

Catalogue of the papers and correspondence of

**EDWARD HUBERT LINFOOT Sc.D.**

(1905 - 1982)

Compiled by Peter Harper and Timothy E. Powell

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1989



National Cataloguing Unit for the Archives of Contemporary Scientists  
under the guidance of the Royal Society's National Committee for the History of Science, Medicine and Technology

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THE ROYAL COMMISSION ON HISTORICAL MANUSCRIPTS

Report on the correspondence and papers of

EDWARD HUBERT LINFOOT

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astronomer

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by

THE ROYAL COMMISSION ON HISTORICAL MANUSCRIPTS

Quality House, Quality Court, Chancery Lane,

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## GENERAL INTRODUCTION

### PROVENANCE

The papers were received in November 1988 and February 1989 from Mrs Joyce Linfoot.

### OUTLINE OF THE CAREER OF E H LINFOOT

Edward Hubert Linfoot was born in Sheffield in 1905. He was educated at King Edward VII School Sheffield and Balliol College Oxford, taking his BA in mathematics with first class honours in 1926. He obtained his D.Phil with a thesis on almost periodic functions in 1928 and spent 1928-29 at Göttingen and 1929-31 at Princeton as the Jane Eliza Proctor Fellow. On his return to England he taught at Balliol until his appointment in 1932 as Assistant Lecturer and then Lecturer in Mathematics at the University of Bristol. In 1935 he married Joyce Dancer, herself an able mathematician, and they had a daughter and son born in 1945 and 1947, respectively.

In the years before the Second World War Linfoot's interests shifted from pure mathematics to optics, particularly the Schmidt telescope and related optical systems such as the Schmidt-Cassegrain. Among the factors stimulating his interest in optics were the presence of C R Burch at Bristol, and his conviction that political developments in Germany would lead to war and that optics would have an important role to play in the conflict. In addition to theoretical contributions he mastered the practical skills involved in figuring optical surfaces and in 1939 the Physical Society exhibited a pair of aspheric microscopes constructed by him. During the war Linfoot did substantial work on

photographic aerial reconnaissance for the Ministry of Aircraft Production. He was also associated with N F Mott's research group which worked on a number of urgent technical problems for the Ministry of Supply.

In 1948 his professional standing in mathematical optics was recognised by his appointment as Assistant Director and John Couch Adams Astronomer at the Cambridge Observatory; he retired in 1970. His arrival in Cambridge coincided with the development of the EDSAC I computer and he was a pioneer in the use of computers in the solution of optical problems. He continued work on Schmidt and related optical systems and acted as consultant on a number of telescope projects including the Isaac Newton and St Andrews telescopes. In addition to his many scientific papers Linfoot published two books, Recent Advances in Optics in 1955 and Fourier Methods in Optical Image Evaluation in 1964. Linfoot died in 1982 aged 77.

For further details of Linfoot's career see the obituary notices in Bull. London Math. Soc. 16 (1984), 52-58 and Q.Jl R. astr.Soc. 25 (1984) 219-222.

#### DESCRIPTION OF THE COLLECTION

The material is presented in the order given in the List of Contents. The collection is of particular interest for the material relating to wartime research and to consultancies on the design of optical systems for commercial and other organisations.

Section A, Biographical, is very slight but includes published biographical accounts and a number of letters from mathematical colleagues.

Section B, Research, is predominantly material relating to

wartime research which is introduced by Linfoot's own lists detailing his Second World War projects. The Ministries of Aircraft Production and Supply are both represented in the documentation, and there is correspondence with scientific colleagues such as N F Mott of Bristol and L C Martin of Imperial College London and technical papers of the Telecommunications Research Establishment mathematics group. There is some postwar material relating to work on Schmidt and related optical systems.

Section C, Consultancies, is presented alphabetically by organisation, and records Linfoot's work for firms and others on both sides of the Atlantic including EMI, Farrand Optical Company and the Perkin-Elmer Corporation. The most extensive documentation relates to the Isaac Newton telescope (presented under Grubb Parsons) and the University of St Andrews telescope.

Section D, Publications, Lectures, Conferences, presents a chronological sequence of drafts and related correspondence. The largest body of material relates to Linfoot's unpublished book on almost periodic functions (completed at Princeton 1929-31), and comprises a typescript draft and correspondence with the Clarendon Press Oxford and colleagues in Britain, Germany and the USA. Section D also includes material relating to a mathematics colloquium organised by Linfoot and H Heilbronn at Bristol in 1935 and to postwar optics conferences.

#### LOCATIONS OF OTHER MATERIAL

Notebooks recording Linfoot's optics research form an earlier deposit in Cambridge University Library.

Notebooks recording mathematics lectures attended by Linfoot 1924-32 were deposited in the Library of Trinity College Cambridge in 1984. The Library has provided the following list of the material:

Notes from lectures on the theory of functions given by G H Hardy at Oxford, 4 vols, 1925-27 and nd Add.Ms.b.179-182

Notes from lectures on the theory of numbers given by G H Hardy at Oxford, 2 vols, 1924-25. Add.Ms.b.183-4

Notes from lectures on transfinite numbers etc., given by G H Hardy at Oxford, 1925 Add.Ms.b.185

Notes from lectures on the distribution of primes given by G H Hardy at Oxford, 1926 Add.Ms.b.186

Notes from lectures on Fourier series and the summation of series given by G H Hardy at Oxford nd Add.Ms.b.187

Notes from lectures on Dirichlet series given by G H Hardy at Oxford, 1926 Add.Ms.b.188

Notes from miscellaneous lectures given by G H Hardy at Oxford, 1925-28. Add.Ms.b.189

Notes from tutorials on real functions given by A S Besicovitch at Oxford, 1925-26 Add.Ms.b.190

Notes from lectures on continuous groups given by B L van de Waerden at Gottingen, 1929, and class field theory given by E Artin at Gottingen, 1932 Add.Ms.b.191

Notes from lectures on almost periodic functions given by H A Bohr at Gottingen, 2 vols, 1928-29 Add.Ms.b.192-3

Notes from lectures on Waring's problem given by L D Landau at Gottingen, 1929 Add.Ms.b.194

Notes from lectures on Schlicht functions given by L D Landau at Gottingen 1929 Add.Ms.b.195

Notes from lectures on dynamics, wave mechanics and quantum theory given by H P Robertson and J von Neumann at Princeton, 3 vols, 1929-30 Add.Ms.b.196-198

Notes from lectures on dimension and Menger's theorem given by P S Aleksandrov at Princeton, 1931 Add.Ms.b.199

ACKNOWLEDGEMENTS

We are very grateful to Mrs Linfoot for making the material available, and for her help and encouragement.

Peter Harper  
Timothy E Powell  
Bath 1989

SECTION A

BIOGRAPHICAL

A.1 - A.10

A.1 Obituary notices in the Times 15 October 1982, Q.Jl.R. astr.Soc 1984, and Bull. London Math.Soc.1984.

Extract from Discovery January 1952 (pp2-6) with references to Linfoot and his work in optics.

Extract from Sunday Times magazine 22 January 1967 (p18) with photograph of Linfoot and brief note on his work at Cambridge.

Linfoot's own lists detailing his wartime research projects.

Miscellaneous biographical notes by Mrs Linfoot.

A.2 Notes from A L Dixon, Magdalen College, Oxford, and E C Titchmarsh re Linfoot's D.Phil.viva, held 20 July 1928.

Letter from Karl Pearson enquiring whether Linfoot would be interested in the post of mathematical assistant in his laboratory, 17 August 1928.

Letter from Ronald P Bell in Copenhagen referring to Linfoot 'probably coming here some time this year', 24 August 1928.

A.3 Letter and card from Norbert Wiener, November 1930 re visit by Linfoot to Cambridge, Mass., and letter from Linfoot to Professor Bohr at Princeton, 18 December 1930.

Letter from Mary L Cartwright, Girton College, Cambridge, 1 June 1932.

Principally of mathematical interest but includes congratulations on Linfoot's post at Bristol (Assistant Lecturer in Mathematics).

Biographical

- A.4 Linfoot's ms notes of mathematical discussion with H Heilbronn, 23 April 1934.
- Linfoot added the following note in 1953: 'Heilbronn had just come to Bristol from Göttingen (via Copenhagen) and these were the ideas he was thinking about at that time'.
- Folder also includes undated letter from Heilbronn of mathematical interest.
- A.5 Letter from D M Wrinch re unspecified position at Oxford, 24 January 1936.
- Letter from W L Ferrar, Hertford College, Oxford, agreeing to write a testimonial for Linfoot, 5 February 1936, and testimonial dated 14 May 1936.
- A.6 Correspondence and papers re Linfoot's application for the Napier Chair of Astronomy, University of St Andrews, March-May, August 1959.
- Includes correspondence with H H Plaskett and P M S Blackett who, with R O Redman, agreed to act as Linfoot's referees, and list of publications.
- A.7 Letter from Secretary General of the Faculties, University of Cambridge, 30 May 1963, informing Linfoot of his reappointment as John Couch Adams Astronomer from 1 October 1963 for five years.
- Statement of the conditions of Linfoot's employment as Assistant Director of the [Cambridge] Observatory, 1 Oct 1964.
- A.8, A.9 Miscellaneous letters from mathematicians. In alphabetical order.
- A.8 B - L
- A.9 S - W and unidentified

Biographical

A.10

3pp ms note 'suggested by Jung's "Essays" and  
Viola Bonham-Carter's talk "the Souls" ', dated  
25 November 1947.

3pp ms note of hypnotism display at the old theatre,  
Regent Street, Cambridge, 1951.

SECTION B

RESEARCH

B.1 - B.57

B.1 - B.43 Wartime research

B.44 - B.57 Postwar research

WARTIME RESEARCH

Linfoot's lists detailing his Second World War research projects are presented at A.1, and reproduced here as an introduction to the wartime research:

List of reports done for Professor Mott's group, 1940-44

1. Effect of sine-form ground corrugations of small amplitude on incoming plane waves. (1940)
2. Estimation by Huyghen's Principle of the effect of ground irregularities on GL Mark II and GL/EF elevation readings. (1941)
  - 2a. Corrections to same.
3. On the Paraboloid Receiver with displaced dipole. (1941)  
Schmidt plate (paraffin wax) delivered to T R E in 1941.
4. Alternative to the Paraboloid Reflector as an aerial system for ultra-short wavelengths. (1942)
5. A theory of fragmentation (with N F Mott). (1942)
6. Depth of Focus under certain special conditions of T H Projector lens (B P 373950, U S 20199859). (1943)

Record of research undertaken during World War II

(while continuing work as a Lecturer in Mathematics in the University of Bristol)

Sept 1939 Optical work on aspheric surfaces was undertaken by Dr Burch and myself at the request of Combined Optical Industries, Ltd., Slough, who were interested in optical plastics.

Research

- July 1940 I became a member of Prof. Mott's Extramural Research Group (M/S) and worked on problems in the development and operational use of radio-location apparatus.
- 1942-44 I had also continued with optical work on a reduced scale, and in March 1942 was asked by M A P to undertake an investigation into certain applications of aspheric optical systems to aerial-reconnaissance photography.
- 1944-45 The M A P optical work was continued, and a more general research into optical systems of ultra-high performance using aspheric surfaces was undertaken. I also continued as a member of Prof. Mott's team, and assisted in mathematical work on shell-fragmentation.
- B.1 - B.3 General correspondence and papers re Ministry of Supply projects, 1941-45.
- B.1 1941. Expenses; work on searchlights etc.
- B.2 1942. Includes 'A theory of wave clutter' by Mott, November. 4pp typescript.
- B.3 1943-45. Includes 'Random fracture of a thin metal sheet' by [F J] Ursell, sent to Linfoot by Mott 20 January 1943, 6pp typescript, and 'Effect of sine-form ground-corrugations of small amplitude on incoming plane waves' by Linfoot, returned to him 1 January 1945, 4pp ms.

Research

- B.4 - B.9 'War work, 1941. RADAR'. Contents of a folder so inscribed by Mrs Joyce Linfoot, divided into six for ease of reference. Mrs Linfoot recalls that this radar section is the work referred to under nos 1, 2 and 3 in her husband's list of the work done for Professor Mott, and that she did some of the calculations: 'I remember going to see Prof. Mott to get "clearance" for this work. The calculations were done on a Brunsviga hand machine in a coal-cellar in Bristol during the blitzes. In practice, we were working out how much wire netting had to be installed round a radar installation to make the surface effectively level, hence a puzzling shortage of wire netting' (private communication, November 1988).
- B.4 'The effect of sine-form ground corrugations of small amplitude on incoming plane waves' by Linfoot, 1940 . 3pp duplicated typescript.
- 'Theory of the E F dipoles and feeders of G L mark II and GL/EF conversion equipment' by N F M[ott] and J M C S[cott] , November 1940. 15pp duplicated typescript + 1p figs.
- 'Theory of the aerial system of the G L mark II and GL/EF conversion equipment' by N F Mott , nd but attached to preceding. 3pp ms.
- B.5 'Estimation by Huyghen's Principle of the effect of ground irregularities on G L mark II and GL/EF elevation readings' by Linfoot, 1941 , and 'Corrections' to the same.
- 26pp ms draft of 'Estimation' + appendices; 2pp ms headed 'Correction'; 10pp duplicated typescript of 'Estimation' and 'Corrections'.
- B.6 Correspondence and papers, April, July, August 1941. Folder includes:
- 'Screening of R D F Radio Direction Finding sets from fixed echoes' by Mott, 28 July 1941. 4pp duplicated typescript.
- Notes on 'Effect of ground-corrugations of small amplitude on RDF elevation-readings' by Linfoot , nd but attached to letter from Mott dated 14 August 1941. 5pp ms.
- 'G L errors of elevation due to the "cliff edge" effect' by F R N Nabarro, 19 August 1941. 3pp duplicated typescript.

Research

- B.7 Correspondence and papers, September, October 1941.  
Folder includes:  
  
'Notes on the Bedford electrical predictor' by Mott,  
nd but enclosed in letter from Mott of 2 September [ ?1941].  
3pp typescript.
- B.8 Undated notes and reports.  
Folder includes:  
  
'The calculation of currents in aerials' by Mott.  
8pp duplicated typescript.  
  
'Synopsis of lecture on EF systems' by Mott. 2pp  
duplicated typescript.  
  
'The application of wave theory to problems of GL siting'  
by Nabarro. 5pp duplicated typescript.
- B.9 Ms calculations by Mrs Linfoot.
- B.10, B.11 'Mott's group'. Contents of an envelope so inscribed by  
Mrs Linfoot, divided into two for ease of reference.
- B.10 Notes from articles by Y Rocard on 'Visibility of objects  
lit up by a searchlight', Revue d'Optique 11 (1932).  
14pp ms.  
  
'Synopsis of Mott's report 25/2/42 on "Visibility of aircraft  
in searchlight beams".' 3pp ms.
- B.11 'Fragmentation of shell casings and the theory of rupture  
in metals' by Mott, received August 19th 1941 by the  
Fragmentation Panel of the Static Detonation Committee of  
the Ministry of Supply's Advisory Council on Scientific  
Research and Technical Development. 12pp duplicated  
typescript.  
  
Folder also includes 'Fragmentation of shells and bombs  
(preliminary note)', nd. 6pp typescript.

Research

- B.12 - B.14 'Paraboloids: Shire's problems'. Contents of a folder so inscribed divided into three for ease of reference.
- B.12 Correspondence 1941. The principal correspondent is E S Shire, Air Defence Experimental Establishment, Somerford.
- B.13 Ms calculations.
- B.14 'On the paraboloid receiver with displaced dipole' by Linfoot. 2pp duplicated typescript + graph.  
  
'Theoretical work on the paraboloid mirror' by F R N Nabarro. 27pp duplicated typescript.
- B.15 - B.17 Miscellaneous reports and papers re Ministry of Supply research projects.
- B.15 'Alternatives to the paraboloid reflector for short-wave aerial systems' by Linfoot, 1942. 3pp duplicated typescript.  
  
Figures 3, 4 and 5 for the paper on 'A theory of fragmentation' by Mott and Linfoot, sent to Linfoot 3 February 1943.
- B.16 'Probability considerations bearing on the arrangement of ammunition dumps' by Linfoot, nd. 4pp ms.  
  
'Extract from Mott's report on resonator magnetrons' by Linfoot, nd. 2pp ms.
- B.17 Unidentified ms notes and calculations.

Research

- B.18, B.19 'Sutton (Optical). Schmidt Projector. Bispherical Monocentric Projector'. Contents of a folder so inscribed, divided into two for ease of reference.
- B.18 Correspondence and papers, 1941-43.
- The principal correspondent is L C Martin, Imperial College London, approached by Linfoot for help in designing a projection lens, November 1941.
- B.19 Notes, drafts, diagrams, calculations.
- Folder includes:
- 'Remarks on projector systems' by Linfoot, nd.  
3pp typescript.
- 'Note on a Schmidt projector system' by Linfoot, nd.  
2pp typescript.
- B.20 - B.29 'M A P Ministry of Aircraft Production programme. Correspondence etc.' Contents of a folder so inscribed, divided into ten for ease of reference.
- The material relates to the project to develop the Schmidt camera for aerial photography which Linfoot undertook at the request of the D S R Optical Committee, Ministry of Aircraft Production. He worked on the project with the Kodak Research Laboratory, Harrow, Middlesex and the Mount Wilson Observatory, California. His principal American contact was Theodore Dunham, Jr., and L C Martin, Imperial College London, was extensively consulted.
- B.20 Correspondence and papers, 1941.
- Includes minutes of working committee meeting (D S R Photographic Research Committee), Kodak Ltd Harrow, 7 March, note on 'Schmidt Camera for night photography' by E R Davies of the Kodak Research Laboratory, 4 December, and photographs of membrane grinding and polishing machine.

Research

- B.21 Correspondence and papers, January - June 1942.
- Includes 'Report of work in progress on applications of the Schmidt optical system' by Linfoot (1p typescript, with ms note 'sent to Sir Charles Darwin by A M T[yndall], March 3/1942').
- B.22 Correspondence and papers, July - December 1942.
- B.23 Correspondence and papers, January - June 1943.
- B.24 Correspondence and papers, July - December 1943.
- Includes minutes of 11th meeting of the Lens Sub-Committee held at the M A P on 22 December 1943. The Committee was chaired by L C Martin. Linfoot attended for the first time at this meeting.
- B.25 'The Schmidt Camera Project'. Sixth and final Progress Report of work carried out by the Carnegie Institution of Washington and Mount Wilson Observatory, California under contract to the United States National Defense Research Council.
- The report was sent to Linfoot by the M A P, August 1943.
- B.26 Correspondence and papers, January - June 1944.
- Includes 'The field-flattened Schmidt and the Cassegrain-type plate mirror systems' by Linfoot, sent to M A P 4 January. 5pp typescript.
- B.27 Correspondence and papers, July - December 1944.
- Includes 'first draft' of 'The use of Schmidt systems in Air Photography - the present position of the work, and suggestions for future policy' by Linfoot, Martin, E W H Selwyn and G S Speak, November 1944 (4pp typescript with ms additions and corrections), and duplicated copy of final version (6pp).

Research

- B.28 'Schmidt Camera for Aerial Use' by A E Lee and F H G Pitt, Developments Department Kodak Ltd, 28 September 1944.
- B.29 Correspondence and papers, 1945.  
  
Includes minutes of 16th meeting of the Lens Sub-Committee held at M A P, 12 January.
- B.30, B.31 General correspondence re optical research, 1939, 1941-42.
- B.30 1939. Includes correspondence with Science Museum London re Schmidt microscope constructed by Linfoot in 1938, and lent to the Museum for display.
- B.31 1941-42. Includes correspondence with Admiralty Department of Scientific Research & Experiment, Admiralty Research Laboratory, Teddington, and the Royal Astronomical Society.
- B.32, B.33 Miscellaneous notes, drafts, reports re optical research.
- B.32 'Report on Schmidt-type optical systems' by Linfoot. 6pp and 2pp typescript drafts. The shorter incomplete draft is dated February 1941.  
  
'The Schmidt Camera' by C G Darwin, 11 October 1941. 5pp duplicated typescript.  
  
'Depth of focus under certain special conditions of T H projector lens' by Linfoot, 26 March 1943. 1p duplicated typescript + graph.

Research

- B.33 'Leading types of plate-mirror systems' by Linfoot, February 1944. Ms and typescript drafts.
- 'On some optical systems employing aspherical surfaces' by Linfoot, nd. 10pp duplicated typescript.
- Miscellaneous shorter typescript drafts.
- B.34, B.35 Correspondence re supplies and equipment for wartime research, 1942.
- 2 folders.
- B.36 - B.43 Miscellaneous wartime reports.
- B.36 'A M R E [Air Ministry Research Establishment] draft manual. Field-strength of R D F Issue 1, 14/7/40'. In original folder.
- B.37 'Report on paraboloidal mirror as a means of obtaining a narrow beam of short wave radiation' by James Young, 9 July 1940. 2pp typescript + graph.
- 'Preliminary report on the production of narrow 10 cm beams with particular reference to AIS', TRE, 13 August 1940. 4pp duplicated typescript + figs.
- 'Report on paraboloids', TRE, 3 October 1940. 6pp duplicated typescript + figs.

Research

- B.38 'The paraboloid as an aerial system', TRE, 3 February 1941. 7pp duplicated typescript + figs.
- 'Assumptions and limitations underlying the use of the larmor-tedone diffraction theory', Mathematical Pool TRE Swanage, 19 August 1941. 5pp duplicated typescript.
- 'A wave-guide whose cross-section is partially filled with solid dielectric', Mathematical Pool TRE Swanage, 17 October 1941. 6pp duplicated typescript + figs.
- B.39 'The elements of wave-propagation using the impedance concept', Mathematical Group TRE Swanage, 1 December 1941. 46pp duplicated typescript + figs.
- B.40 'The reactance of a single wire in a rectangular wave-guide', Mathematical Group TRE Swanage, 24 November 1941. 1p duplicated typescript + fig.
- 'Babinet's principle and the theory of resonant slots', Mathematical Group TRE Swanage, 29 December 1941. 8pp duplicated typescript + figs.
- 'Corrections and comments on reports 1 - 30 issued by Mathematical Group TRE Swanage', 26 January 1942. 2pp duplicated typescript.
- 'Reactance of a wire in a rectangular wave-guide', Mathematical Group TRE Swanage, 10 February 1942. 1p duplicated typescript + figs.
- List of 'Reports issued prior to 16 June 1942 by Mathematical Group TRE Malvern'. 2pp duplicated typescript.

Research

- B.41 'Parallel reactance of inductive iris in rectangular wave-guide', Mathematics Group TRE Malvern, 30 October 1942. 6pp duplicated typescript + figs.
- 'Surface impedance of an infinite parallel wire grid at oblique angles of incidence', Mathematics Group TRE Malvern, 26 November 1942. 5pp duplicated typescript + figs.
- 'The application of quasi-stationary methods to lumped shunt admittances in wave-guides'. 20pp duplicated typescript + figs. The figures are dated in January and February 1943.
- B.42 'The mismatch at a geometrical discontinuity in a parallel strip transmission line and an  $H_{10}$  rectangular wave-guide'. 5pp duplicated typescript + figs. The figures are dated in January and February 1943.
- 'Theory of an ideal gapless RDF aerial', Mathematics Group TRE Malvern. 4pp duplicated typescript + figs. The figures are dated in April 1943.
- B.43 'Effect of wind on sound detection of aircraft', nd. 3pp typescript.
- 'A theoretical estimate of the scattering power of aircraft for electric-magnetic radiation of wave lengths short compared with its dimensions', nd. 2pp duplicated typescript + 1p ms notes.
- 'Note on the accuracy of course and speed determination by graphic plots, with special reference to fire control methods', A A Command Research Group, nd. 10pp typescript with ms additions and corrections. The first page is headed with the ms inscription 'Huxley'.

continued...

Research

B.43 cont'd TRE memorandum 'Time and frequency uncertainty in waveform analysis' by P M Woodward, dated April 1951 but found with wartime papers. 6pp duplicated typescript + figs.

POSTWAR RESEARCH

B.44 - B.46 A sequence of ms optics notes not in Linfoot's hand. Some of the notes are dated March, May and June 1951.  
  
3 folders.

B.47, B.48 'Meniscus Schmidt'. Ms drafts, narratives, calculations etc, including 'Outline of MS investigation Sept 1959 - Feb 1960' and some work by Mrs Joyce Linfoot.  
  
2 folders.

B.49 - B.54 Ms notes, drafts, calculations etc., re'Meniscus Schmidt', 'Meniscus Schmidt Cassegrain' etc., nd.  
  
5 folders.

B.55, B.56 'Mrs Berrer (Spot diagrams).' Contents of a folder so inscribed divided into two for ease of reference. Mrs Berrer did computing work for Linfoot.

B.57 Letters from Mrs Berrer about her work for Linfoot, 1949-54.

SECTION C	CONSULTANCIES	C.1 - C.60
C.1	COX, HARGREAVES & THOMSON LIMITED	
C.2, C.3	ELECTRIC & MUSICAL INDUSTRIES LIMITED (EMI)	
C.4 - C.6	FARRAND OPTICAL CO., INC	
C.7 - C.21	GRUBB PARSONS (SIR HOWARD GRUBB, PARSONS & COMPANY)	
C.22 - C.24	MINISTRY OF SUPPLY	
C.25	MUIRHEAD & CO., LIMITED	
C.26 - C.29	PERKIN-ELMER CORPORATION	
C.30 - C.34	TAYLOR, TAYLOR & HOBSON LIMITED	
C.35, C.36	TECHNE (CAMBRIDGE) LIMITED	
C.37 - C.60	UNIVERSITY OF ST ANDREWS	

Consultancies

COX, HARGREAVES & THOMSON LIMITED 1949-52, 1955

Cox, Hargreaves & Thomson were manufacturers of astronomical and scientific instruments of London EC4 and Kingswood, Surrey.

C.1 Correspondence, ms notes, calculations and diagrams  
re 'Vatican Schmidt' and 'Uccle telescope'.

ELECTRIC & MUSICAL INDUSTRIES LIMITED (EMI) 1945-48

Linfoot acted as 'consultant in Optics' to EMI's research laboratories 1 June 1945 - 30 May 1948.

C.2 Correspondence re Schmidt projectors etc with EMI  
research personnel including the Director of Research,  
I. Shoenberg.

C.3 Ms notes, calculations, diagrams; blueprints.

FARRAND OPTICAL CO., INC. 1951-54, 1961

Farrand Optical Co., Inc. of New York were designers and manufacturers of precision optics, electronic and scientific instruments. In December 1951 Farrand asked Linfoot to consider the post of optical designer with the company. He preferred to remain in Cambridge and enter into a consultancy agreement with them. The agreement expired in March 1955.

C.4 Correspondence and papers including copy of  
consultancy agreement, 1951-52.

Consultancies

C.5 Correspondence, ms notes, calculations and diagrams, 1953.

C.6 Correspondence, ms notes etc., 1954, 1961 and nd.

GRUBB PARSONS (SIR HOWARD GRUBB, PARSONS AND COMPANY) 1946 - 1959

In 1946 Linfoot entered an agreement with Grubb Parsons to act as a consultant in astronomical designs. He was to assist 'by technical advice on computation and the arrangement of optical systems for astronomical instruments' and 'by practical advice and quality assessment in the testing and manufacture of astronomical systems'. In 1950 he reached a separate consultancy agreement with Grubb Parsons in respect of their undertaking the manufacture of the optical parts for the Isaac Newton reflecting telescope.

Linfoot had been associated with the Isaac Newton telescope project from 1947. The Astronomer Royal, Sir Harold Spencer Jones, invited him to attend the 12 December 1947 meeting of the Board of Management of the Isaac Newton Observatory which considered the optical design of the telescope, and he attended further Board meetings in 1948 and 1949. He was also a member of the optical design and spectroscopic subcommittees.

For convenience all Linfoot's Isaac Newton telescope material has been presented under Grubb Parsons.

Consultancies

C.7 - C.12 Correspondence and papers re Linfoot's consultancy work for Grubb Parsons including Isaac Newton telescope. His principal correspondents were G M Sisson and G E Manville.

C.7	1946-47	C.10	1952-53
C.8	1948-49	C.11	1954-55
C.9	1950-51	C.12	1956-58

C.13 - C.21 Correspondence between Linfoot and the Astronomer Royal and others re Isaac Newton Telescope; Isaac Newton Observatory Board of Management papers and other committee papers.

C.13	1947	C.17	1951
C.14	1948	C.18	1954
C.15	1949	C.19	1955
C.16	1950	C.20	1959

C.21 nd

MINISTRY OF SUPPLY

1952, 1954-56

In 1954 Linfoot was offered a consultancy agreement by the Ministry to advise on the 'study of mirror lens systems and the application of information theory to lens design'. The agreement expired on 31 January 1956.

For Linfoot's wartime work for the Ministry of Supply, see Section B.

C.22 Correspondence and papers, 1952, 1954

Includes agenda of meeting of Aeronautical Research Council's Air Reconnaissance Committee, 21 July 1954, and Royal Aircraft Establishment, Farnborough, Technical Memorandum on 'The effect of film resolution upon the size of cameras in air photography', by R W Fish, December 1954.

Consultancies

C.23 Correspondence and papers, 1955-56.

C.24 Letter from Linfoot (first page missing), 'notes on R.A.E problems (M.O.S)', bibliographic references on aerial photography, etc, nd.

MUIRHEAD & COMPANY LIMITED

1945-46

Muirhead were telegraph and electrical engineers of Beckenham, Kent. Linfoot undertook to 'test and report on the optical system of a telephoto apparatus' for the company.

C.25 Correspondence and papers, 1945, 1946.

Includes Linfoot's report, technical drawing of telephoto system, photographs.

PERKIN-ELMER CORPORATION

1955, 1958-62, 1964

In 1959 Linfoot entered into an agreement with Perkin-Elmer of Norwalk, Connecticut to act as a consultant on optical design and optical systems. It was extended on a number of occasions until 31 January 1965.

C.26 Correspondence, 1955, 1958.

Linfoot's letter of 16 November 1958 outlines the fields of optics in which he might be of most use to Perkin-Elmer.

Consultancies

- C.27 Correspondence and papers, 1959.  
Includes Perkin-Elmer's letter confirming terms of consultancy agreement and papers re 'Diffraction-limited Optics Study' with which Linfoot assisted.
- C.28 Correspondence and papers, 1960.  
Includes correspondence re extension and amendment of consultancy agreement.
- C.29 Correspondence and papers, 1961-62, 1964.  
Includes correspondence re extension of consultancy agreement.

TAYLOR, TAYLOR & HOBSON LIMITED

1943-1945

Taylor, Taylor & Hobson were manufacturing opticians and engineers of Leicester. Linfoot was engaged 'as a consultant on the technique of making and testing non-spherical objective systems' in October 1943. Much of the material relates to a patent application.

- C.30 1943 October - December
- C.31 1944 January - June
- C.32 1944 July - December
- C.33 1945
- C.34 Ms and typescript notes and drafts

Consultancies

TECHNE (CAMBRIDGE) LIMITED

1941-42, 1950-51

Techne were a scientific instruments firm of Duxford, Cambridge which engaged Linfoot as consultant on optics from 1 July 1950.

C.35

Ms notes and drafts, 1941-42, found with later Techne material.

C.36

Correspondence and papers re terms of agreement, bispherical monocentric projector etc, 1950-51.

Consultancies

UNIVERSITY OF ST ANDREWS

1944-1959

At the end of the Second World War St Andrews decided to equip its new Observatory (built 1939-40) with a 30-36-inch Schmidt-Cassegrain telescope and Linfoot accepted an invitation to take charge of the theoretical-optical side of the project as temporary external collaborator. The material is principally Linfoot's correspondence with the Observatory's first Director, E Finlay-Freundlich, and the Instrument-maker to the Observatory, R L Waland. There are also Linfoot's ms notes and drafts, press-cuttings and photographs.

- |      |   |
|------|---|
| C.37 | 1944, 1945. 1944 item is 'Preliminary specification of special Baker type camera for Professor Freundlich'. Linfoot agreed to cooperate as optical expert during the construction of the new telescope in his letter of 15 December 1945. |
| C.38 | 1946 January - June.  |
| C.39 | 1946 July - December.   |
| C.40 | 1947 January - June. Includes correspondence <u>re</u> article for <u>Scotsman</u> .  |
| C.41 | 1947 July - December.   |
| C.42 | 1948 January - June.  |
| C.43 | 1948 July - December. Includes draft of Linfoot's BBC radio talk on the 'St Andrews Schmidt-Cassegrain Project'.  |

Consultancies

- C.44 1949. Includes 'Memorandum of points relating to the St Andrews Schmidt-Cassegrain project discussed and agreed October 27-30 1949' signed by Linfoot, Finlay-Freundlich and Waland.
- C.45 1950. Includes drafts of a BBC radio talk by Linfoot on 'The St Andrews Telescope Project'.
- C.46 1951.
- C.47 1952 January-July. Includes 4pp ms 'St Andrews visit (July 1952)'.
- C.48 1952 August-November.
- C.49 Miscellaneous ms notes, drawings, photographs etc, found with 1952 and 1953 material.
- C.50 1953.
- C.51 1954-55.
- C.52 1956-57.
- C.53 1959.
- C.54 Contents of a folder inscribed 'St Andrews Schmidt-Cassegrain system - results'.
- C.55 Miscellaneous notes, drafts, calculations etc.

Consultancies

C.56

Press-cuttings.

C.57

Photographs: contents of an envelope inscribed  
'St Andrews workshops and pilot model'.

C.58, C.59

St Andrews pilot model photographs of star images.  
2 folders.

C.60

Miscellaneous photographs.



Publications, lectures, conferences

- D.17                    'Squaring the circle', lecture to students' Mathematical Society, Bristol, 1933.
- 7pp ms draft.
- D.18                    Mathematical colloquium on number theory, Bristol, 12 - 15 June. Linfoot organised the colloquium (with H Heilbronn) and presented a paper on 'Schneider's proof of Gelfond's theorem'.
- Programme, correspondence re arrangements.
- D.19                    Lecture on mathematical probability, [ ?Bristol ] Mathematical Association, 1937.
- 8pp ms draft.
- D.20                    'An application of the Schmidt principle to Microscopy'.
- Brief correspondence, ms and typescript drafts, proofs for article published in Journal of Scientific Instruments, 1938.
- D.21                    Letter re arrangements for lecture on the 'Schmidt Microscope', Bristol, 17 March 1939.
- D.22                    Brief correspondence re proposed article on 'Recent advances in telescope design' for Royal Astronomical Society's Occasional Notes, 1940, 1941.

continued...

Publications, lectures, conferences

- D.22 cont'd... 'Coma and the abbe sine-condition'.  
  
Brief correspondence, 5pp typescript 'corrected copy' of article published in British Astronomical Association Journal, 1941.
- D.23 'Some properties of integers', lecture to King's College Mathematical Society November 1942, Oxford Invariant Society May 1945, Bristol Students' Mathematical Society March 1948 and Cambridge Adams Society October 1949.  
  
12pp typescript draft.
- D.24 'Some aspects of relativity', lecture to [?Bristol] Students' Mathematical Society, January 1945.  
  
10pp typescript draft.
- D.25 'Science and the Case for Idealism'.  
  
Published version only of article for Listener, 23 March 1950.
- D.26 London Conference on Optical Instruments, 19 - 26 July 1950. Linfoot presented a paper on 'The modern reflecting telescope'.  
  
Programme, brief correspondence with Nature re article on conference, letter of thanks from organiser, 11pp typescript draft of Linfoot's paper.

Publications, lectures, conferences

- D.27                    'On the testing of fast Schmidt cameras'.  
  
Notes, drafts, calculations, brief correspondence re  
paper by Linfoot. Some of the material is dated in  
1950 and 1951.
- D.28                    'Science and aesthetic values', lecture to Socratics,  
Cambridge, February 1951.  
  
11pp ms draft.
- D.29                    Physical Society Optical Group meeting, Cambridge,  
26 - 27 June 1953. Linfoot presented a paper on  
'The theory of R.M.S. aberration balancing'.  
  
Programme, list of participants, correspondence re  
arrangements.
- D.30                    Florence meeting on 'Problems in Contemporary Optics',  
10 - 16 September 1954. Linfoot presented a paper on  
'Informational criteria of image quality and optical design'.  
  
Programme, summary of Linfoot's paper etc.
- D.31                    Symposium on Astronomical Optics and Related Subjects,  
Manchester, 19 - 22 April 1955. Linfoot presented papers  
on 'Noise, aberrations and the information content of  
optical images' and 'Transmission factors and the assess-  
ment of optical image quality'.  
  
Programme, notice of published proceedings.

Publications, lectures, conferences

- D.32                   Symposium on 'Problems in the formation and evaluation of optical images', Rochester, NY, 15 - 18 June 1955. Linfoot presented a paper on 'Transmission factors and optical design'.
- Programme, photograph, brief correspondence re other invitations in connection with Rochester Symposium.
- D.33                   58th meeting of the German Society for Applied Optics, Mainz, 11 - 14 June 1957. Linfoot presented a paper 'Über den Informationsinhalt photographischer Bilder'.
- Programme only.
- D.34                   Meeting of the Research Section of the German Photographic Society and the German Society for Applied Optics on 'Qualität der photographischen Bildwiedergabe', Cologne, 20 - 21 March 1958. Linfoot presented a paper on 'Allgemeine Qualitätsbeschränkung photographischer Bilder'.
- Programme, list of participants, letter from organiser, English version of Linfoot's paper (11pp typescript).
- D.35                   Fifth Conference of the International Commission for Optics on 'Modern systems for detecting and evaluating optical radiation', Stockholm, 24 - 30 August 1959. Linfoot presented a paper on 'Informational considerations in the design of astronomical spectrographs'.
- Programme only.

Publications, lectures, conferences

- D.36                    'Contrast transmission and the image evaluation problem'.  
  
23pp typescript draft paper + references, figure captions,  
French and German summaries, 'received 3 November 1959'.
- D.37                    'Information theory and its application to the quality-  
evaluation of optical systems'.  
  
37pp typescript report for Royal Society Optical Sub-  
committee + references and figures, 1959.
- D.38                    61st meeting of the German Society for Applied Optics,  
Karlsruhe, 7-11 June 1960. Linfoot presented a paper  
on 'Wellentheoretische und strahlentheoretische Bild-  
gütebeurteilung'.  
  
Programme, 6pp typescript draft of Linfoot's paper.
- D.39                    'Light'.  
  
Published version of article for an encyclopaedia  
and 2pp ms notes, nd.
- D.40                    'Appendix on refraction corrections'.  
  
3pp typescript, nd.  
  
'An exercise in the redundancy of the English language'.  
  
2pp typescript, nd.

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