- C.217 E. Cunningham
Letters on mathematical aspects of Appleton's work, and especially on the positive and negative signs; also included is the last page of a letter from Appleton on the problem and asking for assistance.
Only some of the letters are dated, May 1927.
- C.218 D.R. Hartree 1933
- C.219 H.A. Lorentz 1925
12 pp. letter and calculations.
10 pp. ms. draft on 'Propagation of electromagnetic waves in ionized gas under the influence of a constant magnetic field H'.
- C.220 M. Taylor 1931-33
Includes a translation by M. Taylor of a Russian paper on the subject.
- C.221 Notes and calculations by Appleton, on or related to magneto-ionic research but not included in original folder.
'Some Unsolved Ionospheric Problems'
2 pp., n.d. (after 1943).
'Oblique Incidence'
1 p., c.1934.
4 pp. note 'To show that, assuming perfect reflection a tilted aerial can give no information of direction of reflected wave'.
n.d., c.1934
6 pp. notes on vertical and oblique incidence. n.d.
Miscellaneous shorter calculations.

Research topics

C.222-C.236

METEOR TRAILS c.1946-c.1950

Appleton's chief publications on this topic were the collaborative papers with R. Naismith, 'Radar detection of meteor trails', Nature, 158, 28 December 1946, and 'The radio detection of meteor trails and allied phenomena', Proc. Phys. Soc., 59, 1947.

Appleton's own notes and drafts appear at C.222-C.226; correspondence and data from colleagues appear at C.227-C.236.

C.222-C.226

Drafts and notes

C.222

'The Radar detection of meteor trails'

3 pp. typescript draft, and copy of published paper.

C.223

'Meteor detection by radar'

3 pp. press release for press visit to A.O.R.G., Richmond Park, 9 October 1946.

Sent with a covering letter from J.S. Hey.

C.224

3 pp. typescript and ms. notes for 'Lecture version' of paper on 'Radar detection of meteor trails and allied phenomena', with letter from R. Naismith including comments and amendments for published version.

1 p. account of Appleton's and Naismith's work on meteors from 1932 to 1946.

List of slides for lecture.

C.225

Notice of meeting to discuss observations of the Giacobinids, held at Royal Astronomical Society, 13 December 1946, with 6 pp. ms. and typescript account of papers and proceedings (by J.S. Hey).

C.226

Miscellaneous ms. notes on meteors, by Appleton, some antedating 1946 work.

Includes 1 p. 'Notes by EVA' headed 'To be returned with the Astronomer Royal's letter', n.d.

Also included here are tables on 'Meteor Streams' 1947-50, by A.G. Pritchard.

Research topics

C.236

T.J. van Slooten

1946

F.L. Whipple

1946, 1947

Includes data.

Research topics

C.237-C.247 OSCILLATORS c.1922-46

This was one of Appleton's earliest research interests, developed from his work on the thermionic valve during and after the First World War, and later pursued in collaboration with B. van der Pol (see E.117-E.144).

Virtually none of this material is dated. Appleton's own notes and drafts, which appear at C.237-C.240 would seem to date from the 1920s.

The correspondence and data which appear at C.241-C.247 show the continuation of research on non-linear oscillations by Appleton's students at King's College, London, and include exchanges with M. L. Cartwright and J.E. Littlewood on mathematical aspects of similar problems in the 1940s.

See C.384-C.388 for other material on valves.

C.237-C.240 Appleton's drafts and notes

C.237 'The triode oscillator'
14 pp. typescript and ms. n.d., c.1922.

C.238 'Note on a property of an oscillating circuit'
3 pp. ms.

C.239 'On a property of a certain oscillating circuit'
5 pp. ms.

C.240 'Method of procedure'
2 pp. ms. notes.
Shorter notes and drafts.

C.241-C.247 Correspondence and data

C.241 'Simple triode oscillator'
12 pp. draft paper, and accompanying calculations, probably by J. A. Ratcliffe (see Clark, Sir Edward Appleton, pp.33-34).

C.242-C.244 Theses on non-linear oscillators, by Appleton's students at King's College, London.

C.242 by K.A. Macfadyen 1928

C.243 by F.M. Colebrook 1932

C.244 by J.H.H. Merriman 1937

All in original binders.

Research topics

- C.245 Shorter unidentified drafts and notes by others on oscillators, non-linear circuits, etc.
- C.246, C.247 Correspondence with M. L. Cartwright (not all dated).
- C.246 c. 1943 Letters and calculations; includes two letters from J.E. Littlewood (only one dated, 1943), and 1 p. calculations in another hand.
- C.247 c. 1946 Letters, graphs, etc. Includes draft of M.L. Cartwright's paper 'Forced oscillations in nearly sinusoidal systems', and miscellaneous offprints on the subject by Cartwright, Littlewood, Van der Pol, etc.

Research topics

C.248-C.274

RADAR 1935-52

Much of this consists of reports and information; some was sent to Appleton to document research in progress or for various wartime projects, and some was sent to or assembled by him as documentation for the historical development of radar. The material consequently includes some interesting reports on wartime research in Britain and elsewhere, and also copies of patent applications before and during the war.

There is some related correspondence, and material referring to the hearings of the Royal Commission on Awards to Inventors (see especially C.272).

The material is presented as a chronological sequence.

C.248

1935 'Rapport sur la détection électromagnétique par la télégraphie militaire'

Sent to Appleton with a covering letter 1945; a note at the end of the report describes it as the only surviving document on French prewar research of that type, all other records having been destroyed in 1940.

1936 Copy of typescript letter from R.A. Watson-Watt re British Patent Application No. 25770/35 (for radar) describing the circumstances of his invention, dated 23 May 1936.

C.249

c.1938 'The detection of aircraft by radio-wave sounding'

Ms. and typescript draft for paper, no author or date, latest reference 1938.

C.250

1939 Offprint, and English translation of an Italian article on wireless range-finding.

4 pp. only of report on German detection of English aircraft, September 1939.

C.251

1940 Correspondence and calculations on reflection from C.G. Darwin.

3 reports by N.F. Mott, on scattering power of aircraft, and echoes.

Research topics

- C.256 c.1941-43 Ring-back notebook, with a few loose pages inserted.
Miscellaneous typescript and ms. notes, mainly on radar, reflection coefficient and similar topics, including notes on the literature, summaries of wartime research reports and committee meetings, notes of discussions, visits to laboratories and research stations, ideas for research, etc.
Material mainly runs 1941-43, but includes a few references 1939, and press-cuttings on 'Radar and the weather', 1946.
- C.257 1942 'The limiting ranges of R.D.F. sets over the sea'
Report (by F. Hoyle and M.H.L. Pryce) for R.D.F. Application Committee, Ministry of Supply, January 1942.
Press-cutting (with scoring by Appleton) from The Engineer, on history of radar, May 1942.
'Reflection of 10 cm radiation by model aircraft'
Report from A.D.R.D.E. Christchurch, September 1942.
- C.258 1942 Correspondence and data, mainly on influence of water vapour density.
- C.259 1943 'R.D.F. Propagation at Centimetre Wavelengths'
Report from Radiophysics Laboratory, Australia, April 1943.
- C.260 1943 Correspondence, papers and reports re supply and use of M.B.I. equipment at Slough. Mainly July 1943.
- C.261 1943 Correspondence from colleagues, mainly on history and inventors of radar.
In alphabetical order.
W.T. Griffiths
A. Hoyt Taylor
re British and American contribution to radar and enclosing U.S. Senate document on 'Story of Radar'.
A.G. Lee
re events in 1932 and 1935 and enclosing press-cutting.
E.B. Moullin
re work in 1923, and enclosing copies of article in Electronics, 1935, on German research.

Research topics

- C.262, C.263 1944 Continuing correspondence and data from colleagues on history of radar.
In alphabetical order.
- C.262 W.A.S. Butement
Enclosing a copy of his proposal for coastal defence radar, 1931.
- R.G. Lloyd
 E.T. Paris
Enclosing request from F.E. Smith for official record of early radar development to be kept.
- C.263 R.L. Smith-Rose
Including copies of patents, photographs, and some research calculations.
- R. Whiddington
Enclosing note by C.S. Prince on his early 'squegger' circuit.
- C.264 Miscellaneous abstracts of patent specifications relating to work on radar.
Circulated by Radio Board, 1944.
- C.265 1944 Letter on American U.S.W. research from W. Ross, September 1944.
- Report on 'Meteor Whistles ...', by H.V. Griffiths, received from B.B.C., with a letter from A.P. Rowe to whom the report was forwarded. September-October 1944.
- Correspondence and reports on 'Angels', and on radar echoes from birds, including A.O.R.G. report by G.C. Varley and D.L. Lack, December 1944.
- See C.266 below.
- C.266 1945 Continuing correspondence and reports on 'Angels' or echoes from unidentified objects.
- Correspondence from W.S. Elliott (R.R.D.E.) also enclosing A.O.R.G. Report 257 on 'Radar Echoes from Birds', by D.L. Lack.
- 'Note on echoes of unidentified origin', by Appleton
 2 pp. typescript, n.d.

Research topics

- C.267 n.d. c.1945 'Work of R.D.F. Application Committee'
5 pp. typescript for speech or report. No author,
but with ms. corrections by Appleton.
No date, but refers to study of 'angels'.
- C.268 1945 Continuing correspondence and material on history of radar.
C.E. Horton
On work with Watson-Watt on Cathode Ray Direction-
finding, 1924.
C.J. Mackenzie
On American Cathode Ray research, 1923.
Press release on Vatican radio and radar.
Offprint of article 'Radiolocation' by R.L. Smith-Rose.
Also included here is 3 pp. typescript article 'The technique
of radar. An off-spring of pure science' with a ms. note
by Appleton 'Not for publication'.
- C.269 1945 Report on 'Alexandra Palace Tests' by T.L. Eckersley, on
tropospheric propagation, January 1945.
With a letter from Appleton and comments on the
article by R.L. Smith-Rose.
- C.270 1945 Miscellaneous items on wartime radar.
Press-cuttings on radar.
Photographs taken 1944 by R.R.D.E. at Beachy Head.
Chart of German North Sea stations and German report
on radio technique, May 1940.
- C.271 1946 'Programme of the Division of Radiophysics'
Report by E.G. Bowen on Australian research,
August 1946.
- C.272 1951-52 Correspondence and papers relating to hearings of the Royal
Commission on Awards to Inventors.
Includes correspondence with E.G. Bowen, F.E. Smith,
typescript copy of Appleton's statement to the Commission
(9 pp.), 1 p. note on the importance of Appleton's
giving evidence (no author), 3 pp. typescript 'criticism'
of 'evidence submitted by a radar syndicate to the
commission ...' (no author, but probably by R. Naismith).

Research topics

- C.275-C.287 RADIO RECEPTION c.1926-50
 Including 'Luxembourg Effect'.
- C.275 9 pp. ms. draft by Appleton, on loops; antennae, etc. n.d.
- C.276 'Summary of Reports on W.G.Y.'
 14 pp. ms. account of reception at various wavelengths,
 August-December 1926.
 No author.
- C.277 Ms. graphs of reception at various sunset times at 2LO for
 6 March 1928.
 Charts of reception during magnetic storms, 1927.
- C.278 Chart of intensity curves, by Appleton, 1930.
 Correspondence and data on short wave transatlantic reception, 1930.
- C.279 Miscellaneous ms. notes on radio reception at various wavelengths
 and stations, covering 1931-34, by R. Naismith.
- C.280 Work on 'Luxembourg Effect', 1934.
 Research proposal on 'The Interaction of Radio Waves', put by
 R. Naismith to the Superintendent, Radio Department (2 pp. ms.
 14 December 1934) and comments by Committee Secretary 'J.F.H.'
 [Herd], 3 pp. ms., 18 December, with a covering letter.
 Letter on Luxembourg strength, from B.B.C.
 Related offprint.
- C.281 36 pp. duplicated typescript account of electricity and radio circuits,
 bound into a hardback volume with initials E.V.A.' Some pages
 bear ms. annotations and underscorings by Appleton.
 The volume appears to have been 'Exhibit P.1' in a High
 Court case in 1934, between B.T.H., Marconi's and E.M.I.
 and Guildford Radio Stores and another.
 (See Clark, Sir Edward Appleton, p.91, for reference to
 Appleton's frequent appearances as expert witness in various
 legal cases arising from developments in radio.)

Research topics

- C.282 'Report on Short Wave Pulse Reception from Montreal - September 1934-October 1935'
Radio Research Board, March 1936.
- C.283 'Short distance oblique incidence propagation tests'
Report on transmission tests by Marconi's, May 1938.
- C.284 Comment on a Japanese paper on radio transmission, with diagrams, sent with a covering letter by W.G. Beynon, October 1940.
Comments on another paper on transmission, by Beynon and Piggott, 1940.
- C.285 Miscellaneous data and notes.
Includes: Graphs of B.B.B. reception at Gibraltar, 1944.
Graphs of reception at Paxton, Massachusetts, 1943-45.
etc.
- C.286 Report on oblique incidence propagation research at Harvard, by W.R. Piggott, sent with a covering letter on current U.S.A. projects, 1950.
- C.287 3 pp. typescript 'Report on reception of Alexandra Palace in South Africa', signed T.W. Bennington (B.B.C.), July 1950.

Research topics

C.288-C.300

RECOMBINATION AND ATTACHMENT c.1930-62.

Including ' β -determinations', 'negative ions'.

This material spans a considerable period of time. The earlier work, c.1930-38, conducted at King's College, London, and at Cambridge, was originally contained in two folders labelled by Appleton 'Recombination and Attachment' and 'Radio Expt. Recombination'. These folders are preserved at C.288 and C.289 respectively, but the material has been reassigned as a sequence of smaller items.

Appleton's folder labelled 'Recombination Theory' contained correspondence from the 1950s and is preserved at C.297.

Items C.298-C.300 are Appleton's folders, all labelled β -Determinations (β = coefficient of recombination), and containing miscellaneous research material continuing to c.1962.

C.288

Appleton's ms. notes and drafts on recombination (none dated).

'The Effective Electron Recombination Coefficient in the Ionosphere'

2 pp.

'The Process of Electron Disappearance in the Cases of Regions E and F₁'

3 pp.

'Can there be detachment of electrons by sunlight?'

1 p.

'Test of Recombination versus attachment'

1 p.

'Ionisation Gradient for intense E'

1 p.

'Recombination in Lab.'

1 p. (numbered 3).

'Recombination'

These items are in Appleton's original folder labelled 'Recombination and Attachment'.

Research topics

- C.289 Shorter notes and calculations by Appleton, some graphs dated 1934.

Bibliographical notes on recombination (not all in Appleton's hand).

These items are in Appleton's original folder labelled 'Radio Expt. Recombination'.
- C.290 Correspondence, 1934-38.

K. G. Emeleus 1934-36

Extensive correspondence on negative ions and other research problems; includes letter from O.S. Duffendack, 1935, and offprint on glow discharges in helium by Emeleus et al.
- C.291 W. G. Greenwood 1936-37

Includes research reports on recombination, comments by Appleton.
- C.292 D.R. Hartree 1937
H.R. Hulme 1937

Two letters, sent to Hartree and J.A. Ratcliffe and passed on by them, and annotated by Appleton.

L.B. Loeb 1937
K.A. Macfadyen 1937
- C.293 H.S.W. Massey 1934-35

Includes draft of Chapter V, and copy of completed book by Massey on 'Negative Ions'.
- C.294 H.H. Plaskett 1936
- C.295 J. Sayers 1937

Includes calculations, graphs, drafts of papers on recombination by F. L. Mohler.
- C.296 F.J.M. Stratton 1938
L.H. Thomas 1934
J.S. Townsend n.d.
Unidentified (p.1 only) 1936

(from Trinity College, Cambridge)

Research topics

- C.297 Correspondence, 1952 and 1958, relating to Appleton's research at Edinburgh on recombination and negative ions.
- D.R. Bates
- Including research notes.
- K.G. Emeleus
- H.S.W. Massey
- W.R. Piggott
- J.A. Ratcliffe
- J. Sayers
- Includes a research communication.
- and one letter, 1958, from K. Bibl.
- These items are in Appleton's original folder labelled 'Recombination. Theory'.
- C.298 Original folder labelled ' β Determinations'
- Data and graphs for various centres, mainly comparison of 1954 and 1958 observations by Appleton, Mrs. Turnbull and others, and some ms. notes by Appleton.
- C.299 Original folder labelled ' β Determinations' (not in Appleton's hand)
- Data and graphs, mainly for Puerto Rico for 1958-59, with forwarding letters (undated) from Mrs. Turnbull and a few ms. notes by Appleton.
- C.300 Original folder labelled ' β Determinations. Puerto Rico'
- Data, charts and graphs, by Mrs. Turnbull and others, using observations to March 1962.
- Includes two sets of ms. notes by Appleton headed 'Case of vertical drift' and 'Note'.

Research topics

C.301-C.303

SEASONAL ANOMALY

This material, little of which is dated, is scanty and refers mainly to work in the 1930s. Appleton did further research on the subject of seasonal variation in the 1950s with the assistance of A. J. Lyon and C. P. Bell, qqv.

C.301

Miscellaneous ms. notes and research ideas by Appleton.

None dated, but data cover various years to 1945, and some notes refer to comparison of observations at Delhi and Baton Rouge (see Clark, Sir Edward Appleton, p.151).

Included here is a letter from R. Naismith, April 1944 re comparative figures for Delhi and Sydney and including ms. charts of data for Delhi 1942-43.

C.302

2 pp. only typescript draft of paper (no author, but probably by Appleton's collaborators).

9 pp. ms. paper on Chapman's Theory and seasonal effects, no author or date.

C.303

Correspondence and data on seasonal variations, enclosing graphs of Slough observations for 1936, from R. Naismith. 1937

1 p. notes by L. J. Ingram, annotated by Appleton, n.d.

Research topics

C.304-C.322

SECOND POLAR YEAR 1932-35

Including Tromsø expedition.

Appleton led a British party to Tromsø in northern Norway as part of the Second Polar Year observations of the ionosphere. The other members were G. Builder, W.C. Brown and R. Naismith. The party left for Tromsø in July 1932, observations began in August, and Appleton and Naismith returned to Britain later in August with the first records. Brown remained in Norway for a year to continue observations, and Appleton paid a further visit in the summer of 1933. The data thus obtained provided basic information for many research projects and publications, mainly in collaboration with Naismith and L. J. Ingram (see C.312 for her appointment as mathematical assistant). Almost all projects in Section C refer to or use Tromsø data in some way.

The material below contains Appleton's journals of the expedition, photographs and data, background correspondence, and some documents relating to the writing-up of the research. These were all kept as such by Appleton, mostly in folders labelled 'Tromsø'. It should be repeated, however, that many other topics in Section C involve data derived from the expedition.

See also A.6.

C.304

Contents of an envelope labelled 'Tromsø'.

Miscellaneous press-cuttings from Norwegian papers.
(Folder also includes the original envelope.)

C.305

3 small envelopes as follows:

Envelope addressed 'Professor Appleton Grand Hotel', containing photographs of aurora, etc.

Envelope, mainly containing observations made at King's College, London, 1929 (many identified on verso).

Envelope of photographs of scenery (one with ms. note by Naismith).

C.306

Photographs of scientific observations and equipment, some with dates and identifications on verso in the hands of Appleton, Naismith, Ingram, 1931, 1933, 1936.

Research topics

- C.307 Photographs of Tromsø town, the observatory, transmitter, aeri-als, members of expedition, equipment, etc., several identified on verso.
- C.308 General photographs of Norway.
Other miscellaneous photographs and postcards.
- C.309 3 cards from R. Naismith sent during his journey to Norway, 1933.
Letter from R. Naismith re research, 1934.
Postcard of Tromsø ('the Paris of the North') sent by R.A. Watson-Watt (date not legible).
- C.310 Ring-back loose-leaf notebook, labelled 'Tromsø'.
Both ends of book used.
At front of book: sequence of runs at Tromsø, 23 July-13 August by Appleton, 30 August-6 September by G. Builder; continues with typescript data of critical frequencies at Slough October-November 1932, Appleton's ms. notes on the literature, Chapman, Larmor, etc.
At rear of book: a journal by Appleton, beginning in train from London, 9 July, continuing to 6 August, then 21 and 27 August (last entry from Liverpool).
- C.311 Hardback notebook, with two photographs inserted on loose pages at rear of book.
Contains Appleton's account, headed 'A Wireless Visit to Tromsø', beginning 24 July 1932 (a week after landing at Tromsø) and continuing to 24 August.
There is a separate entry in the middle of the book, headed 'Abnormal E region' (2 pp.).
- C.312 Original folder labelled 'Tromsø' 1933 Visit'.
Includes: Correspondence re customs facilities for equipment, installation of transmitters, call signs, etc., 1933.
Appointment of L. J. Ingram to assist with Tromsø data, 1934.
Correspondence re publication or presentation of Second Polar Year data from J.H. Dellinger, B. van der Pol, G.C. Simpson.

Research topics

- C.313 Correspondence from K. Kreielsheimer (Tromsø observatory), including photographs, data and draft report. 1933-34
- Correspondence from K.W. Wagner, 1933
- (originally included in C.312 above)
- C.314 Sequence of charts of comparative magnetic activity at Slough and Tromsø, compiled as part of Polar Year Programme.
- Data run August 1932-May 1933.
- C.315 Data from Tromsø and Kjeller.
- C.316 14 pp. ms. draft for a paper on ionisation at Tromsø. No author or date, but written during Second Polar Year 1932-33.
- C.317-C.320 Drafts, data, correspondence relating to publication of Polar Year and Tromsø work.
- C.317 1933 Appleton's own notes for papers.
- 2 pp. 'Notes regarding the Tromsø results' (not by Appleton).
- Correspondence from A.C. Stickland, L.J. Ingram.
- C.318 1934 Correspondence and data from R. Naismith.
- C.319 1935 Original folder labelled 'Tromsø Interim Report'.
- Appleton's own notes and drafts.
- 'Magnetic Section'; drafts so titled by L.J. Ingram and by R. Naismith.
- Correspondence and notes from Naismith.
- C.320 1935 Correspondence from J.M. Stagg. Including draft of a paper by Stagg on magnetic disturbance.
- (originally included in C.319 above)

Research topics

- C.321 Correspondence and papers re U.R.S.I. programme of ionospheric research continuing Polar Year work.

Includes: Copy of Appleton's paper to U.R.S.I. Commission II on 'Measurement of ionosphere layer heights and correlation with other geophysical and cosmic data', August 1934.

Ms. notes of U.R.S.I. research programme as decided, by Naismith, November 1934.

Note on U.R.S.I. research, and calendar for 1935 observation days, by J.F. Herd, 1934.

Comments on U.R.S.I. Congress, by J.F. Herd, sent to Appleton by R.A. Watson-Watt, October 1934.

- C.322 Copy of Journal of the Institution of Telecommunication Engineers, 12, April 1966.

This was a 'Sir Edward V. Appleton commemorative issue' and contains several articles referring to his work, including 'A Wireless Visit to Tromsø (1932)' by C.M. Minnis, which quotes from Appleton's journals.

Research topics

C.323-C.357

SOLAR NOISE

This material focusses especially on the period 1945-47 of Appleton's collaborative work with J.S. Hey, and the favourable opportunity for observations in February 1946. Nevertheless, it extends considerably beyond these limits, and includes correspondence and observations from the 1930s noted by radio 'hams' (see especially correspondence with D.W. Heightman (C.337, and E.J. Williams C.353) and also continuing correspondence and reports from colleagues.

See also B.37.

Papers, lectures and notes by Appleton appear in chronological order at C.323-C.328.

Correspondence and data from others are presented in alphabetical order at C.329-C.353.

Related reports and printed matter appear at C.354-C.357.

C.323-C.328

Notes and drafts by Appleton

Including comments by colleagues, background material, etc.

C.323

'Comments by R.E. Burgess on note entitled "Calculation of Solar Noise Developed in Radio System", by Sir Edward Appleton'

2 pp. typescript, 19 September 1945.

Note by Appleton, '" Non-black body " radiation from the sun'

4 pp. typescript, 24 September 1945.

'Notes on Meeting Saturday 12 January 1946'

2 pp. typescript account of research and papers in hand (not all concerned with 'Solar Noise').

C.324

Notes and material, February 1946, related to increased 'Solar Noise' activity observed at that time.

Includes extract from minutes of meeting of Ultra Short Wave Propagation Committee, 11 February 1946, 3 pp. typescript document on 'Radio Noise from the Sun' giving an account of historical and current research on the phenomenon and of Appleton's contributions, 5 February, press release 7 February, 1 p. only of statement by Appleton (possibly for press release or broadcast), 2 pp. observational data for 7 and 9 February, printed matter and diagrams.

Research topics

- C.325 'Solar radio noise'
10 pp. typescript draft of paper by Appleton and Hey published in Phil. Mag., 37, 1946.
- C.326 'Extra-tropospheric influences in ultra-short-wave radar operation'
Paper presented by Appleton at Institution of Electrical Engineers Radar convention, 27 March 1946, and published in J. Instn. Elect. Engrs., 93.
Drafts, comments and correspondence.
Includes: 12 pp. typescript draft.
10 pp. typescript 'Lecture version' of paper.
Correspondence on the draft, with comments and revisions, from W.G. Beynon, R.E. Burgess, J.S. Hey, L.A. Moxon, March 1946.
- C.327 I.C.S.U. Circular, March 1947, requesting contributions to Sixth Report on solar relationships, with a ms. note by Appleton (addressee not given) 'I suggest we do a joint article on solar radio noise'.
This request for contributions is often referred to in the correspondence at C.329-C.353 below.
'Solar Radio Noise'
3 pp. typescript draft for paper by Appleton and Hey, 8 April 1947.
- C.328 'Solar Radiation in the Radio Spectrum. Radiation from the Quiet Sun'
8 pp. typescript notes for slide lecture by Appleton mainly on D.F. Martyn's research. n.d., c.1948.
'The Sun as an Emitter of Radio Waves'
Royal Institution Friday evening discourse, 25 November 1950.
3 pp. typescript draft (incomplete) and slide list.
Ms. notes, probably for short talks, 2 pp. and 1 p.
Ms. notes, on work of others (Hoyle, Ryle, Hey, etc.) by Appleton and Piggott, perhaps taken at conference or discussion meeting.

Research topics

C.329-C.353

Correspondence

With colleagues, amateur observers, institutions, etc., including comments on research and publications (including U.R.S.I. reports), data, observations, photographs. Many of the exchanges deal with the special activity observed in 1942 and 1946, but there is also earlier material relating to observations in the later 1930s and some correspondence on later research projects. Some of the letters refer to the 'hissing phenomenon', as the earlier observations were called.

The correspondence is presented alphabetically, with dates and a brief note of content and is followed by reports and papers on solar noise.

- | | | |
|-------|---|---------------|
| C.329 | L. d'Azambuja | 1947 |
| | Includes photograph taken July 1946. | |
| | W.G. Beynon | 1946, 1948 |
| | L.C.B. Blanchard | 1945, 1946 |
| | Data on 'hissing phenomenon' 1941, 1944. | |
| C.330 | E.G. Bowen | 1947, 1948 |
| | Mainly on U.R.S.I. report. | |
| | H.M. Bristow | 1946 |
| | Data from Admiralty Station, Nutbourne. | |
| C.331 | British Broadcasting Corporation | 1942, 1945-46 |
| | Correspondence and data from B.B.C. radio engineers and stations on 'hissing phenomenon'. Includes data 1937-41. | |
| C.332 | C.E.R. Bruce | 1942-48 |
| | Includes drafts for publications. | |
| C.333 | R.E. Burgess | 1947-50 |
| | Includes drafts for publications, contributions to U.R.S.I. report, translations and comments on reports by others. | |
| C.334 | Cable and Wireless | 1946 |
| | A. Copisarow | 1946 |
| | Includes draft report. | |
| | N. Corry | 1946 |

Research topics

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|-------------|---|---|
| C.335 | E. Eastwood | 1945-46 |
| | Includes data and observations at various R.A.F. stations for 1942 and 1946. | |
| C.336 | K.G. Emeleus | 1948, 1950 |
| | Includes more general references to research topics. | |
| C.337 | D.W. Heightman | 1936-37,
1945-46 |
| | Heightman was a radio 'ham' (G6DH) who observed the 'hissing phenomenon' in 1936 and corresponded with Appleton, and with <u>Wireless World</u> , on the subject. In 1945, further correspondence ensued and Heightman's letter of 6 July encloses observations noted 1936-39. Appleton acknowledged Heightman's early observations in some of his later writings on solar noise. | |
| | See also C.352. | |
| C.338-C.342 | J.S. Hey | 1942-51 |
| | Hey had observed the 'Solar Noise' phenomena in 1942, and was Appleton's collaborator in papers and articles after the renewed activity in February 1946. The folders include drafts and data, comments on research, etc. | |
| C.338 | 1945 | Includes copy of Hey's observations on solar radiation, February 1942 (A.O.R.G. report 275). |
| C.339 | 1946 | (February-May). Includes observational data for February 1946, drafts and suggestions for papers. |
| C.340 | 1946 | (August-September). Mainly drafts, data, and comments for various papers by Hey and others (not all on 'Solar Noise'). Includes photograph of equipment. |
| C.341 | 1947 | Correspondence, comments on research, etc. Includes a survey of research and papers published on 'Galactic and Solar Noise' since 1931, prepared by Hey and others. |
| C.342 | 1948, 1951 | (on Appleton's proposed research project at Edinburgh). |
| C.343 | F. Hoyle | n.d. |
| | K.G. Lansky | 1947 |
| | G. Lehmann | 1947 |

Research topics

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| C.344 | E. Marsden | 1945-47 |
| | Including data and observations from New Zealand and correspondence on New Zealand research from J.E. Coop. | |
| C.345 | D.F. Martyn | 1948-49 |
| | Mainly <u>re</u> U.R.S.I. reports. | |
| C.346 | D.H. Menzel | 1947 |
| | R. Naismith | 1946 |
| C.347 | H.W. Newton | 1946 |
| | Includes photograph of giant sunspot, July 1946, and draft of Newton's report on 'Solar Activity 1946'. | |
| C.348 | J. L. Pawsey | 1946, 1951 |
| | Includes reports on research in Australia, comments on U.R.S.I. report, and on Appleton's proposed research at Edinburgh. | |
| C.349 | T. Penney | 1943 |
| | W.R. Piggott | n.d. |
| | B.G. Pressey | 1946 |
| | G.H. Ramsden | 1946 |
| | . 'Hissing phenomenon' observations in 1941. | |
| C.350 | M. Ryle and others | 1946-51 |
| | Includes drafts of papers, contributions to U.R.S.I. reports, etc. by Ryle, comments on publications by others, and on Appleton's proposed research at Edinburgh. | |
| C.351 | M.N. Saha | 1948 |
| | R.L. Smith-Rose | 1945 |
| | F.J.M. Stratton | ? 1946 |
| | H.C. van de Hulst | 1947 |

Research topics

- C.352 E. J. Williams 1938
Includes comments on early observations of 'hissing phenomenon' by D. Heightman (see C.337).
Also enclosed is a copy of Radio Society of Great Britain's T. and R. Bulletin, July 1939, with an analysis by Williams of Heightman's and others' observations; sent by the secretary in response to Appleton's request for information.
- C.353 R.v.d.R. Woolley 1947
Enclosing research report by C.W. Allen.
- C.354-C.357 Reports and printed matter
- C.354 Reports and data, mainly of early observations of phenomena 1936-41, sent to Appleton, name of sender missing or illegible.
- C.355 Reports and data.
Includes: Report by H. G. Booker (T.R.E.), 1944
Report on eclipse observations in Canada, 1946
T.R.E. report and data, 1946
Comments on publication (no author), 1947
Charts and data for Australia, 1948-49
- C.356 Draft papers and photographs by Piddington, Minnett and others.
- C.357 Miscellaneous U.R.S.I. Reports, mainly on solar noise, 1948-50.

Research topics

C.358-C.360 SUNSPOTS and SOLAR CYCLE

Appleton published several papers on sunspots, and he and his collaborators accumulated much data on sunspot cycles, comparative results at various stations, etc., which will be found in Section F. The following folders contain his own notes and drafts, and a sample of some of the data.

C.358 Original folder with typescript label 'Paper for the Royal Society ... "Sunspot Cycle Influences on the Ionosphere"'

Inside, 2 pp. ms. notes and headings, with various suggested titles for the paper.

No paper with this title is listed in Appleton's writings, but he published a paper on 'Sunspot-cycle control of ionospheric and geomagnetic variations' in J. Atmos. Terr. Phys., 26, 1964.

C.359 Miscellaneous ms. notes, research ideas, graphs and calculations, all in Appleton's hand.

No dates, but some refer to Polar Year Paper (1930s), some are on wartime paper, some relate to 1957 data.

C.360 Graphs and data, mainly on 11-year sunspot cycle, by Appleton and others.

Includes some printed matter, by J. Bartels and others, on sunspot-cycle.

See C.422-C.425 for additional material on sunspots and solar cycle.

Research topics

C.361-C.383

U.R.S.I. (International Union of Scientific Radio)

Appleton attended and contributed papers to the meetings of U.R.S.I. from 1927, when he announced his discovery of the F layer at the Second General Assembly in Washington (C.361). He was President of the Union 1934 - 52, and also Chairman of the Mixed Commission on the Ionosphere (M.C.I.).

The Fourth General Assembly of U.R.S.I. at Copenhagen, to which Appleton contributed a paper on 'Some Observations on International Research on Atmospherics' (C.361), decided to organise a Sub-Committee to conduct radio observations during the Second Polar Year 1932 - 33. Appleton was Chairman of this Sub-Committee and the observations were made at Tromsø in northern Norway. See C.304 - C.322 for his journals and photographs of the expedition and correspondence before and after the trip, with colleagues and collaborators on the interpretation and publication of the data.

After the Second World War, Appleton, as President of U.R.S.I. and Chairman of M.C.I., helped to organise and attended many of the international conferences and meetings of the Union. See A.83, C.369, H.20, H.36, H.37 for his journey to Australia in 1952 and B.40 - B.43 for notes made at that and other meetings. The M.C.I. adopted the proposal of L.V. Berkner for an International Geophysical Year, finally held in 1957 - 58, and Appleton helped to foster the preparations.

The material, which runs 1927 - 60, is presented chronologically and is of varied nature, correspondence, research reports and data, arrangements for meetings and publications, nominations and organisation, etc. The greater part of the correspondence is with the Secretary of M.C.I., W.J.G. Beynon; the correspondence is indexed, but reference should also be made to other letters from Appleton's principal colleagues (Ingram, Beynon, Naismith, Piggott) elsewhere in the collection which deal with or refer to U.R.S.I. affairs.

U.R.S.I. reports and papers on various topics of special interest to Appleton are included with related material in other sections of the collection.

Drafts and speeches by Appleton at U.R.S.I. meetings or about U.R.S.I. can be found in Section D.

Research topics

- C.361 1927
- 'The existence of more than one ionized layer in the upper atmosphere'
- Published version of Appleton's paper presented at U.R.S.I. General Assembly, October 1927, announcing his discovery of the F layer.
- 1931
- 'Some Observations on International Research on Atmospheric'
- Typescript of Appleton's paper presented at Copenhagen meeting, 1931.
- 1938
- Program of meeting, Washington D.C.
- C.362 1947
- Duplicated report (on wave interaction) by Radio Research Board for U.S.R.I. 8th General Assembly, May 1947.
- Program of joint meeting, Washington, October 1947.
- C.363 1948
- Programme, resolutions and papers for meeting of Mixed Commission on the Ionosphere (Appleton was Chairman), Brussels, July 1947.
- Includes 13 pp. typescript paper by Appleton and Beynon on 'Some unsolved problems of the ionosphere', paper by Chapman and Kahn on solar flares, and other research reports.
- Also included is printed matter re British papers contributed to U.R.S.I. General Assembly, Stockholm, 1948.
- C.364 1948
- Tagged folder, labelled 'Letters A', with list of papers 6-13 presented at Brussels stuck on inside front cover.
- Not all the papers remain in the folder.
- C.365 1949-50
- Correspondence with W.J.G. Beynon on U.R.S.I. and M.C.I. affairs, publications, meetings, etc.

Research topics

- C.366 1950
- Shorter correspondence on U.R.S.I. affairs, from:
- S. Chapman
D. Lepechinsky
N. Smith
- 1 p. only of Appleton's 'Additional Statement' as President, U.R.S.I.
- C.367 1950
- U.R.S.I. report on 'Extra-terrestrial radio noise', sent with a covering letter by D.F. Martyn.
- C.368 1951
- Correspondence with W.J.G. Beynon, on U.R.S.I. and M.C.I. affairs, including Third Polar Year proposed for 1957-58. Some research matters are also discussed.
- Also included here is an U.R.S.I. report on 'Terminology and units' with a letter from D.F. Martyn.
- C.369 1952
- Correspondence with W.J.G. Beynon, mainly re meeting of M.C.I. at Canberra, August 1952, and also re membership and organisation of M.C.I.
- C.370 1953
- Correspondence with W.J.G. Beynon.
- Includes reports by Beynon on M.C.I. meeting at Canberra in August 1952, and on meeting re International Geophysical Year at Brussels, July 1953, information on next meeting of M.C.I., Brussels, 1954, etc.
- C.371 1954
- Correspondence with W.J.G. Beynon and others on U.R.S.I. and M.C.I. affairs, especially re meeting at Brussels, August, planned Symposium on Eclipse results, I.G.Y. arrangements, etc.
- Includes: Paper by J. Paton on aurora 1952-54, prepared for Rome meeting.
- Paper by A.C.B. Lovell on radio echo research at Jodrell Bank, prepared for Brussels meeting.
- 'Notes on the Theoretical Discussions', by Appleton, for report of the Brussels meeting.
- Advance programme for Symposium on 'Solar Eclipses' planned for August 1955.

Research topics

- C.372 1954
Correspondence re papers and other matters relating to Brussels meeting.
Includes papers by P. Lejay.
- C.373 1954
List of participants, copies of papers read and reports presented on ionospheric research at Brussels meeting.
Includes Beynon's report, papers by Appleton and Lyon, etc.
- C.374 1955
Correspondence with W.J.G. Beynon on U.R.S.I. and M.C.I. affairs, organisation of I.G.Y., arrangements for meeting in U.S.A. in 1957.
Includes offprint of an article on I.G.Y. by Appleton, The Times, 17 January.
- C.375 1956
Brief correspondence with W.J.G. Beynon, January-March only.
- C.376 1957
Correspondence with W.J.G. Beynon and others re programme and arrangements for M.C.I. meeting in New York, September, on the general theme 'The global morphology of the ionosphere', and also on suggestions for re-organisation of U.R.S.I. Joint Commissions.
Includes typescript copy of Appleton's 'National Report to Commission III'.
- C.377 1957
Duplicated material, committee papers, etc. circulated by the Royal Society (organising body in U.K. for International Geophysical Year).
Mainly papers for British National Committee for I.G.Y. and its Artificial Satellite Sub-Committee, and the Advisory Committee on Publications.
Includes programme of Discussion Meeting, 29 November 1957, on 'Observations of the Russian artificial earth satellites and their analysis'.

Research topics

- C.378 1957
Photographs, press releases, reports, etc. on artificial satellites, with special reference to Russian 'Sputnik' and American earth satellite.
- C.379 1957
Letters to Appleton, on the Russian satellite, October-November, from H.V. Griffiths (B.B.C.), W.J.G. Beynon, H.S.W. Massey, A.C.B. Lovell, M. Allan.
Includes 1 p. ms. notes by Appleton, perhaps for lecture on subject.
- C.380 1958
Correspondence, mainly re proposed absorption of M.C.I. as a Sub-Committee of U.R.S.I. Commission III. Appleton considered this undesirable, sent a circular letter, and received letters of support which are included in the folder.
Also included are versions of Appleton's contributions to New York meeting (for publication), and an undated draft paper 'Some notes on the Interpretation of I.G.Y. Ionospheric Interpretations'.
- C.381 1959
Correspondence with W.J.G. Beynon and others, mainly re publication arrangements for M.C.I. Proceedings and changes in organisation of U.R.S.I. and future of the Mixed Commission.
- C.382 1958-59
Copy of nomination of the International Council of Scientific Unions (I.C.S.U.) for the Nobel Peace Prize, 1959, with carbons of Appleton's letters on the subject.
- C.383 1960-61
Shorter correspondence on 'Inter-Union Committee on the Ionosphere' (successor of M.C.I.)

Research topics

C.384-C.388

VALVES c.1918-31

This represents Appleton's earliest research interest, originating in his work as a wireless instructor during the First World War, and his study of thermionic valves.

C.384

Hardback folder containing graphs of reception for various types of valves. The French valves are initialled 'W.A.E.D.' and dated 1918. Some of the charts bear notes and calculations by Appleton.

Also included are 4 pp. typescript 'Details of oscillograms'.

C.385

G.R. Army Book, 129, inscribed 'Edward V. Appleton, Lieut. R.E.'

Bibliographical notes, records of experiments, notes for investigation on valves, batteries, circuits, etc., during service in R.E. Signals.

Most of the work is in Appleton's hand, some is in another unidentified hand. Only one entry is dated 'From Biggin Hill 12/9/18' (not in Appleton's hand).

C.386

G.R. Army Book 130, inscribed 'E.V. Appleton, St. John's Coll.'

Hardback notebook with some graphs glued in, and some loose pages of notes.

Notes on the literature, records of experiments on condensers, discharges, etc.

Experiments run December 1922-June 1923 and are recorded in another hand, with comments, additions, etc. by Appleton.

C.387

2 Letters from F.A. Bannister, 1924, enclosing photographs.

C.388

Graphs of electrical measurements, 1931.

Research topics

ADDITIONAL MATERIAL

See note in Introduction to Section C.

C.389-C.404

ABSORPTION

C.389-C.391

'General Theory of Absorption'

Contents of a folder so described by Appleton.

C.389

Appleton's notes and drafts.

Two extensive ms. sequences, in pencil and in ink, on absorption, perhaps for paper. With marginal comments in the hand of W.R. Piggott, n.d., c.1938-39.

'Note on the results of oblique incidence transmission'

Typescript note, 1941.

'A sketch of a general theory of ionospheric absorption'

Ms. note, n.d., written on wartime paper.

Miscellaneous shorter notes.

All in original folder.

C.390

Correspondence, 1937, from F.W.G. White, and a note by him on absorption.

C.391

Correspondence and data, 1939, from W.R. Piggott, with extensive ms. report on experiments.

Continued

Research topics

- C.392-C.404 'Absorption. R.R.B. Report'
Contents of a binder so described by Appleton.
N.B. The contents of this binder are diverse and there is considerable overlap with the material elsewhere in the collection.
- C.392-C.397 Notes and drafts by Appleton.
- C.392 Titles for report to Radio Research Board, and for papers c.1936-37.
3 pp. notes by Appleton of research ideas.
3 pp. shorter notes on absorption.
1 p. 'Outline of a comprehensive theory of absorption'.
1 p. introduction on 'Ionospheric Absorption Measurements during a Sunspot Cycle' (after 1944).
1 p. draft on 'Solar Flares and Ionospheric Catastrophe'.
- C.393 4 pp. ms. draft on 'Irregularities', with 3 pp. ms. notes on same subject by R. Naismith.
(Appleton published a paper 'Regularities and irregularities in the ionosphere, Proc. Roy. Soc., 162, 1937.)
- C.394 Extensive draft for paper 'Normal and Abnormal Absorption of Radio Waves in the Ionosphere' by Appleton and Piggott.
Various sequences, some with comments by Piggott, n.d.
(Not listed in bibliography.)
- C.395 'Conductance Effects in Ionospheric Circuits'
5 pp. draft paper by Appleton and Piggott, with a letter dated 1948.
(Not listed in bibliography.)
Also included here is a draft paper 'Electric conductivity of the ionospheric D region', 1948, no author.
- C.396 Notes and calculations by Appleton.
Includes miscellaneous tabulations of data, 1935, 1936, letter to G.F.C. Searle requesting advice (1937, see C.7), letter from R. Naismith (1939).
- C.397 Miscellaneous shorter notes and calculations by Appleton.

Research topics

- C.398-C.402 Correspondence (in alphabetical order).
- C.398 N. Ashridge 1937
B.B.C. data.
- S. Chapman 1937
- T. L. Eckersley 1937
- D.R. Hartree 1937
- L. Harang 1938
- C.399 D.H. Johnson 1937
- A. G. Lee 1937
- R. G. Lowe 1937
- Enclosing report on fading of television signals
caused by aircraft.
- J.H.H. Merriman 1937
Post Office data.
- C.400 W.R. Piggott 1939-40
Enclosing miscellaneous data and reports
on research. Similar material to C.391.
- C.401 H.D. Poole 1937-38
Includes mathematical calculations and draft
report.
- C.402 J.A. Ratcliffe n.d. c.1936
Includes comments on paper by Martyn.
- T. Walmsley 1937
Includes a memorandum by Walmsley dated
1930.
- C.403 Miscellaneous data, etc. by others.
Includes photographs, 1938, 1939, photographs of
polarization during magnetic storm, graphs of reflection
coefficient, 1936, etc.

Research topics

C.404 Miscellaneous reports.

Report on absorption, c.1936

Research report for D.S.I.R. by J.W. Findlay, 1937-38

Draft paper by J.H. Piddington, c.1938

Report on differentiating circuit, c.1938

2 Reports from Marconi, 1938

Miscellaneous printed reports, 1932-40

(In original binder.)

C.405 CRITICAL FREQUENCY

Two ms. notes by Appleton, dated respectively 13 and 14 April 1942 and both marked 'Please return. Only copy'.

'The influence of a deviating layer below the main reflecting layer'. 2 pp.

'Further note on maximum usable frequency (limiting case)'. 2 pp.

C.406-C.409 E LAYER

'E LAYER CORRELATIONS

$$\frac{f^3}{\cos x} \text{ versus } \frac{f^4}{\cos x}$$

Contents of a binder so described by Appleton.

C.406 Notes and drafts by Appleton.

Includes a copy of the collaborative paper with R. Naismith 'The Variation of Solar Ultra-Violet Radiation during the Sunspot Cycle' (*Phil. Mag.*, 27, 1939) and a draft follow-up paper by Appleton and Naismith 'The Variation of Solar Ultra-Violet Light through the Sunspot Cycle' (Not listed in bibliography.)

Research topics

- C.407 Correspondence with R. Naismith, 1944-49, re publications and research and including data, diagrams, etc.
- C.408 Data, photographs, etc. from Slough, sent by Naismith (similar material to above).
- C.409 Correspondence.
- | | |
|---------------|------|
| W.J.G. Beynon | 1947 |
| W.R. Piggott | 1948 |
| A.F. Wilkins | 1949 |

All the above items are enclosed in the original binder.

Research topics

C.410-C.421

IONOSPHERIC STORMS

Most of the material relates to Appleton's collaborative papers on ionospheric storms with W.R. Piggott ('World morphology of ionospheric storms', *Nature*, 165, 1950, and 'The morphology of storms in the F₂ layer of the ionosphere: I. Some statistical relationships', *J. Atmos. Terr. Phys.*, 2, 1952 - referred to in the correspondence as 'the big paper'). It seems that follow-up papers were planned, but are not listed in the bibliography. Appleton continued research on storms at Edinburgh with the assistance of Mrs. Pritchard.

C.410-C.418

Appleton's notes and drafts.

C.410

'Some notes on the Theory of F₂-layer Formation (Part I)'.
12 pp. typescript, n.d., c.1938.

C.411

'Irregularities in the ionosphere associated with solar events',
n.d., c.1949 (perhaps not by Appleton).

C.412

Various typescript notes, narratives and ideas for research:

'A note on ionospheric storms'

'Further notes'

'The world morphology of ionospheric storms'

'The general picture of ionospheric storms'

Not dated, but with typescript comments by Piggott dated 1949.

C.413

'A note on ionospheric storm phenomena' and 'Appendix of supplementary notes', October 1952. (Perhaps prepared for U.R.S.I. meeting.)

C.414

'The morphology of ionospheric storms'

38pp. typescript draft, not identical with version published in 1952.

C.415

'The Morphology of Storms in the F₂ Layer of the Ionosphere: II. The Study of Individual Ionospheric Storms'

49 pp. typescript draft of a collaborative paper with W.R. Piggott.

Includes corrections by Piggott to a section of the draft, 1951.

Research topics

- C.416 Miscellaneous drafts for papers, or sections of papers, on ionospheric storms, variously paginated.
- C.417 'Skeleton of Paper III. Ionospheric Absorption Measurements throughout a Sunspot Cycle'.
- C.418 Shorter notes and drafts.
- C.419 Correspondence with W.R. Piggott, 1948-49.
 re research and publications, and enclosing data, graphs, etc.
- C.420 Extensive data and graphs on storms, mainly by Piggott (similar to C.419 above), but some by Mrs. Pritchard.
 In original folder labelled 'Storms'.
- C.421 Correspondence from T.W. Bennington, 1946, and miscellaneous reports and notes on magnetic disturbances.

Research topics

C.422-C.425

SUNSPOTS AND SOLAR CYCLE

'Solar Cycle Variation
(E and F₁)'

Contents of a folder so described by Appleton.

C.422

Notes and research ideas by Appleton, mainly 1930s.

Included here are collaborative papers by Appleton and Sayers 'Recombination in the ionosphere', 1938, and Appleton and Naismith, 'Solar radiation changes during the sunspot cycle', 1938.

In original folder.

C.423-C.425

Correspondence in alphabetical order.

C.423

H.S.W. Massey

1939

C.424

R. Naismith

1938-40, 1949

Enclosing data, correspondence with J.R. Ashworth, etc.

C.425

H.W. Newton

1938-39

W.R. Piggott

n.d. c.1938

R.L. Smith-Rose

1938

SECTION D

LECTURES, SPEECHES, PUBLICATIONS D.1 - D.73

D.1 - D.64 below comprise manuscript or typescript drafts for shorter talks or writings by Appleton. Some are scientific papers in the usual sense, but many are directed at a more general public through less specialised journals or by radio and television; the majority are additional to the published bibliographies in biographies of Appleton.

The material is presented as a chronological sequence so far as this is ascertainable.

D.69 - D.71 contain additional material received too late for inclusion in the main sequence.

Attention is drawn to D.72, a folder of press-cuttings of articles written by Appleton for World-Radio, Wireless World and other journals during the 1920s and 1930s. These are not recorded elsewhere.

- D.1 'Some methods of investigating wireless signal variations',
by Appleton and M.A.F. Barnett.
7 pp. typescript. n.d., latest reference 1925.
- 'Some wireless methods of investigating the upper atmosphere'.
3 pp. typescript. n.d., c.1924-25.
- 'Some problems of wireless wave propagation'
11 pp. typescript, lacks pp.5 and 6, describes
Appleton's and Barnett's experiments.
n.d., c.1925.
- D.2 'Atmospheric Interference in Wireless Telegraphy'
Ms. and typescript draft for a slide lecture.
n.d., c.1926.
- 'Fading and the Heaviside layer'
6 pp. typescript. n.d., c.1925-26.

Lectures, speeches, publications

- D.3 'The Study of Wireless Signal Fading'
5 pp. ms., probably for Wireless World, c.1926.
- 'The Proof of the Existence of the Heaviside Layer'
6 pp. ms., probably for Wireless World, c.1926.
- D.4 'Wireless Telegraphy'
3 pp. ms. draft of the first of three lectures, n.d.
- 'Wireless Transmission and the Upper Atmosphere'
4 pp. ms. draft, n.d.
- D.5 'Beam Wireless'
9 pp. heavily corrected draft for broadcast to inaugurate 'the last of a series of wireless links between Great Britain and the Dominions'.
- D.6 'Short Wave Wireless Transmission. The Discovery of the Low Attenuation of Short Waves'
First of a series of articles.
4 pp., n.d.
- 'Atmospheric Electricity and Wireless Transmission'
Article for B.B.C. Handbook. Galley proof. n.d., c.1930.
- D.7 Draft for slide lecture (perhaps Royal Institution discourse) on short-wave discoveries of Störmer, Hals, etc.
Incomplete. n.d., c.1930.
- Draft for slide lecture on early television.
Incomplete. n.d.
- D.8-D.11 Lectures on Clerk Maxwell.
Mainly given at King's College, London, as part of the Centenary Celebrations of Maxwell's birth.
- D.8 16 pp. ms. draft for a slide lecture, with note at end 'Unfinished, more possibly tomorrow'.
- D.9 10 pp. ms. draft for lecture.

Lectures, speeches, publications

- D.10 p.1 and pp.8-10 only of ms. draft for lecture.
- D.11 Draft for speech at school prize-giving using some of same material.
- D.12 Ms. draft for slide lecture, mainly on work of Wheatstone, at King's College, London. n.d., c.1931.
- D.13 'Electrical Communication and its Indebtedness to Physics'
Two separate versions of a lecture with this title, 31 pp., and unpaginated ms. draft.
- D.14 Miscellaneous ms. and typescript drafts on E-layer, incomplete, perhaps for paper with R. Naismith and L.J. Ingram, Phil. Trans., 1937.
- D.15 'Solar radiation changes during the sunspot cycle', by Appleton and Naismith.
4 pp. typescript, July 1938.
- D.16 'Solar activity'
4 pp. ms. notes and 1 p. introduction for a lecture at Manchester, 1939.
3 pp. talk on similar subject, n.d.
'The Progress of Geomagnetism'
Review article of 'Geomagnetism' by S. Chapman and J.G. Bartels, n.d., c.1940.
- D.17, D.18 Projected book on the Ionosphere.
- D.17 Black hardcover spring-back binder, containing draft of book to be called 'The Ionosphere by Sir Edward Appleton FRS' and dedicated 'To my research students 1920-1940'.
Includes Preface, chapters 1 and 2 only. n.d., c.1941
- D.18 Original folder inscribed 'Methuens Monograph' containing projected layout for eight chapters, draft chapters 1 and 3, probably written much earlier, 1920s.

Lectures, speeches, publications

- D.19 'Scientific research and industrial progress'
Typescript draft for article in Country Life Export Number, Autumn 1941.
Notes for a broadcast on 'Science and Illumination'. n.d.
'Seeing the invisible'
2 pp. note on the electron microscope (perhaps not by Appleton), n.d.
3 pp. only ms. notes for speech at school prize-giving, n.d., but during wartime.
- D.20 Speech at opening of laboratories, British Cast Iron Research Association.
3 pp., 1943.
Speech at meeting of Architectural Institute.
4 pp., n.d.
Draft for broadcast talk on science and industry.
6 pp., n.d.
1 p. notes for talk on 'Science and Government'.
- D.21 'Note on the morphology of the F2 layer of the ionosphere'
6 pp. typescript + 2 pp. figs., with ms. annotations, and a letter from R. L. Smith-Rose offering comments and the suggestion that the work should be circulated as a Radio Research Board confidential paper. March 1944.
- D.22 'Proposal for a Frequency-Modulation Navigation System'
3 pp. ms., n.d.
'Ultra Short Wave Radio' and 'Television'
4 pp. ms., n.d.
- D.23 Miscellaneous proposals for postwar radio research (perhaps not by Appleton).
'Memorandum on ionospheric research and prediction of radio propagation'
16 pp. + 2 pp. and 6 pp. appendices.
'Post war civil broadcasting'
2 pp.

Lectures, speeches, publications

- D.24 'How radiolocation works'
Draft and script of broadcast, August 1945.
- 'Recent radio progress'
2 pp. talk on radiolocation.
- 2 pp. untitled talk on wartime advances in science, n.d., 1945.
- 'British Science in war and peace'
Draft, perhaps for broadcast, c.1945.
- D.25 'Discours à radiodiffuser par Sir Edward Appleton'
2 pp. speech in French, October 1945.
- 'Sir Ambrose Fleming'
7 pp. memorial tribute, 1945.
See also E.40.
- Press handout on Appleton's lecture on 'Tides in the Atmosphere'.
- Appleton's contribution to discussion on civil engineering research and its future, c.1945.
Offprint only.
- D.26 'Radio Noise from the Stars'
11 pp. ms. draft for a popular talk or broadcast, n.d., c.1946.
- 3 pp. typescript note on similar subject.
- 3 pp. note on mesons (probably not by Appleton).
- D.27 11 pp. typescript of contribution to 'Science Survey' with Andrade and Watson-Watt, to commemorate first postwar television programme. 1946.
- D.28 5 pp. ms. draft, and miscellaneous data for a paper provisionally titled 'Radio Sounding of the Lower Atmosphere'.
- 2 pp. report on visit to America, c.1946.

Lectures, speeches, publications

- D.29 'Organisation of government science in the United Kingdom'
Appleton's contribution to Empire Scientific Conference,
June 1946.
14 pp. typescript and ms.
4 pp. typescript note on technical information services.
5 pp. typescript lecture on 'Practical Importance of Fundamental
Research'
4 pp. speech to baking industry.
- D.30 Notes for talk on international control of atomic energy, c.1946
1 p. notes for talk on scientific collaboration, n.d.
- D.31 'Recent advances in radio research'
2 pp. note of talk to Royal Dublin Society, c.1947.
'Research in the Midlands'
Opening address at F.B.I. Conference, Birmingham,
March 1947.
15 pp. typescript and ms.
'Peace-time applications of nuclear energy'
Opening remarks at British Association discussion,
August 1947.
- D.32 'Coal as a source of heat and power'
Chairman's address at British Association meeting,
September 1947.
7 pp. typescript and a little correspondence arising.
- D.33 'Science, Industry and Government'
Typescript notes for speech, n.d.
Speech at Centenary Celebration, Chemical Society.
11 pp. typescript.
Speech at opening of Building Science Exhibition.
10 pp. ms. and typescript.

Continued

Lectures, speeches, publications

- D.33 (cont'd.) Speech at opening of Coal Research laboratories.
5 pp. ms. and typescript.
- Speech at Tallow Chandlers Dinner.
3 pp. ms. and typescript.
- D.34 'The Scientist in Industry'
Ms. and typescript drafts, notes, etc., some dated
February 1948.
- 'British Science in War and Peace'
31 pp. typescript for slide lecture to Bradford
Civic Society, May 1948.
- 'Science and the public'
30 pp. typescript talk, n.d., c.1948.
- D.35 'The electron in theory and practice'
The second Dunn Memorial Lecture, given to the
Society of Chemical Industry, June 1948.
41 pp. ms. and typescript.
- D.36 'Reflections of a Scientific Civil Servant'
3 pp. only ms. draft, headed 'Chapter I', perhaps for
a projected longer work.
- Ms. notes for a speech on science and government.
- D.37 'The application of ionospheric data to radio communication
problems III'
Two versions of a paper with this title. First version carries
names of Appleton, Beynon and Piggott, and consists of 'Part (I)
Theoretical'.
22 pp. typescript, n.d.
- Second version has names of Appleton and Beynon and contains
part (I) as above (with some ms. amendments) and also 'Part (2)
Some experimental results and their application'. n.d.
- Appleton published Parts I and II of a paper with this title in
collaboration with Beynon in 1940 and 1947 (Proc. Phys. Soc.
Lond.) but no Part III is listed in the bibliography of his writings.

Lectures, speeches, publications

- D.38 'Radio Waves of extra-terrestrial origin'
Presidential address to Science Masters' Association,
Edinburgh, January 1949.
26 pp. typescript (incomplete).
- 'Radar development and scientific radio research'
Recorded summary of address to Royal Society of
Edinburgh, March 1949, broadcast in Science Review,
Scottish Home Service.
7 pp. typescript and ms.
- D.39 'The organization and work of the Department of Scientific
and Industrial Research'
39th May lecture to the Institute of Metals, 1949.
Offprint only.
- Notes and information for a lecture on cable and wireless,
August 1949.
- Speech to International Council for the Exploration of the
Sea, October 1949.
. 7 pp. typescript.
- D.40 Introductory remarks at Gifford Lecture by Niels Bohr,
October 1949.
2 pp. typescript.
- 'Geomagnetism and the Ionosphere'
Address at Inaugural Meeting of Edinburgh University
Physical Society, October 1949, and summary for press
release.
- Address to General Council, University of Edinburgh,
October 1949.
Offprint only.
- D.41 'Atomic energy and its applications'
Drafts for a contribution to a book 'Aspects of Modern
Science', with a little editorial correspondence.
In original folder, inscribed 'Atomic Energy'.

Lectures, speeches, publications

- D.42 Speech at Valedictory Dinner to Members of Parliament,
Scottish Universities Constituency, January 1950.
6 pp. typescript.
- Toast to 'The City of Edinburgh', Walter Scott Club,
January 1950.
4 pp. typescript.
- Chairman's remarks at University Industrial Liaison Committee
Symposium, March 1950.
5 pp. typescript.
- Speech at Institute of Brewing Dinner, March 1950.
9 pp. typescript.
- D.43 Speech to Conference of Registrars, April 1950.
11 pp. typescript (some pages missing).
- Speech at lunch for André Siegfried, May 1950.
4 pp. typescript.
- Speech to P.E.N. Club, August 1950.
8 pp. typescript and ms.
- D.44 Speech to S.S.C. (Solicitors before the Supreme Courts)
Society, October 1950.
4 pp. typescript.
- Address to General Council, University of Edinburgh,
October 1950.
24 pp. typescript.
- Speech at reception for Overseas Students, November 1950.
5 pp. typescript.
- D.45 Speech for Honorary Graduands, July 1951.
16 pp. typescript.
- Contribution to British Association meeting on 'World
Communications', September 1951.
3 pp. typescript.
- 'Science, Government and Industry'
Dallas lecture delivered at Glasgow, November 1951.
Printed version in Glasgow Chamber of Commerce Monthly
Journal.

Lectures, speeches, publications

- D.46 1 p. press-release on radar awards to Watson-Watt,
January 1952.
- Address at Conference of School of Scottish Studies,
May 1952.
- Notes for speeches in Australia, 1952.
- D.47 Background information for Appleton's Presidential Address
to British Association, March 1953.
- 'The scientific method'
 B.B.C. talk to schools, April 1953.
 10 pp. typescript.
- Speech to Company of Merchants of Edinburgh, June 1953.
 6 pp. typescript.
- D.48 Speech at Graduation of Earl and Countess Mountbatten,
January 1954.
- 3 pp. typescript.
- Speech for Honorary Graduands, July 1954.
 13 pp. typescript.
- Speech at opening of Symposium on 'The Upper Atmosphere',
July 1954.
- 8 pp. typescript.
- Speech to graduates, October 1954.
 7 pp. typescript.
- D.49 Dinner Speech, May 1945.
- 7 pp. typescript.
- Speech at Royal College of Surgeons of Edinburgh, June 1955.
- 'The University and the Community'
 Opening Address, Section D, Conference of University
 Rectors and Vice-Chancellors, July 1955.
 13 pp. typescript.

Lectures, speeches, publications

- D.50 Speech at graduation ceremony, October 1955.
 5 pp. typescript.
- Jubilee Appeal for Edinburgh University Settlement,
 broadcast November 1955.
 3 pp. typescript.
- D.51 Dinner speech for Commerce Graduates, February 1956.
 5 pp. typescript.
- Dinner speech at Pipe Band Contest, May 1956.
 6 pp. typescript.
- 'Some Developments in Radio Science'
 Slide lecture to Royal Society of Engineers in Antwerp,
 September 1956.
 14 pp. typescript.
- D.52 Speech for Soviet Cultural Delegation, October 1956.
 3 pp. typescript.
- Speech at dinner for French Institute, December 1956.
 5 pp. typescript.
- Speech for Graduation Ceremony, December 1956.
 7 pp. typescript.
- D.53 'Science and Industry'
 Broadcast talk for schools, Scottish Home Service,
 April 1957.
 9 pp. typescript and ms.
- Speech at unveiling of Syme-Lister plaque, June 1957.
 3 pp. typescript.
- 'The International Geophysical Year'
 Broadcast on B.B.C. Home Service, June 1957.
 3 pp. typescript.

Lectures, speeches, publications

- D.54 Speech at U.R.S.I. meeting in America, August 1957.
 7 pp. typescript.
- 'Science and the Satellite', October 1957.
 6 pp. typescript and ms.
- 'The Significance of the Satellite'
 Article for Edinburgh Evening News, November 1957.
 5 pp. typescript.
- D.55 'After the I.G.Y.'
 Miscellaneous ms. notes and drafts, n.d., 1957-58.
- 'The International Geophysical Year 1957-58'
 The Ryland Lecture, May 1958.
- D.56 Speech at British Council Summer School for Russians,
 July 1959.
- 'Science and the Humanities'
 Address at Special Convocation, Dalhousie University,
 September 1958.
- Speech at Institution of Engineers and Shipbuilders, Glasgow,
 October 1958.
 4 pp. typescript.
- Speech at Graduation Ceremony, October 1958.
 5 pp. typescript.
- D.57 Transcripts of programme on the occasion of C.T.R. Wilson's
 90th birthday, broadcast on Scottish Home Service, February 1959.
 Appleton contributed a tribute to Wilson on the programme
 (not included in folder).
 See also H.24.
- D.58 Contributions to Glasgow Herald, on nuclear explosions,
 August 1959.
 5 pp. typescript.
- Speech to Royal Zoological Society of Scotland, November 1959.
 9 pp. typescript.

Lectures, speeches, publications

- D.59 'Scotland and the Atomic Age'
Article for The Scotsman, January 1960.
3 pp. typescript.
Dinner speech at E.U. Schools Club, February 1960.
14 pp. typescript.
Dinner speech for British Federation of University Women,
May 1960.
15 pp. typescript.
Address at Guildhall, U.R.S.I. General Assembly,
September 1960.
9 pp. typescript.
Address at Conference on Natural Resources in Scotland,
November 1960.
5 pp. typescript.
- D.60 Address to Parliamentary and Scientific Committee, January 1961.
7 pp. typescript.
'Science and Space'
Lecture to Edinburgh Schools Scientific Society.
23 pp. typescript.
3 pp. ms. notes on Artificial Aurorae, space exploration, etc.,
n.d.
Foreword to handbook for Edinburgh University Industrial
Liaison Committee.
3 pp. typescript and ms., n.d.
- D.61 Prize-giving speech at Usher Hall, July 1963.
7 pp. typescript.
Speech at opening of Napier Technical College, February 1965.
10 pp. typescript.
Speech at opening of Wind Tunnel, Edinburgh, March 1965.
7 pp. typescript.
1p. ms. notes for Graham Clark Lecture, n.d., c.1964.

Lectures, speeches, publications

- D.62-D.64 'Appleton's last note on the E-region anomaly'
Notes, data and graphs relating to work on the E layer left unfinished at Appleton's death. The material was later prepared for publication by L.M. Muggleton and published in Journal of Atmospheric and Terrestrial Physics, 1971.
- D.62 Original folder of data and graphs, including corrected proof of article as presented by Muggleton in J.A.T.P.
- D.63 Original folder of notes and drafts, mainly ms. and typescript notes of instructions by Appleton to 'I.Y.L.', or to A.G. Turnbull. c. September 1964-January 1965.
- D.64 Papers and drafts by Appleton on the E layer.
- 'On Seasonal and Non-Seasonal Anomalies in the E Layer'
7 pp. typescript draft for paper.
- 'A Further Note on the E Layer Seasonal Anomaly'
3 pp. ms. notes, March 1965.
These notes are reproduced in facsimile in the J.A.T.P. article.
- 3 pp. ms. notes introducing the Gifford Lecture, April 1965.
- 'Some Radio Reflections'
2 drafts, 2 pp. and 3 pp. for Geilo Lecture, dated June 1965.
Appleton died in April 1965 and did not complete this work.
- Also included here are letters, 1966, to Lady Appleton from W.J.G. Beynon and W.E.J. Farvis about publication of the work.
- D.65 Undated or incomplete lectures and talks, on experimental proof of the existence of the ionosphere (c.1924), talk to Danish Natural Science Association, notes for talks on space exploration, scientific research, etc.
- D.66 Folder of drafts, notes, headings, references, anecdotes, etc. for speeches, on science, education, government, etc.
- D.67-D.68 Two hard-cover notebooks (few pages used) of quotations and anecdotes.

Lectures, speeches, publications

- D.69-D.71 Notes and drafts for lectures and papers . (Contents of a folder with Appleton's name, but no title or description.)
- D.69 Letter from W.E. J. Farvis asking Appleton to repeat a course of lectures for the Diploma Course on the Ionosphere at University of Edinburgh, 1953.
- Two sequences of ms. notes by Appleton, both headed 'Lecture (1)'.
'A note on some approximate ionospheric theorems'
Typescript and ms. draft for paper. No paper of that title is listed among Appleton's publications.
- (All in original folder.)
- See Clark, Sir Edward Appleton, p.194 for a reference to these lectures, first given by Appleton in 1952.
- D.70 Various ms. sequences of notes by Appleton, on phase velocity, circuits, V.H.F., absorption, etc., some probably 1930s, some 1950s.
- Related publications by Appleton.
- D.71 Sequence of typescript and ms. drafts for slide lectures numbered 1-4, no date or author (perhaps not by Appleton).
- Notes for similar unnumbered lecture, on radio-communication.
- D.72 Folder of press-cuttings, mainly articles written by Appleton on developments in radio research 1920s and 1930s for World-Radio, Wireless World and other journals.
- D.73 Miscellaneous offprints of Appleton's writings (not a complete set).
- 1 box.

SECTION E

CORRESPONDENCE E.1 - E.151

This Section presents, in an alphabetical sequence, all correspondence other than that kept in specific folders by Appleton as part of a research topic.

Because of the disordered state in which the papers were received, this criterion sometimes falls short of the desired validity. Several of the documents (letters, data, research reports, etc.) perforce included here could have found a place in Section C, but it was felt that such few of Appleton's files as had survived should be preserved as entities. Nevertheless, the long exchanges of letters and data with W.J.G. Beynon (E.9 - E.16), R. Naismith (E.71 - E.82), W.R. Piggott (E.87 - E.98), and B. van der Pol (E.117 - E.144), to name only the most obvious examples, relate closely to the research topics of Section C and should be considered as supplementary material to them.

The correspondence is dated and indexed, and a brief indication is given of material of particular scientific or personal interest. Extensive correspondence with an individual appears in one or more personal folders; shorter exchanges are grouped in miscellaneous folders.

There is very little surviving personal or family correspondence, but see E.60, Appleton's letters and cards to Ada Leach.

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|-----|--|---------|
| E.1 | A.C. Aitken | 1949-60 |
| | Aitken was Professor of Mathematics at Edinburgh and often consulted by Appleton about the statistical aspects of research data; some of the correspondence is accompanied by data and calculations. | |
| E.2 | J.P. Andrews | 1939-40 |
| | On 'fading'. Includes a draft paper by Andrews 'Low power apparatus for ionospheric investigation', data and graphs. | |
| | Also included are 1p. notes by Appleton and an offprint by P. Lejay on fading at Shanghai. | |

Correspondence

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|----------|---|---------|
| E.3 | P. Angwin | 1951 |
| | Includes note on Radio Astronomy in the South Bank exhibition, Festival of Britain. | |
| E.4 | D.K. Bailey | 1944 |
| | Comments on Appleton's 1944 papers on morphology of F ₂ layer. | |
| | R. Bailey | 1948 |
| | Falkland Islands observations. | |
| E.5 | J. Bartels | 1949-58 |
| | Includes data, graphs, printed matter relating to various research problems. | |
| E.6 | L.F. Bates | 1946 |
| | J.W. Beagley | 1949 |
| | Enclosing data from New Zealand. | |
| E.7 | T.W. Bennington | 1958-59 |
| | On various research projects, and to accompany data, 1957-61, sent by B.B.C. Research Department. | |
| E.8 | B.B.C. Data sent by Bennington and referred to in correspondence. | |
| E.9-E.16 | W. J. G. Beynon | 1938-59 |
| | Beynon was one of Appleton's principal collaborators, first at the National Physical Laboratory where Beynon was Senior Scientific Officer, 1938-46, and at University College, Swansea, 1946-58, and University College of Wales, Aberystwyth, where he became Professor and Head of Department in 1958. | |
| | The material includes data and reports, and frequent references are made to U.R.S.I. during the 1950s when Beynon was Secretary and Appleton Chairman of the Mixed Commission on the Ionosphere. See C.365-C.383 for the main sequence of U.R.S.I. correspondence. | |
| | Letters for 1953-54 also refer to research which Appleton was conducting in collaboration with A. J. Lyon. See C.142-C.144 for further material on this subject. | |

Correspondence

- E.9 1938-39
- Includes data, graphs, abstract for paper on 'The reflexion of radio waves from the ionosphere at oblique incidence'.
- E.10 1940
- Includes two papers by Beynon 'Angle of Incidence' (January) and 'The application of ionospheric data to radio-communication problems'. 17 pp. + 15 figs. (January), etc.
- Included here is a letter, 9 October 1940, from G. Millington to R.L. Smith-Rose on a report by Beynon on maximum usable frequency calculations.
- E.11 1941, 1944-45
- Includes data, outline of research programme, comments on papers by others.
- E.12 1947-49
- Mainly on research and collaborative publications, but includes a little U.R.S.I. material.
- Correspondence relates to Appleton's and Beynon's note 'Lunar oscillations in the D-layer' (Nature, 164, 1949), Beynon's 'Note on Focussing Effects in the horizontal plane in Oblique Incidence Transmission', 'Atmospheric Effects in Short and Medium Radio Wave Propagation', and includes two drafts 'The Reflection of Radio Waves from the Ionosphere at Oblique Incidence' (by Beynon), and 'Astigmatic Reflection by the Ionosphere' (by Appleton and Beynon).
- Also includes a letter and draft paper by D.F. Martyn.
- E.13 1950-51
- Includes correspondence relating to Beynon's application for D.Sc. degree at University of Wales, and a paper by him on P',f measurements, June 1951.
- 1952 (one letter only).

Correspondence

E.21 (Cont'd.)	C.E.R. Bruce	1949
	On Bruce's draft note on 'Solar Flares', with a letter from W.M.H. Greaves.	
	D. Brunt	1934
	On diurnal variation.	
	H. Buckley	1950
E.22	R.E. Burgess	1948-50
	Includes comments and reports on ionospheric research in U.S.	
E.23	O. Burkard	1947
	T.J. Carroll	1957
	On history of radio, and Marconi.	
E.24	W.S. Chalmers	1947
	Includes paper on ionospheric characteristics in Chungking.	
E.25	F.W. Chapman	1948, 1950
E.26	S. Chapman	1932, 1943, 1948, 1950
	Includes Chapman's note on 'Upper Atmospheric Nomenclature', 1950.	
E.27	Cherwell (F.A. Lindemann)	1945
	Comments on a draft paper by Appleton, with ms. notes by Appleton and Piggott.	
E.28	R. Clavel	1930
E.29	L.J. Comrie	1937
	Two letters by Comrie, and a ms. draft by Appleton on conductivity; Comrie advised on mathematical calculation of integrals.	
	One letter bears a ms. note 'Papers leading up to Bakerian Lectures J.A.R.' (Ratcliffe).	
E.30	T.G. Cowling	1948, 1950

Correspondence

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|------|--|--------------------------------------|
| E.31 | C.G. Darwin | 1942, n.d. |
| | Correspondence 1942 is discussion of research note by A.R. Meetham on scattering; attached is a research note on scattering by Appleton dated February 1944. | |
| | The undated material is 4 pp. ms. notes on 'Group Velocity of Damped Waves'. | |
| E.32 | F.T. Davies | 1947 |
| | Also includes data and photographs. | |
| E.33 | W. de Groot | 1930 |
| | J.H. Dellinger | 1948 |
| E.34 | O. Devik | 1945 |
| | Including data and graphs from Kjeller. | |
| E.35 | W. Dieminger | 1957, 1958 |
| | H. Dingle | 1952 |
| E.36 | G.M.B. Dobson | 1935 |
| | One letter only, on temperatures at great heights. | |
| | H. Dowden | 1944 |
| | Note <u>re</u> German radio station. | |
| | A.S. Eddington | 1942 |
| | One letter only. | |
| | J. Egedal | 1950 |
| E.37 | M.A. Ellison | 1950, 1958 |
| | On 'Solar Flares', including data, and a letter from Zirkler, 1950. | |
| E.38 | K.G. Emeleus | 1934, 1937 (one letter has p.1 only) |

Correspondence

- E.39 J.A. Fleming 1932, 1934, 1946
On research projects. The 1932 letter is a copy of a letter from Fleming to A.E. Kennelly on the history of research in the ionised layers of the atmosphere.
This document has kindly been made available by W.R. Piggott.
- E.40 J.A. Fleming (Sir Ambrose Fleming) 1942
Includes an autograph letter from Fleming (then aged 92), 1942, with reminiscences of Clerk Maxwell, etc., press obituaries of Fleming, 1945, ms. notes by Appleton for an obituary he was asked to prepare for St. John's College, Cambridge, and correspondence arising, and a 36 pp. typescript 'Recollections of Sir John Ambrose Fleming' by Arthur Blok, 22 May 1945, apparently not published elsewhere.
See also D.25.
- E.41 J.S. Forrest 1950
- E.42 J.C. Goodier n.d.
Enclosing graphs and data on sunspots for 1923-38, and F₂ critical frequencies for 1944, 1945.
- E.43 A. Gray 1956, n.d.
Enclosing references, information, etc.
- E.44 A. L. Green 1926, 1930, 1948
Correspondence 1926 concerns experiments at King's College, London, and other stations, and includes data and results.
- E.45 H. J. Groenewold 1948
- E.46 L. Harang 1935-38
On research at Tromsø, including data, photographs, reprint.
- E.47 L.S. Harley 1945
Includes comments on a draft broadcast script by Appleton, on radar.

Correspondence

E.48	D.R. Hartree	1930 (2 letters) 1932 (3 letters) 1934 (1 letter) 1936 (1 letter)
	On various research problems and results.	
E.49	L.W. Hayes	1946
	J.T. Henderson	1931
	E. Herbays	1950
	On U.R.S.I., and enclosing a letter on Japanese co-operation.	
	F.J. Hewitt	1949
	Information from Johannesburg.	
E.50	J.S. Hey	1947
	Enclosing graphs, and a letter from A. Vrede.	
E.51	E.L. Hirst	1961
	Comment on a ms. by Appleton.	
	W.V.D. Hodge	1958
	J. Hollingworth	1929
	A. Holmes	1956
	Information for Appleton's Reith Lectures.	
E.52	F. Horner	1947, 1948
	On research and meetings in U.S.	
E.53-E.55	L.J. Ingram	1934-37
	Miss Ingram was appointed to assist in the preparation and writing-up of data from the Second Polar Year (see C.312).	
	The correspondence, often accompanied by data and calculations, deals with various ionospheric projects in hand during the period and should be consulted in conjunction with similar material in Section C, 3 folders as follows:	
	E.53	1934
	E.54	1935
	E.55	1936-37

Correspondence

E.62	H.A. Lorentz	1922, 1923
E.63	A.C.B. Lovell	1951, 1956, 1958
	Includes some material <u>re</u> development of Jodrell Bank.	
E.64	G.G. Macfarlane	1943
	On non-linearity.	
E.65	D.H. McIntosh	1953-59
E.66	J.P.V. Madsen	1949
	G. Marconi	n.d.
	Photocopy of a letter, n.d., offering to prepare receiving apparatus for a lecture demonstration.	
	F. Mariani	1958
	D.C. Martin	1956
	Appleton's carbon only, on Russian science and scientists.	
E.67	D.F. Martyn	1937, 1948-55
	On various research problems, U.R.S.I., data exchange, and enclosing drafts or headlines for reports.	
E.68	A.R. Meetham	c.1939-42
	Research notes on various problems in F layer research, including comments on a theory of accretion by R.A. Lyttelton and F. Hoyle, 1942.	
E.69	J. Miller and others	1951-52
	Correspondence <u>re</u> Appleton's proposed nomination of the Edinburgh Festival Society for the Nobel Peace Prize.	
	Includes draft copy of the submission.	

Correspondence

E.70	G. Millington (Photocopies.)	1946
	A.C. Mitchell 'Patchiness' in ionisation.	1934
	S.K. Mitra	1954
	T. Nagata On Japanese ionospheric research.	1950
E.71-E.82	R. Naismith	1934-58

Naismith worked at the Department of Scientific and Industrial Research's Radio Research Station at Slough, where he was largely responsible for the ionospheric work. He became a close collaborator and friend of Appleton, a member of the Tromsø expedition, and a co-author of many publications with Appleton and L. J. Ingram (q.v.).

The correspondence, often accompanied by data, graphs, drafts, etc., is presented as a chronological sequence as far as this is ascertainable; it deals with a variety of ionospheric research topics and should be consulted in conjunction with similar material in Section C.

E.71 1934
Includes a sequence of notes, dated 5 April and identified A-P, of points arising from results on critical frequency. Appleton's remarks appear at the head of each note, with Naismith's answer or comment below.

E.72 1935-37
Includes data and drafts, some with additional notes by L. J. Ingram.

E.73 1938
Original folder inscribed 'Eclipse' with the date '1937' added in another hand.
Includes correspondence from Naismith re plans for observing the Solar Eclipse of 1940, bibliographies and tabulated information on recent (1935, 1936) eclipses, printed reports of observations during 1936, 1937 eclipses (and one for 1955).
Also included are a letter and photographs on the 1936 eclipse, from J. A. Pierce.

Correspondence

- E.74 1938
- E.75 1939
Includes data, comments on papers and discussion meetings, and also letters from F.W.G. White on ionospheric research in New Zealand.
- E.76 1940
Includes data, graphs, comments on results, two short reports on magnetic storms (April), report on 'ionospheric discussion' (November), and also letter and data on sunspots from H.W. Newton.
- E.77 1941
Correspondence and data (to July only).
- E.78 1943
Includes draft report on 'Radio Communication over high latitudes' (February), and a letter and graphs on noon values (August). This has a note appended by Dr. J. King (1980) 'This letter shows that Appleton was aware in mid-1943 that the foF₂ values around latitude 30°N were abnormally high. For more details see also letter from Naismith dated 11/X/1944' (in E.79).
- E.79 1944
Includes letter of 11 October referred to above, to which is appended 1p. ms. notes by Appleton.
- E.80 1945-46
Includes a letter from L.W. Hayes (1945) and a note by Naismith on 'Proposed Scheme to transfer British Ionospheric Stations to D.S.I.R.' (1946).
- E.81 1947
Includes letter from M. Waldmeier.
- E.82 1950
1951 (Includes paper by K. Rawer)
1958 (One letter only)

Correspondence

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|-----------|--|------------------|
| E.83 | J. Needham | 1953 |
| | One letter only. | |
| E.84 | H.W. Newton | 1939, 1944, 1955 |
| | Correspondence 1944 is a letter (2 copies) from Newton commenting on a Russian memorandum on magnetic and ionospheric storms. | |
| E.85 | J. Paton | 1949-53 |
| | Mainly on aurorae and including a draft or transcript of a discussion on aurorae between Appleton, Paton and A.C.B. Lovell, n.d. | |
| E.86 | P.O. Pedersens | 1931 |
| | M. L. Phillips | n.d. |
| | J.A. Pierce | 1947 |
| E.87-E.98 | W.R. Piggott | 1939-59 |
| | Piggott had been a student at King's College, London, and later moved to Cambridge with Appleton. He subsequently worked at the Radio Research Station, Slough, and, like R. Naismith (q.v.) became one of Appleton's chief collaborators, being seconded at the latter's request to D.S.I.R. headquarters on the outbreak of war. He was thus particularly close to Appleton during the war years and their correspondence takes the form of notes on scraps of paper, headed (by Piggott) simply 'Secretary' and not always dated. After the war Piggott returned to work at Slough, whence the later correspondence is addressed. | |
| | The material, which includes data, graphs, reports, etc., is presented as a chronological sequence as far as this is ascertainable; it deals with a variety of research topics and should be consulted in conjunction with similar material in Section C. | |
| E.87 | 1939-40 | |
| E.88 | 1941-44 | |
| | Includes letter from L.W. Hayes on accuracy of Delhi ionosphere measurements (1943), and 'Note on the organisation of ionosphere recording stations after the war' (1944) prepared by Piggott for Royal Society. | |

Continued

Correspondence

- E.88 (Cont'd.) The Delhi measurements drew Appleton's attention to the geomagnetic anomaly which became a focus for his later research. See Clark, Sir Edward Appleton, p.151.
- E.89 Hardcover springback folder containing 75 pp. +3 pp. appendix typescript account, with lists of references and contents, beginning 'The following appendix consists fundamentally of notes taken by myself at a series of lectures delivered by Mr. W.R. Piggott of D.S.I.R. in October 1944'.

The account is not signed, and there are ms. corrections in more than one hand.
- E.90 1946

Report on B.B.C. anti-fading aerial.
- E.91 1947

Letters May-August during Piggott's visit to National Research Council, Ottawa, re projects and equipment in Canada.
- E.92 1947.

Correspondence and papers November-December, including material on Japanese and German ionospheric research.
- E.93 Undated notes and material, probably 1947.
- E.94 1948

Includes data, photographs, etc.
- E.95 1949

Not all dated.
- E.96 1950

Reports by Piggott on ionospheric work at various U.S. centres: Harvard, Stanford, Carnegie Institute.
- E.97 1951-53

Includes data and graphs, and a letter from F. Ranzi.
- E.98 1954-55, 1959.

Correspondence

E.99	H.D. Poole	1939-40
	Includes correspondence on Poole's theories from W.J.G. Beynon, October 1939.	
E.100	B.G. Pressey	1946
	O. Pulley	1935
E.101, E.102	J.A. Ratcliffe	1933-64
	The early letters (E.101) are all ms. and include research ideas, discussion of theories, proposed publications, etc. Not all are dated, and one letter is incomplete.	
	2 folders as follows:	
E.101	1933-35	
E.102	1951, 1952, 1955, 1960, 1964 (Appleton's carbon only).	
	1952 correspondence includes memorandum re analysis of I.G.Y. records, with comments by A.J. Lyon. Appleton's letter of 1964 refers to Larmor, and to the discovery of the equatorial anomaly.	
E.103	Rayleigh	1937
	One letter only.	
E.104	Rutherford	1937
	One letter only, 22 August 1937 (Rutherford died in October), with a copy of the order of service at Rutherford's funeral and a note by Appleton 1957.	
E.105	M. Ryle	1956
	Enclosing information on research.	
E.106	D.H. Sadler	1964
	Sq values.	
	M.N. Saha	1938
	R. Samuel	1938
	On absorption.	

Correspondence

- | | | |
|-------|---|---------------|
| E.107 | J.C. Schelleng | 1928 |
| | J.M.C. Scott | 1946 |
| | Comments on paper. | |
| | A.H. Shapley | 1960 |
| E.108 | T. Shimazaki | 1957 |
| | On Sq papers. | |
| | E.K. Smith | 1957 |
| E.109 | R.L. Smith-Rose | 1942, 1946-60 |
| | Includes a letter from Y. Rocard, 1949, on French ionospheric research, and a report by Smith-Rose on the solar eclipse 1952. | |
| E.110 | H.T. Stetson | 1933, 1947 |
| | Letter of 1933 (with a photograph) has a note by Dr. J. King (1980) 'letter drawing attention to the decrease of radio reception during the years 1930-32 when the sunspot number was also decreasing'. | |
| E.111 | A.C. Stickland | 1933, 1942 |
| | 1933 correspondence relates to Tromsø data on storms. | |
| E.112 | E.C. Stoner | 1946 |
| E.113 | C. Störmer | 1935, 1947 |
| E.114 | J.O. Thomas | 1954-62 |
| | Includes graph, draft paper, etc. | |
| | L. Thomas | 1962 |
| | Equatorial anomaly. | |
| E.115 | J.J. Thomson | 1931, 1937 |
| | Letter of 1931 is on Clerk Maxwell; letter of 1937 refers to the serious illness of G.P. (later Sir George) Thomson. | |

Correspondence

E.116	L. Tonks	1933
	K.W. Tremellen	1943
	M. Tuve	1964
	Appleton's carbon only.	

E.117-E.144	B. Van der Pol	1920-54
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Van der Pol was the first of Appleton's close collaborators, their friendship beginning at the Cavendish Laboratory in 1919. Later that year, Van der Pol returned to the Netherlands to work in Haarlem under H.A. Lorentz; in 1922, after exploring the possibilities of posts at Delft and (via Appleton) at Cambridge, he accepted (June 1922) a position in the Research Department of N.V. Philips Gloeilampenfabrieken, Eindhoven.

The correspondence is particularly intensive, 1921-24, and is primarily concerned with work on oscillations and non-linearity. From the surviving evidence, Appleton was the more assiduous correspondent, writing letters and postcards from his laboratory, his home and from various holiday addresses, sometimes more than once a day when a thought, or a second thought, struck him. Although the letters are almost wholly concerned with research problems, there are a few personal references to family matters, occasional visits, Cambridge affairs and personalities, etc. The correspondence tails off after about 1925 but resumes in a more desultory, though friendly, fashion after the Second World War. There was a somewhat sharp exchange in 1927 (E.132, E.144) when Appleton thought that his proposed election to the Royal Society might be jeopardised by references to his work in an article published by Van der Pol, but all was well and the friendly tone of the correspondence resumed undiminished.

This close exchange is an interesting example of the development of a collaborative research project conducted by correspondence before telephone communication and air travel became sufficiently cheap to be the accepted mode. It has been referred to in several published works and was the subject of a paper by F. L.H.M. Stumpers, 'Some notes on the correspondence between Sir Edward Appleton and Balth. Van der Pol' (Philips Res. Repts., 30, 1975) a copy of which is included in E.144.

No doubt as a result of previous interest in the letters, some degree of sorting and numbering had already been carried out, which has imposed constraints on the present listing. Appleton's and Van der Pol's letters were kept in separate

Correspondence

E.117- E.144 (Cont'd.)

sequences and this division has been preserved. Appleton's letters down to October 1924 were numbered 1-110 in red pencil with additional documents sometimes added as, e.g., 6a, 7A, 7B, and some numbers, e.g., 3, 8, are used more than once. Some letters also have words ringed in the same red pencil, presumably because they were thought uncertain or illegible. The numbering stops after 110 (1924). It should be noted that Appleton often left letters undated or with a simple note such as 'Sunday', and the red-pencil numbering must have had to rely on content alone; there are in consequence inaccuracies and omissions from the sequence. These have been noted where possible in the present listing.

Van der Pol's letters are less numerous and only one undated set of notes occurs, included in E.144.

Both sets are presented chronologically.

E.117-E.138 from Appleton to Van der Pol, 1920-54

E.139-E.144 from Van der Pol to Appleton, 1920-48.

E.117-E.138

Appleton - Van der Pol.

- E.117 1920. Letters run 26 September to 28 December and are numbered 1-7A.
- E.118 1921. 8 January-30 April, numbered 7B-20.
- E.119 1921. 23 June-August, numbered 21-33.
- E.120 1921. c. September-20 December, numbered 34-44.
- E.121 1922. 1 January-28 February, numbered 44-54. The numbering is very capricious here; there are two documents for each number 44, 45 and 46, no.47 is out of date order, there is no no.52, and several unnumbered items are included.
- E.122 1922. 20 March-25 June. These letters are unnumbered, except for the last three, June 10, 16, 25, which are numbered 42, 43 and 44.
- E.123 1922. 31 July-28 October, numbered 45-58. Several are out of chronological order and some are dated but unnumbered.
- E.124 1922. 2 November-3 December, numbered 59-63.

Correspondence

- E.125 1923. 9 January-12 April, numbered 63a-73, not all in chronological order. (no.64 is postmarked 15 December 1922, no.68 is postmarked 6 December 1922).
- E.126 1923. 3 May-20 September, numbered 75-90.
N.B. Four letters numbered 79-82, dated 1924 and referring to Appleton's consultancy with Philips and to his appointment at King's College, London, have been transferred to E.129.
- E.127 1923. 19 October-20 December, numbered 91-100.
N.B. A letter numbered 92, addressed from King's College, London, 12 October [1924] has been transferred to E.129.
- E.128 1924. 20 January-25 April, numbered 101-107.
- E.129 1924. 6 June-12 October. Includes letters numbered 79-82 (transferred from E.126), letter numbered 92 (transferred from E.127), 108-110.
N.B. This marks the end of the sequence numbered in red pencil.
- E.130 1925. Letter of 27 December mentions W. Altar (q.v.).
- E.131 1926. March-September.
- E.132 1927. Includes correspondence in February referring to Van der Pol's article which Appleton considered to include damaging references to himself and his contribution to non-linearity problems.
- E.133 1928. (Includes one letter lacking p.1).
- E.134 1929.
- E.135 1930.
1931 (one letter only).
1932 (one letter only).
- E.136 1945 (two letters only).
1946.
- E.137 1947 (two letters only).
1948.

Correspondence

- E.138 1950 (one letter only).
 1951 (one letter only).
 1952 (two letters only).
 1954 (one letter only).
- E.139-E.144 Van der Pol to Appleton.
- E.139 1920 (one letter only).
- E.140 1921. Includes notes and calculations, offprint of published paper.
- E.141 1922. January-April (letter of 26 April discusses Van der Pol's career plans).
- E.142 1922. May-c. October (letter of 20 May describes Van der Pol's decision to accept a post at Philips).
- E.143 1923.
- E.144 1927 (one letter only, in reply to Appleton's charge that Van der Pol had misrepresented his work in an article, see E.132).

 1948 (one letter only).

 Included here are undated ms. notes by Van der Pol, c.1922-24, an offprint of a centenary article by Van der Pol on Lorentz, 1953, and an offprint of an article on the Appleton-Van der Pol correspondence by F. L.H.M. Stumpers, 1975.
- E.145 F.W. Van Straten 1947

 R.A. Watson-Watt 1920

 A.H. Waynick 1948.
- E.146 K. Weekes 1939, 1947, 1950, 1958.
- E.147 A.G.D. West 1934

 Early Baird Television Ltd. reception.

 F.W.G. White 1936, 1938

 Including data; some ms. annotations by Appleton.

Correspondence

E.148	D. Whitteridge	1956
	On natural temperature regulation.	
E.149	M.V. Wilkes	1939
E.150	A.F. Wilkins	1949, 1950
	J.W. Wright	1959
	C. Zener	1934
	Unidentified	1937
E.151	Shorter correspondence to accompany data or reports.	
	Not indexed.	

SECTION F

CHARTS, GRAPHS, DATA F.1 - F.69

INDEX

F.1, F.2	ELECTRON DENSITY
F.3 - F.8	EQUATORIAL ANOMALY
F.9 - F.16	fE
F.17 - F.21	fF ₁
F.22 - F.33	fF ₂
F.34 - F.36	r(fF ₂)
F.37 - F.43	(M3000)F ₂
F.44 - F.49	h'F
F.50 - F.60	SUNSPOTS
F.61 - F.69	MISCELLANEOUS

Charts, graphs, data

INTRODUCTION TO SECTION F

The material in this Section is entirely manuscript. It was prepared under Appleton's instructions by collaborators, students and assistants, mainly 1949 - 65, for various research projects on the ionosphere. Some of the charts are in identifiable hands such as those of A.J. Lyon and A.G. Pritchard (later Turnbull) but the majority seem to have been compiled by the 'Ionospheric Young Ladies'. There is an occasional note in Appleton's own hand.

Some of the material remains in its original folders or wrappers, but most was received as loose sheets. It constitutes the background information for the various projects in Section C, and which, because of its bulk and because it is not specifically referred to in correspondence or drafts, has been listed separately.

The contents are very miscellaneous. The index covers only broad descriptive titles; any original groupings or headings have been preserved and are indicated by the use of inverted commas, but it has not been possible to furnish detailed descriptions, especially for loose sheets or fragmentary notes.

F.1, F.2

ELECTRON DENSITY

F.1

'Electron density'

Original folder of graphs of electron density at various heights, compiled by Mrs. Turnbull and others, 1959-61.

Includes a research report on the subject by J.O. Thomas, 1957.

F.2

'Work on Electron Density for Puerto Rico'

Original folder of graphs and values, using data March 1959-March 1962.

A full list of contents is written on the front cover of the folder.

Charts, graphs, data

F.3-F.8

EQUATORIAL ANOMALY

- F.3 'Graphs of $N(h)$ for Talara, Panama, Huancayo ...'
Original folder of graphs, with a typed note of instructions from Appleton to 'I.Y.L.', 1964.
A full list of contents is written on the front cover of the folder.
- F.4 Studies of $\frac{I}{N} \frac{dN}{dt}$ for Talara.
Includes some material in Appleton's hand.
- F.5 Miscellaneous charts for Talara, Panama, etc.
- F.6 Miscellaneous charts with geographic and magnetic latitude.
- F.7, F.8 Miscellaneous charts and graphs on equatorial anomaly.

F.9-F.16

fE

- F.9 Charts and tables of noon values, mainly Slough data, 1932-58.
Includes a note from Mrs. Turnbull to Appleton on the data, and a brief reply by him.
- F.10 'Slough Monthly Means of fE'
Original wrapper of data.
- F.11 'Washington Monthly Means of fE'
Original wrapper of data.
- F.12 'Slough Monthly Means of fE and fF_1 '
Original wrapper of data.
- F.13 'Slough character figures'
Original wrapper of data.
- F.14 'fE 1953/1954'
Original wrapper of data for ionospheric stations worldwide.
- F.15 'fE 1957/1958'
Similar data.
- F.16 Charts of world values, March and September 1958, March 1959, March 1962.

Charts, graphs, data

- F.17-F.21 ff_1
- F.17 ' ff_1 1953/1954'
Original wrapper of data for ionospheric stations worldwide.
- F.18 ' ff_1 1957/1958'
Similar data.
- F.19 ' $f_{Min.}$ 1953/1954'
Original wrapper of data for ionospheric stations.
N.B. data for only two stations survive.
- F.20 ' $f_{Min.}$ 1957/1958'
Similar data.
- F.21 ' $(fo F_1)^2$ for each month 1949-59'
Original wrapper of data for various stations.
-
- F.22-F.33 ff_2
- F.22 ' F_2 Layer Distortion Diurnal Variation'
Appleton's original folder. Contents now include only charts of June and December values ff_2 (S.S. min.)/ ff_2 (S.S. max.) (not in his hand).
- F.23 'I.G.Y. ff_2 Diurnal Sheets'
Original wrapper of data for ionospheric stations worldwide.
- F.24 ' ff_2 1955'
Original wrapper of data, similar to F.23 above.
- F.25 Miscellaneous data ff_2 max./ ff_2 min., mainly for equinoctial values.
- F.26 Miscellaneous ff_2 data, comparative values for 1948 and 1953.
- F.27 Miscellaneous curves for ff_2 in mc/s for various stations and years.

Charts, graphs, data

- F.28 Miscellaneous curves for $(foF_2)^2$ and sunspot numbers for various stations and years.
- F.29 Curves for foF_2 S.S. max. 1958/S.S. min. 1954, for June and December.
- F.30 Large hardcover spiral-bound folder of data, tabulating monthly medians of ff_2 from several observatories over several years. Composite tables for 1953 and 1954 appear on the front pages.
- F.31 Miscellaneous ff_2 data and graphs for several stations and values, averaged over various periods.
Data mainly cover 1954-58, but include some earlier 1943-44.
In various hands, including Mrs. Turnbull's, and a few notes by Appleton.
1 box.
- F.32, F.33 Diurnal curves of ff_2 (S.S. min. and S.S. max.), for several stations, summer and winter values, at various dates, 1937-57.
2 boxes.
- F.34-F.36 $r(ff_2)$
- F.34 Original folder containing '1958-62 Values of ff_2 midnight equinox', and later charts dated 'Easter 1964' for ' $r(ff_2)$ '.
A full list of the contents is written on the folder cover.
- F.35 'Christmas 1963. Work on $r(ff_2)$ '.
Original wrapper of data.
- F.36 Graphs of $r(ff_2)$ for various stations and hours of the day.
- F.37-F.43 (M3000) F_2 data
- F.37 '(M3000) F_2 1954'
Original wrapper of data for ionospheric stations worldwide.

Charts, graphs, data

- F.38 '(M3000)F₂ 1957-58'
Similar material.
- F.39 Miscellaneous composite and average graphs for (M3000)F₂, mainly 1953-58.
- F.40 Average curves of (M3000)F₂ for various stations, March and September 1948-53.
- F.41 Miscellaneous (M3000)F₂ plots S.S. min./S.S. max., related to work on equatorial anomaly.
- F.42 'F₂ - M3000 S.S. min./S.S. max.'
Original wrapper of values for Slough, Washington, Huancayo, Tokyo, Watheroo.
- F.43 'fF₂ - R Midnight and noon'
Original wrapper of values for five named stations as in F.42 above, and kept with it.
- F.44-F.49 h'F data
- F.44 'H'F for Q days and D days 1932-56'
Original folder of data and charts, by Mrs. Turnbull and others.
- F.45 'h'F 1957/1958'
Original wrapper of data for ionospheric stations worldwide.
- F.46 Composite tables of h'F data for Slough 1949-59, by Mrs. Turnbull.
Includes 1 p. ms. chart by Appleton.
- F.47 Diurnal and seasonal variations of h'F and its variation with latitude, various stations, mainly 1957-58.
- F.48 'Grand Average h'F for 1900 and 2000 hrs. for all months of I.G.Y. with Magnetic and Geographic Latitude'
Original folder so described.

Charts, graphs, data

F.49 Chart of midnight values of H'f₂ 1939-41 (probably by Naismith).

Chart of h'F₁ values at noon, various stations, n.d.

h'F charts 1958, 1959.

Miscellaneous other h'F curves and data.

F.50-F.60 SUNSPOTS

F.50 $\frac{D(ff_2)}{Q(ff_2)}$,

Appleton's folder, so described, containing data and graphs by Mrs. Pritchard mainly 1951-52.

F.51 Charts, etc. on sunspot cycle 1937-40, and 1936-38.

F.52 Charts, etc. of sunspot numbers, various years 1954-58, some annotated by Appleton.

F.53 'Storms $\frac{D(ff_2)}{Q(ff_2)}$ and $\frac{O}{W}$ type curves'

Appleton's original folder, so described, containing extensive data and graphs by Piggott, Mrs. Pritchard and others, mainly 1945-52. Includes a graph of sunspot cycle variation, by Piggott, 1935-48.

F.54 Data on sunspot numbers, mainly of sunspot cycles at various stations.

Includes some work by C.P. Bell.

F.55 Data on sunspot cycles 1931-53, graphs of quiet and disturbed days, etc.

F.56 'Effect of S and K on noon ff₂'

Original folder so described, containing data for Abinger and Slough 1942-52.

F.57 Miscellaneous sunspot numbers and data, some dated 1949.

Charts, graphs, data

F.58 'Declination Sq (γ) 1948-62'
Original folder so described, containing extensive data and curves for various sunspot periods, and including work on elimination of seasonal anomaly.
Includes 1p. ms. note by Appleton.

F.59 Miscellaneous notes, calculations, graphs, etc. by Mrs. Turnbull.

F.60 Miscellaneous data, graphs and curves on sunspots.

F.61-F.69 MISCELLANEOUS

F.61 Calculations of average noon values $\frac{\Delta f}{f_0}$ from Slough data, 1959-63.

F.62 Calculations of noon values, monthly means 1933-53, by A. J. Lyon.

F.63 Calculations of equinox noon M values for sunspot maximum and minimum.
With Appleton's typescript note to 'I.Y.L.' setting out problem and method, July 1964.

F.64 Miscellaneous data and graphs from Slough, 1931-48.

F.65 Original folder of charts and graphs, some on Slough data 1931-51, in several hands.

F.66 Miscellaneous graphs and data, c.1956-58, mainly by Mrs. Turnbull, with a few ms. annotations by Appleton.

F.67 Charts and graphs of geographical and geomagnetic latitude values for various stations and dates.
Some sheets are headed $\frac{(fF_2)^A}{(fF_2)^B}$ in Appleton's hand.

F.68 Ionospheric storm calculations.

F.69 Miscellaneous graphs, curves, etc.

SECTION G

REPORTS AND PRINTED MATTER G.1 - G.31

The material is presented as follows:

- G.1 - G.22 Preprints or reports of limited circulation, briefly described, in chronological order.
- G.23 - G.25 Data sent to Appleton from observatories and ionospheric stations, in alphabetical order.
- G.26 - G.31 Offprints of published papers by others.

G.1-G.22 Preprints and limited circulation reports

- | | | |
|------|---|-----------------|
| G.1 | L.W. Austin: Solar and Radio Relationships | 1931 |
| G.2 | Aerial Terminal Calculations (Marconi Co. Ltd. no.10) | 1936 |
| G.3 | A. G. McNish: Geomagnetic co-ordinates for the whole earth | 1936 |
| G.4 | P. Lejay: Study of the ionosphere at Shanghai (trans. and comment by Beynon and Piggott) | 1940 |
| G.5 | Report on Australian Ionospheric Services | 1941 |
| G.6 | Reports on German Research Institutes, and related committee | 1945 |
| G.7 | Ionospheric observations at Spitzbergen | 1948 (and 1943) |
| G.8 | Charts of auroral data | 1944 |
| G.9 | World-wide distribution of E _s Ionisation (Marconi Co. Ltd., RD729) | 1946 |
| G.10 | List of ionospheric stations operating 1933-48 (B.B.C.) | 1948 |
| G.11 | Department of Scientific and Industrial Research Radio Research Board, Report of activity, 1933-48. | [1948] |

Reports and printed matter

- | | | |
|------------|---|---------|
| G.12 | A. L. Gardner: Ionosphere work in New Zealand | 1948 |
| G.13 | R. Naismith and R. Bailey: An automatic ionosphere recorder (D.S.I.R. report) | 1949 |
| G.14 | Fluid Compensating Magnetometer (Elliott Bros. design for P.M.S. Blockett) | 1949 |
| G.15, G.16 | Two reports on work on ionospheric physics (D.S.I.R. Radio Research Board) | 1954 |
| G.17 | U.S. Reports, from National Bureau of Standards and Bell Telephone Laboratories | 1931-49 |
| G.18 | Three reports on rockets | 1947-48 |
| G.19 | Miscellaneous translations from German and Russian of articles on ionosphere | |
| G.20 | W. G. Baker: Anomalous magnetic variations near the Equator | n.d. |
| G.21 | Draft paper on magnetic variations, no author or date | |
| G.22 | Miscellaneous addresses and writings on science and industry | 1951-58 |

G.23-G.25 Data and Reports from observatories and stations

3 boxes as follows:

- | | |
|------|---|
| G.23 | Antarctica, Argentina, Australia, Berne, Cape of Good Hope, Clyde, Delhi, France (Fribourg, Dakar), Freiburg, Geneva, Hamburg, Japan, Kerguelen |
| G.24 | Lindau
Monthly charts of various values in F and E layers, 1948-56. |
| G.25 | Norway, Sao Paolo, Singapore, Slough, Sweden, U.S.A. |

Reports and printed matter

G.26-G.31 Offprints of published papers by others

5 boxes as follows:

- G.26 R.D.F. and radar
 Ionised air
 Recombination and negative ions
 Storms (in original folder)
- G.27 Solar Noise
 Meteors
- G.28-G.31 Miscellaneous reprints

SECTION H

NON-PRINT MATERIAL H.1 - H.39

- | | |
|------------|---|
| H.1 - H.6 | Scientific photographs |
| H.7 - H.36 | Photographs of Appleton, colleagues and friends |
| H.37, H.38 | Records |
| H.39 | Tape recording |

H.1-H.6 Scientific photographs

Photographs of equipment, results, etc. in approximate chronological order.

- | | |
|-----|--|
| H.1 | Small red notebook, unused, but with typed list of points relating to Appleton's research pasted inside first page, and enclosing photographs of results, 1929 and 1931. |
| H.2 | Photograph of results, c.1931. |
| H.3 | Small envelope of diagrams and figures, some described and dated, 1932 and 1933. |
| H.4 | 3 photographs of receiving apparatus (perhaps c.1942, Burghhead). |
| H.5 | Ionograms, one dated 1946. One bears on verso a note in the hand of W.R. Piggott which begins 'From Mr. Naismith. The interference pattern on the lower E echo is of great interest and has never been observed before'. |
| H.6 | Miscellaneous photographs, one dated 1939. |

H.7-H.36 Photographs of Appleton, colleagues and friends

- | | |
|----------|---|
| H.7 | 'Bethesda Junior Gymnasium Class' (Bradford).
(Appleton standing, left). |
| H.8-H.10 | 3 photographs, dated June 1916, on war service. |

Non-print material

- H.11 Conference at Brussels, 1921. Group photograph with ms. note (not by Appleton) of 'People we know'.
- H.12, H.13 Two group photographs at King's College, London, one (H.12) signed by participants.
- H.14 Photograph of Appleton with Duke and Duchess of York (later King George VI and Queen Elizabeth) at King's College, London. (See Clark, Sir Edward Appleton, p.71.)
- H.15 Album (and some loose photographs) of conference, equipment, etc. in Italy, 1938.
- H.16 Photographs and press-cuttings of award of Nobel Prize for Physics, 1947.
- H.17 Group photograph at Fuel Research Station, April 1949 (with legend).
- H.18 Visit to Clydebank, 1951.
- H.19 Visit to Liverpool, 1952.
- H.20 Album of photographs of Tenth General Assembly of U.R.S.I., Sydney, 1952.
- H.21 Appleton lecturing at U.R.S.I. meeting, The Hague, 1954.
- H.22 Dinner, 1955.
- H.23 Dedication of Chaplaincy Centre, University of Edinburgh, 1957.
- H.24 Envelope of six photographs taken at celebration of 90th birthday of C.T.R. Wilson, 1959.
- H.25 Envelope of six photographs at Institute of Radio Engineers, New York, 1962.
- H.26 Visit of Indian Editors to Edinburgh, 1964.
- H.27 Portrait studies and photographs of Appleton.
- H.28 Edinburgh University ceremonies (including visits by H.R.H. Prince Philip and Pandit Nehru).
- H.29 Photographs of Appleton at various Honorary Degree ceremonies.

Non-print material

- H.30 Photographs of J.J. Thomson and of the Old Cavendish Laboratory, Cambridge.
- H.31 Photographs of G. Marconi, W. Preece.
- H.32 Photographs at Mullard Radioastronomy Observatory, Cambridge (group includes O.R. Frisch, M. Ryle).
- H.33 Photographs at conferences (Frankfurt, Zurich).
- H.34 Miscellaneous photographs at dinners and conferences.
- H.35 Miscellaneous photographs of colleagues.
- H.36 Miscellaneous personal photographs (includes signed photograph of W. Rhodes).

H.37, H.38 Records

Two gramophone records, each inscribed 'A.B.C. Guest of Honour Sir Edward Appleton August, 1952' and 'Recorded at 78 r.p.m. from tape. Use lightweight pickup'.

(Tape made at U.R.S.I. conference, Sydney, 1952.)

- H.37 Parts 1 and 3.
- H.38 Parts 2 and 4.

H.39 Tape recording

Magnetic tape, recorded 3.5.57., at the Centennial Exposition, Commemorating a Century of Medical Progress of the Academy of Medicine of Cincinnati, Ohio. Appleton gave the Centennial Convocation Address on 'Medicine: a Science and a Humanity'.

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