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Catalogue of the papers and correspondence of

Sir Edward Penley Abraham FRS

(1913 - 1999)

VOLUME I

Section A: Biographical

Section B: University of Oxford

Section C: Research and development

Section D: Publications

by Simon Coleman and Peter Harper

NCUACS catalogue no. 103/2/02

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Title: Catalogue of the papers and correspondence of Sir Edward Penley Abraham
FRS (1913-1999), biochemist

Compiled by: Simon Coleman and Peter Harper

Description level: Fonds

Date of material: *ca* 1925-2000

Extent of material: *ca* 2450 items

Deposited in: Department of Western Manuscripts, Bodleian Library, Oxford

Reference code: GB 0161

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NCUACS catalogue no. 103/2/02

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GENERAL INTRODUCTION

PROVENANCE

The papers were received from the Sir William Dunn School of Pathology, University of Oxford, with additional biographical material from Mrs T. Mayes, Sir Edward Abraham's niece, in summer 2000.

OUTLINE OF THE CAREER OF EDWARD PENLEY ABRAHAM

Edward Penley Abraham was born at Southampton on 10 June 1913 and educated there at the King Edward VI School. He won an exhibition to Queen's College Oxford, taking a First in chemistry and acquiring a particular interest in organic chemistry. At the Dyson Perrins Laboratory in Oxford he undertook research on peptides and studied for a D.Phil. under Robert Robinson. His work included an important contribution to the study of lysozyme which was also being investigated by Howard Florey and Ernst Chain at the Sir William Dunn School of Pathology. After taking his doctorate in 1938 Abraham was able to develop his increasing interest in biochemistry at the Biokemiska Institut, Stockholm, which he attended as a Rockefeller Travelling Fellow. He returned to England the following year and in January 1940 took up a post at the Sir William Dunn School of Pathology at Florey's invitation.

During their investigations of naturally occurring antibiotic substances, Florey and Chain had turned their attention to penicillin in 1938. After experiments on mice in the summer of 1940 yielded encouraging results, Abraham joined the work on the purification and chemistry of penicillin. In the course of this research he and Chain observed that the antibiotic was destroyed by an enzyme produced in a strain of E-coli. The discovery of this enzyme, named penicillinase, proved to be of great importance to future studies of micro-organisms and antibiotic resistance. Following the first successful clinical trial of penicillin on humans in February 1941, Abraham played a significant role in the elucidation of its chemical structure and in 1943, with Chain, proposed the novel beta-lactam (henceforth written B-lactam) structure with a fused two ring system. This theory was strongly opposed by Abraham's former supervisor, Robinson, who favoured an alternative structure. The issue was settled in 1945 when X-ray crystallographic study by Dorothy Hodgkin and Barbara Low confirmed the B-lactam structure.

Although the astonishing clinical impact of penicillin would overshadow all subsequent breakthroughs in antibiotics, the discovery of Cephalosporin C by Abraham and Guy Newton led to the appearance of a new group of B-lactam antibiotics of equal importance to medicine and of greater commercial value. A culture of the *cephalosporium* fungus, whose antibiotic properties were first discovered in

Sardinia by Giuseppe Brötzu in 1945, reached the Sir William Dunn School of Pathology in September 1948. After initial experiments by N.G. Heatley, the production of culture fluids was turned over to the Medical Research Council's Antibiotics Research Station at Clevedon in July 1949. Abraham and his colleagues succeeded in isolating a number of antibiotic substances from the culture fluids, the one producing the results originally observed by Brötzu given the name 'Cephalosporin N'. The discovery of Cephalosporin C, a substance detected in minute quantities in partially purified Cephalosporin N in September 1953, was epoch making. It was active against certain bacteria unaffected by penicillin, while being resistant to penicillinase and of very low toxicity. Cephalosporin N was shown to be a new form of penicillin and was re-named 'Penicillin N'.

Despite the combined efforts of Oxford, Clevedon and the Glaxo Group there proved to be many difficulties with the production of Cephalosporin C by fermentation and it took until 1959 for Abraham and Newton to determine its chemical structure. Later that year they showed that subtle mutations of the Cephalosporin C molecule could lead to the production of more potent antibiotics which would still be resistant to penicillinase. Work aimed at producing higher yields of the nucleus of the molecule (7-aminocephalosporanic acid or 7-ACA) continued during the early 1960s, with Glaxo and other pharmaceutical laboratories licensed by the National Research Development Corporation (NRDC) collaborating with the Dunn School. The successful outcome of this painstaking work enabled studies of semi-synthetic cephalosporins to proceed, with the drugs cephalothin and cephaloridine being introduced into medicine in 1964. The NRDC's worldwide patenting and licensing scheme covering the cephalosporins eventually yielded huge royalties, for many years the chief source of income for the corporation. Abraham diverted the greater part of his royalty income into two trusts, the E.P. Abraham Research Fund and the E.P.A. Cephalosporin Fund, which he set up to support medical, biological and chemical research, especially at Oxford.

After 1964 Abraham continued to conduct research on B-lactam antibiotics, including the biosynthesis and enzyme inactivation of penicillins and cephalosporins, while also investigating other antibiotics such as bacilylsin. He maintained a strong interest in antibiotics research abroad, and travelled extensively to visit research laboratories and give lectures such as the Rennebohm Lecture at the University of Wisconsin (1966-1967) and the Squibb Lecture at Rutgers University (1972).

Abraham was elected a Fellow of the Royal Society in 1958 and became Professor of Chemical Pathology in 1964. In addition to his knighthood in 1980, his outstanding contributions in the antibiotics field brought him numerous awards, including the Royal Medal of the Royal Society (1973), a CBE (1973), the Mullard Prize of the Royal Society (1980) and several honorary degrees. Abraham also contributed to academic life in Oxford as a Fellow of Lincoln College from 1948 to 1980 (an Honorary Fellow from 1980) and as an Honorary Fellow of a number of other colleges.

A man of exceptional modesty, Abraham was affectionately regarded by his colleagues at all levels. He remained on good terms with both Florey and Chain after their acrimonious breach and later wrote well-received articles on both scientists for *Biographical Memoirs of Fellows of the Royal Society*.

He married Absbjörg Harung, a Norwegian, in 1939 and they had a son. Abraham died on 8 May 1999.

DESCRIPTION OF THE COLLECTION

The papers cover the period 1925 to 2000. The following paragraphs are intended to provide a summary of the collection, by section, and to draw attention to items of particular interest. Further explanatory notes and cross-references are found, where appropriate in the individual sections in the catalogue.

Section A, Biographical, includes a variety of material reflecting many aspects of Abraham's personal and professional life. A number of his school notebooks survive, along with eighteen undergraduate notebooks. There are letters of congratulation on his election to the Fellowship of the Royal Society, 1958, and on his receipt of the Royal Medal of the Royal Society in 1973, and correspondence and papers relating to other honours and awards. Included also are correspondence concerning the history of antibiotics (mostly 1990s), correspondence and papers relating to his support of various charities and appeals later in his life, appointments diaries (1963-1992) and a sequence of personal correspondence, 1974-1998.

Section B, University of Oxford, is short. The material includes correspondence and papers relating to the business of Lincoln College (1960-1996), of which Abraham was a Fellow, and building work and administration at the Sir William Dunn School of Pathology (1954-1994). Other papers, chiefly concerning social and fundraising events, reflect his associations with other Oxford colleges and organisations, sometimes through donations by the Abraham Trusts.

Section C, Research, presents extensive and diverse material spanning some sixty years of Abraham's biochemical research. There are notebooks, correspondence, publications and other papers, chiefly relating to research on cephalosporins and related substances by Abraham's team and other organisations. There are a few of his notebooks dating from his period at the Dyson Perrins Laboratory and his early years at the Sir William Dunn School of Pathology; one survives from his year in Stockholm (1938/1939) as a Rockefeller Travelling Fellow. The early Dunn School notebooks include details of experiments on penicillin from 1940. There is significant coverage of the collaborative research with the Antibiotics Research Station of the Medical Research Council on the

cephalosporium culture fluids in the 1950s, the work that led to the isolation of Cephalosporin C and the determination of its chemical structure. A large body of correspondence and papers relates to the involvement, through to the 1990s, of the National Research Development Corporation in the ongoing research on the cephalosporin antibiotics and their commercial exploitation, the participation of licensed pharmaceutical companies such as Squibb, and legal cases concerning cephalosporin patents in which Abraham provided expert opinion. Experimental work by Abraham's team on a range of antibiotics and related compounds, including Cephalosporin C, Bacilysin and B-lactamases, is documented by a large group of laboratory notebooks dating from 1946 to 1983. They are mostly the work of Abraham's research assistants, though a few are in his hand. A small body of correspondence and papers relates to research on bacilysin from 1957 and there is also some scientific correspondence of a more general nature.

Section D, Publications, comprises Abraham's drafts of scientific papers, book reviews and other articles by Abraham, dating from 1956 to 1998, and editorial correspondence. Of particular interest are the drafts and correspondence relating to his *Biographical Memoirs of Fellows of the Royal Society* for Howard Florey (1971) and Ernst Chain (1983). The correspondence highlights the sensitive issues Abraham had to negotiate in the preparation and drafting of the Memoirs. There are also drafts of other obituaries he wrote for Florey and Chain.

Section E, Lectures and broadcasts, principally comprises drafts and correspondence relating to public lectures given by Abraham from ca 1960 to 1993. Most lectures are on the origin and development of B-lactam antibiotics; one given at the National Portrait Gallery in 1993 surveys the discoveries of Sir Alexander Fleming. A small amount of lecture material used by Abraham for teaching is included. The papers relating to broadcasts is slight, chiefly concerning Abraham's contributions to various television and radio programmes on penicillin, the cephalosporins and the work of Howard Florey, dating from 1962 to 1991.

Section F, Visits and conferences, covers the period 1955 to 1995. The material chiefly covers Abraham's participation in symposia and conferences on chemotherapy, antibiotics and, in some cases, specifically B-lactam antibiotics. On longer stays abroad he sometimes combined attendance at symposia with lectures at universities and visits to pharmaceutical laboratories. Among the visits and conferences for which significant documentation survives are the International Congresses of Chemotherapy held in Vienna, 1967 and 1983; the Interscience Conferences on Antimicrobial Agents and Chemotherapy held in Chicago, 1967 and 1981; and a visit to India in January 1985 which included the Asian Congress of Pharmacology in New Delhi. Included are drafts of papers given by Abraham at symposia.

Section G, Societies and organisations, presents material covering Abraham's involvement in many British scientific organisations, including the Biochemical Society, the Chemical Society, the Society

for General Microbiology and the Royal Society. Overseas organisations are represented by the American Academy for Arts and Sciences and the Australian National University (John Curtin School of Medical Research). Much of the correspondence in this section is general in nature, though there is material relating to lectures and addresses given by Abraham, such as the 5th L.P. Garrod Lecture for the British Society for Antimicrobial Chemotherapy in 1986.

Section H, Correspondence, principally consists of scientific correspondence, 1944-1998, arranged by individual or country. The correspondents include some colleagues of Abraham, such as Norman Heatley, Henry Harris and Guy Newton, research assistants and workers in Abraham's laboratory and scientists in other institutions. The correspondence arranged by country reflects Abraham's strong interest in antibiotics research overseas and documents visits to many countries for participation in conferences and meetings. There is also a short sequence of material concerning references and recommendations.

Section J, Non-text material, largely consists of photographs of Abraham, with a few of colleagues such as Guy Newton, dating from 1930-1995. Included are school photographs, portraits from Abraham's early career and several showing him with colleagues and fellow scientists taken at conferences or functions. There are also a few lecture slides and videotapes, one recording an event at the Sir William Dunn School of Pathology, at which Abraham spoke, celebrating the 50th anniversary of the published paper on the therapeutic application of penicillin.

There is also an index of correspondents.

S. Coleman
Bath 2002

SECTION A	BIOGRAPHICAL	A.1-A.115
	A.1-A.10	AUTOBIOGRAPHICAL AND BIOGRAPHICAL
	A.11-A.40	CAREER, HONOURS AND AWARDS
	A.41-A.66	SCHOOL AND UNDERGRADUATE NOTEBOOKS
	A.67-A.96	DIARIES
	A.97, A.98	E.P. ABRAHAM TRUSTS
	A.99-A.101	CHARITIES AND APPEALS
	A.102, A.103	HISTORY OF SCIENCE
	A.104, A.105	ARCHIVES AND BOOKS
	A.106-A.114	PERSONAL CORRESPONDENCE
	A.115	LIST OF PUBLICATIONS

Biographical

- | A.1-A.10 | BIOGRAPHICAL AND AUTOBIOGRAPHICAL | 1957-1998 |
|----------|--|-----------|
| A.1 | <p>'Personal records' prepared for Royal Society, latest bibliographical reference, 1957.</p> <p>Abraham was elected to the Fellowship of the Royal Society in 1958. See A.20-A.22.</p> | |
| A.2 | <p>Autobiographical account for <i>McGraw-Hill Modern Scientists and Engineers</i>, 1980.</p> | |
| A.3 | <p>'Sir Edward Abraham and the cephalosporin and penicillin stories', NRDC [National Research Development Corporation] publication, 1980 or later.</p> <p>The article was written by J.C. Cain, Managing Director, NRDC.</p> | |
| A.4 | <p>'Biography' for Central Office of Information, 1981.</p> <p>'New antibiotic from another happy accident'. 'Portrait' of Abraham, <i>Oxford Times</i>, 13 December 1985.</p> | |
| A.5 | <p>'Edward Abraham: A major figure in antibiotics', <i>The Biochemist</i>, 1990.</p> | |
| A.6 | <p>'Description' of Abraham's career at Oxford for the University's External Relations Office, 1991.</p> <p>Brief biographical details for meeting of Oxford University's Chancellor's Court of Benefactors, 1998.</p> | |
| A.7 | <p>'Chance favours the prepared mind. A tribute to the work of Sir Edward Abraham and his distinguished colleagues at the Sir William Dunn School of Pathology'. 5 December 1991.</p> <p>See also A.13.</p> | |
| A.8 | <p>'Sir Edward Abraham: An Eightieth Birthday Tribute', <i>Lincoln College Record</i>, 1993.</p> | |

Biographical

- A.9, A.10 Entries for biographical directories, 1971-1997.
2 folders.
- A.11-A.40 CAREER, HONOURS AND AWARDS 1925-1999**
- A.11, A.12 King Edward VI School, Southampton

Abraham attended the school, 1925-1932. He was subsequently a major benefactor.
- A.11 Swimming certificates, 1925-1926
- A.12 Oxford & Cambridge Schools Examination Board Certificate, 1929.
- A.13-A.16 Correspondence with Chairman of Governors, Headmaster and others, 1991-1998.
4 folders.
- A.17 The Queen's College, Oxford.

Abraham was an Exhibitioner of the College, 1932-1936 where he read the Honour School of Chemistry.

Correspondence and papers, 1931-1934.

Letter of 20 November 1931 from the College informs Abraham of his election to an Exhibition.
- A.18 Rockefeller Travelling Fellowship, University of Stockholm, 1939.

Abraham worked at the Biokemiska Institut Stockholm as a Rockefeller Travelling Fellow, 1938-1939.

One letter only from the head of the institute, H. von Euler, 18 September 1939.

Biographical

- A.19 Nuffield (Penicillin) Research Fellowship, Lincoln College, Oxford, 1948.
- Abraham was a Fellow of Lincoln College, Oxford 1948-1980, Honorary Fellow from 1980. See also A.32.
- Typescript note from the Rector on the terms of the Fellowship.
- A.20-A.22 Election to the Fellowship of the Royal Society, 1958.
- Letters of congratulation, 1958.
- In alphabetical order. Unindexed.
- A.20 A-J.
- A.21 K-Z.
- A.22 Unidentified and first names only.
- A.23 Rennebohm Lecturer of the University of Wisconsin School of Pharmacy, 1966-1967.
- Certificate only.
- Honorary membership American Pharmaceutical Association Academy of Pharmaceutical Sciences, 1967.
- Certificate only.
- A.24, A.25 Appointed Commander of the Order of the British Empire (C.B.E.), 1973.
- Official notification and letters of congratulations, 1972-1973. Unindexed.
- A.24 Notification and letters A-H.
- A.25 Letters J-Z.
- Unidentified and first names only.

Biographical

- A.26 Honorary Fellowship, Queen's College, Oxford, 1973.

Letters from the Provost and others *re* election to the Honorary Fellowship, 1973.
- A.27-A.29 Award of Royal Medal of the Royal Society, 1973
- A.27 Correspondence with the Royal Society, 1973-1974.
- A.28, A.29 Letters of congratulation, 1973.

In alphabetical order. Unindexed.
- A.28 A-M.
- A.29 N-W.

Unidentified first names only.
- A.30 Knighthood, 1980.

Newspaper-cutting only.
- A.31 Honorary degree, University of Exeter, 1980.

Correspondence *re* arrangements, manuscript notes of speech by Abraham.
- A.32 Dinner in Abraham's honour at Lincoln College, Oxford, 1980.

Photocopy of manuscript notes for Abraham's speech.
- A.33 Mullard Award of the Royal Society, 1980.

Correspondence with the Royal Society, 1980-1981.

Biographical

- A.34 Correspondence *re* proposed nominations of Abraham for Nobel Prize, 1981, 1983 and 1997.
- A.35 Honorary Fellowships of Oxford Colleges, 1983, 1986.
- Honorary Fellowship, St Peter's College, Oxford, 1983.
- Letter of congratulations only
- Honorary Fellowship, Keble College, Oxford, 1986
- Invitation declined by Abraham: 'But some time ago I began to feel embarrassed by the number of my Honorary Fellowships and decided that I should not allow the list to grow if the possibility of its doing so were to arise'.
- A.36 Honorary degree, Oxford University, 1984.
- Letters of congratulation; brief correspondence *re* arrangements, 1983-1984.
- A.37 Honorary degree, University of Strathclyde, 1989.
- Correspondence *re* arrangements, 1988-1989.
- A.38 Honorary degree, Harvard University, 1997.
- Correspondence and papers, 1996-1997.
- A.39 Opening of the Oxford University Pathology Support Building, 1997.
- Abraham officially opened the building to which he had 'contributed so generously', 10 October 1997.
- A.40 Funeral and memorial service. 1999.
- Includes memorial address by H. Harris as published in Oxford Magazine, Nough Week, Hilary Term, 2000.
- Draft of obituary by L.D. Sabbath.

Biographical

- | A.41-A.66 | SCHOOL AND UNDERGRADUATE NOTEBOOKS | 1928-1936 |
|-----------|--|-----------|
| A.41-A.48 | King Edward VI School, Southampton, notebooks. | |
| A.41 | Notebook with label 'King Edward's School, Southampton' on front cover with pupil's name 'E. Abraham', the subject 'Physics' and the date 'Oct. 1928'.

Used for experimental work. A list of experiments is on the first lined page at the front. | |
| A.42 | Notebook with label 'King Edward's School, Southampton' on front cover with pupil's name 'E. Abraham' and the subject 'Physics'. N.d.

Used for experimental work. | |
| A.43 | Notebook with label 'King Edward's School, Southampton' on front cover with pupil's name 'E. Abraham' and the subject 'Physics. Heat & light sound'. N.d.

Used for experimental work. | |
| A.44 | Notebook with label 'King Edward's School, Southampton' on front cover with pupil's name 'E. Abraham' and the subject 'Physics [rest of label torn but probably indicated that the particular areas of the subject covered were magnetism and electricity]'. N.d.

Used for experimental work. | |
| A.45 | Notebook with label 'King Edward VI. School, Southampton' on front cover with pupil's name 'E.P. Abraham' and the subject 'Physics'. N.d.

Used for notes on the 'Properties of Matter'. | |
| A.46 | 'Notebook with label 'King Edward VI. School, Southampton' on front cover with pupil's name 'E.P. Abraham' and the subject 'Physics'. N.d.

Used for notes on 'The Properties of Matter'. | |

Biographical

- A.47 'Notebook with label 'King Edward VI. School, Southampton' on front cover with pupil's name 'E.P. Abraham' and the subject 'Physics II'. N.d.
- Used for notes on magnetism and electricity.
- A.48 'Notebook with label 'King Edward VI. School, Southampton' on front cover with pupil's name 'E.P. Abraham'.
- Used for essays. The first essay on pragmatism is dated at the end 'Essay Club Winter Term 1930'.
- A.49-A.66 Undergraduate notebooks, The Queen's College, Oxford.
- A.49 King Edward VI. School, Southampton notebook with school label on front cover obscured with new blank label inscribed 'The Phase Rule'. 'E.P. Abraham' inscribed inside front cover. N.d.
- Used for undergraduate notes.
- A.50 Notebook with 'E.P. Abraham Queen's College Oxford' inscribed inside front cover.
- Used for ? essays on chemistry. 'The composition of water and the relative atomic weights of oxygen and hydrogen' is dated 'Nov. 1st 1932'.
- A.51 Notebook with 'E.P. Abraham The Queen's College Oxford' inscribed inside front cover.
- Used for chemistry notes. First page headed 'The methods for the determination of vapour density'. Latest date in the text 1933 (in note on the hydrogen isotope).
- A.52 Notebook with 'E.P. Abraham The Queen's College [Oxford] 1934' inscribed inside front cover.
- Used from the front for notes on 'Isomerism'.
- A.53 Notebook with 'E.P. Abraham The Queen's College Oxford 1934' inscribed inside front cover.
- Used from the front for notes on 'The kinetic theory of gases'.

Biographical

- A.54 Notebook with 'E.P. Abraham 1934' inscribed on the front cover.
Used from the front for notes on 'The lesser known elements' and from the back for notes on 'Inorganic compounds'.
- A.55 Notebook with 'E.P. Abraham 1934' inscribed on the front cover.
Used from the front for notes on 'Corrosion, Passivity and the Protection of Metals'.
- A.56 Notebook with 'E.P. Abraham The Queen's College [Oxford]' inscribed inside front cover.
Used for notes on 'Oxidation and Reduction in Organic Chemistry' from the front and on 'Mechanism of Reactions' from the back. Latest bibliographical reference 1934.
- A.57 Notebook with 'E.P. Abraham The Queen's [College Oxford]' inscribed inside front cover.
Used from the front for notes on 'Acids and bases (continued)'. Latest date in notes 1934.
- A.58 Notebook with 'E.P. Abraham' inscribed inside front cover.
Used for notes on 'Rubber', 'Ketenes', 'The basic properties of oxygen', etc. Latest bibliographical reference 1935.
- A.59 Notebook with 'E.P. Abraham The Queen's College [Oxford]' inscribed inside front cover.
Used from the front for notes on 'Relativity', 'The Alkaloids', 'Structure and Synthesis', 'Carbohydrates' etc. Latest bibliographical reference 1936.
- A.60 Notebook with 'Essays E.P. Abraham The Queen's [College Oxford]' inscribed inside front cover.
There are essays on 'Fermentation', 'The Constitution of Alcohol and Ether', 'Aldehydes', 'Nitrification', 'The fixation of Nitrogen', etc. Latest bibliographical reference 1932.

Biographical

- A.61 Notebook with 'E.P. Abraham The Queen's College [Oxford]' inscribed inside front cover.
- First page headed 'Essays'. However, contents may be summary notes of contents of earlier notebooks perhaps prepared for revision purposes. See A.50 for example. Latest bibliographical reference 1934.
- A.62 Notebook with 'E.P. Abraham 1934' inscribed inside front cover.
- Used for notes *re* practical work. First page headed 'Quantitative Analysis'.
- A.63 Notebook with 'E.P. Abraham The Queen's College Oxford 1934' inscribed inside front cover.
- Used for notes *re* practical work. First page headed 'Organic Preparations etc.'
- A.64 Notebook with 'E.P. Abraham The Queen's College [Oxford]' inscribed inside front cover. N.d.
- Used for notes *re* practical work. First page headed 'Points in Physical Chemistry'.
- A.65 Notebook with 'E.P. Abraham The Queen's [College Oxford]' inscribed inside front cover. N.d.
- Used from both ends for notes *re* practical work. First page at front headed 'Potassium iodate'. First page at back headed 'Gas Manipulation'.
- A.66 Notebook with 'E.P. Abraham The Queen's [College Oxford]' inscribed inside front cover. N.d.
- Used for notes *re* practical work. First page headed 'Tetrahydrocarbazole'.

Biographical

A.67-A.96

DIARIES

1963-1992

Appointments diaries. The sequence lacks a diary for 1970. There are two diaries for 1978.

A.67

1963.

A.68

1964.

A.69

1965.

A.70

1966.

A.71

1967.

A.72

1968.

A.73

1969

A.74

1971.

A.75

1972.

A.76

1973.

A.77

1974.

A.78

1975.

Biographical

A.79 1976.

A.80 1977.

A.81 1978.

A.82 1978.

A.83 1979.

A.84 1980.

A.85 1981.

A.86 1982.

A.87 1983.

A.88 1984.

A.89 1985.

A.90 1986.

A.91 1987.

A.92 1988.

Biographical

A.93 1989.

A.94 1990.

A.95 1991.

A.96 1992.

A.97, A.98 E.P. ABRAHAM TRUSTS 1979, 1989

Abraham established a number of charitable trusts with funds arising from the development of the cephalosporin antibiotics.

A.97 Letter from E.P. Abraham *re* cephalosporin funds in reply to an enquiry from G.Wilkinson, February 1979.

A.98 Letter from Kidsons chartered accountants, 20 February 1989, enclosing photocopies of Deed of Trust in respect of the E.P. Abraham Research Fund, 17 March 1967, Trust Deed in respect of the Guy Newton Research Fund, 17 March 1967, and Deed of Trust in respect of the E.P.A. Cephalosporin Fund, 18 May 1970.

A.99-A.101 CHARITIES AND APPEALS 1975-1997

Correspondence and papers *re* charities and appeals supported by Abraham, 1975-1997.

3 folders.

Biographical

A.102, A.103 HISTORY OF SCIENCE 1976, 1994-1998

Correspondence with historians and others *re* the history of antibiotics, biographies of scientists etc., 1976,1994-1998.

2 folders.

A.104, A.105 ARCHIVES AND BOOKS 1986-2000

Correspondence and papers *re* arrangements made for Abraham's archives and books and *re* related matters, 1986-2000.

A.104 1986-1989.

A.105 1997-2000.

2000 item is a list of the books transferred from Abraham's home to Lincoln College, Oxford.

A.106-A.114 PERSONAL CORRESPONDENCE 1974-1998

A.106-A.108 A chronological sequence of correspondence, 1974-1998.

Includes replies to Abraham's letters of congratulation.

A.106 1974-1976.

A.107 1979-1993.

A.108 1995-1998, n.d.

Biographical

A.109-A.114 Correspondence and papers with B.L. Parry and others, 1973-1977 and n.d.
6 folders.

A.115 PUBLICATIONS LIST

Typescript chronological list of Abraham's publications.

SECTION B

UNIVERSITY OF OXFORD

B.1-B.92

B.1-B.19 WILLIAM DUNN SCHOOL OF PATHOLOGY

B.20-B.61 LINCOLN COLLEGE

B.62-B.92 OTHER COLLEGES AND UNIVERSITY ORGANISATIONS

University of Oxford

B.1-B.19 WILLIAM DUNN SCHOOL OF PATHOLOGY 1954-1994

B.1-B.19 Invoices etc for equipment and supplies purchased by the William Dunn School, 1954.

19 folders.

B.20-B.35 Correspondence and papers *re* the building of a major extension to the School, 1964-1975, 1980.

Contents of 2 files inscribed 'Pathology - New Building'.

16 folders.

B.36 Minutes of Departmental Committee Meetings etc, 1992-1994.

B.37 Miscellaneous correspondence and papers, 1992-1994.

B.38-B.61 LINCOLN COLLEGE 1960-1996

Abraham was a Fellow of Lincoln College, 1948-1980, and a member of the College's Finance Committee.

See A.19 and A.32 for further material relating to Lincoln College.

B.38 Various committee papers and other papers *re* general College business, 1960-1965, n.d.

B.39-B.47 'Lincoln College Appeal'. Contents of a file so inscribed.

The college organised an appeal in 1972 for the conversion of a church into a new library and later sought funds for other projects.

Correspondence etc, 1972-1993.

9 folders.

University of Oxford

- B.48-B.57 Correspondence and papers *re* general business and activities of the college, 1974-1996, with a few papers 1962-1964.
- Included are invitations to functions and papers relating to college and committee meetings (Abraham was a member of the Finance Committee). Included in B.53 is a 2pp manuscript draft of a speech by Abraham, [?after 1980].
- 10 folders.
- B.58 Letter from National Research Development Corporation, with related papers, 1979.
- Found with papers in B.48-B.54.
- B.59-B.61 Copies of papers concerning applications for Junior Research Fellowships at Lincoln College, including accounts of research projects or proposed research, 1975.
- 3 folders.
- B.62-B.92 OTHER COLLEGES AND UNIVERSITY ORGANISATIONS 1958-1998, n.d.**
- Arranged alphabetically. Miscellaneous correspondence is at B.91, B.92.
- B.62 Ashmolean Club 1990-1998**
- Abraham was a Supernumerary Member.
- Correspondence, mostly notices for meetings.
- B.63, B.64 Green College 1993-1998**
- Abraham was on the College Advisory Council.
- Correspondence and papers *re* Advisory Council meetings and various events and functions.
- 2 folders.

University of Oxford

B.65 **Keble College** **1992-1996**

Correspondence etc *re* appointments of EPA Junior Research Fellows.

B.66 **Lady Margaret Hall** **1978-1997**

Abraham was elected an Honorary Fellow of the college in 1978.

Correspondence etc *re* Abraham's election to an Honorary Fellowship, invitations to functions, grants to the college by EPA trusts and other matters, 1978, 1992-1997.

B.67, B.68 **Linacre College** **1983-1996**

Abraham was an Honorary Fellow of the college. The EPA Cephalosporin Fund made a donation towards a new residential building at the college.

Correspondence etc *re* invitations to functions and general business.

2 folders.

B.69-B.71 **Natural Sciences Club** **1969-1988**

Abraham was a member.

Papers and correspondence *re* meetings, functions and general business.

3 folders.

B.72 **Pembroke College** **1988-1995**

Abraham was a Friend of Pembroke. One or both of the Abraham Trusts donated money to the college.

Correspondence etc *re* invitations to functions and general business.

University of Oxford

B.73, B.74 **The Queen's College** **1977-1996**

Abraham was an Honorary Fellow.

Correspondence *re* functions and general business.

2 folders.

B.75 **St Cross College** **1983-1990**

One or more of the Abraham trusts appears to have been a benefactor of the college.

Correspondence etc *re* invitations to functions and other business.

B.76 **St Hilda's College** **1984-1994**

Both Abraham trusts were benefactors of the college.

Correspondence etc mostly *re* funding of academic posts and functions, 1984-1994.

B.77 **St Hugh's College / St Anne's College** **1995, 1997**

At least one of the Abraham trusts was a benefactor of St Hugh's College.

Correspondence, mostly *re* invitations to functions.

B.78, B.79 **St Peter's College** **1987-1997**

Abraham was an Honorary Fellow. The EPA Cephalosporin Fund made a donation to the college to help endow an existing Biological Sciences Fellowship.

Correspondence etc *re* functions and general business.

2 folders.

University of Oxford

- | | | |
|-------------------|---|------------------------|
| B.80-B.88 | University Registry and other offices | 1958-1998, n.d. |
| B.80-B.85 | Contents of file inscribed 'University Offices'.

Correspondence etc with the Registrar and other offices and individuals within the University, 1958-1998, n.d.

Topics covered include funding for the Sir William Dunn School of Pathology, Abraham's receipt of an honorary Doctor of Science degree from the University in June 1983, and various events and functions, 1958-1998.

6 folders. | |
| B.86, B.87 | Contents of a file inscribed 'University Registry'.

Correspondence <i>re</i> fundraising, events and general matters, 1977-1988.

2 folders. | |
| B.88 | Contents of a file entitled 'Safety'.

Papers and correspondence, mostly with the University of Oxford Safety Office, <i>re</i> safety procedures associated with work with micro-organisms, 1989-1992. | |
| B.89, B.90 | Wolfson College | 1982-1995 |
| | Abraham was an Honorary Fellow of the college and a Patron of its Appeal. The EPA Cephalosporin Fund made a donation to the college.

Correspondence, mostly <i>re</i> fundraising and functions.

2 folders. | |
| B.91, B.92 | Miscellaneous correspondence | 1993-1997 |
| | Correspondence with various Oxford colleges, including Linacre College, and individuals <i>re</i> fundraising, donations by the EPA Cephalosporin Fund and other matters.

This material was found in one original file.

2 folders. | |

SECTION C

RESEARCH AND DEVELOPMENT

C.1-C.1114

This section documents a variety of research by Abraham and his colleagues at the Sir William Dunn School of Pathology and by a number of other organisations. The greater part of the material relates to the work on Cephalosporin C and related compounds and the development of marketable cephalosporin antibiotics, though research on penicillin (from 1940), bacilysin and other antibiotics is also covered.

Papers relating to the cephalosporins is dispersed through most of the sub-sections listed below. The correspondence covering the stages of the collaborative research from the late 1940s to the introduction of the first cephalosporin drug in 1964 is chiefly found in the sub-sections 'Medical Research Council', 'National Research Development Corporation' and 'Other Organisations'.

C.1-C.206	EARLY RESEARCH AND RESEARCH ON PENICILLIN
C.207-286	LABORATORY NOTEBOOKS AND PAPERS
C.287-C.357	MEDICAL RESEARCH COUNCIL
C.358-C.605	NATIONAL RESEARCH DEVELOPMENT CORPORATION (NRDC) (BRITISH TECHNOLOGY GROUP (BTG))
C.606-C.963	OTHER ORGANISATIONS
C.964-C.989	SCIENTIFIC CORRESPONDENCE
C.990-C.1016	BACILYSIN RESEARCH
C.1017-C.1037	LEGAL CASES
C.1038-C.1067	'CEPHALOSPORIN C HISTORY'
C.1068-C.1114	MISCELLANEOUS PAPERS

Research and development

C.1-C.206 EARLY RESEARCH AND RESEARCH ON 1935-*ca* 1949
PENICILLIN

- C.1-C.4 Dyson Perrins Laboratory notebooks
- C.5 Rockefeller Travelling Fellowship (Stockholm)
- C.6-C.14 Early William Dunn School of Pathology notebooks
- C.15-C.206 Penicillin reports

C.1-C.4 Dyson Perrins Laboratory notebooks 1935-1938

Abraham worked at the Laboratory from 1936-1938, researching on peptides.

Hardback notebooks containing manuscript notes by Abraham mostly relating to experiments, including tables and graphs of experimental results. All are inscribed 'Dyson Perrins Laboratory' except C.4 which probably belongs in this set, being of very similar physical appearance to C.1-C.3 and dated 1938.

Records of particular experiments are often dated.

- C.1 Mostly *re* experiments involving Undecylenic acid, October 1935-*ca* June 1936.
- C.2 From front notes on various experiments; from back notes on experiments involving lysozyme. Undated.
- C.3 Abstracts from papers on various experiments with references at end, undated.
- C.4 General notes on various compounds and reactions. Inscribed '1938' inside front cover.

Research and development

- C.5** **Rockefeller Foundation Travelling Fellowship (Stockholm)** **1938-ca 1949**
- Notebook inscribed inside front cover 'Biokemiska Institutet...Stockholm' (crossed out) and 'Sir William Dunn School of Pathology'.
- The notes cover Abraham's period in Stockholm as a Rockefeller Foundation travelling fellow, 1938, 1939.
- Re* experiments involving various enzymes, October 1938-August 1939. Paginated 1-150 (pages 1-147 used), with further notes at back.
- See also A.18.
-
- C.6-C.14** **Early Sir William Dunn School of Pathology notebooks** **1940-ca 1949**
- The notebooks vary considerably in physical appearance. Some include loose pages of notes.
-
- C.6** *Re* experiments involving various substances, including enzymes and intestinal mucosa, and early experiments on penicillin (June-ca October 1940). January-October 1940.
-
- C.7** *Re* various experiments on penicillin and its purification, November 1940-ca August 1942.
-
- C.8** *Re* various experiments on penicillin and related compounds (including penicillanimine), and experiments unrelated to penicillin, August 1942-ca November 1947.
- This notebook appears to be a continuation of C.7.
-
- C.9** Notebook with heading 'Penicillin Analyses' on first page.
- From front: brief notes relating to experimental results on various compounds, May 1941-ca 1943; from back: similar notes on compounds, including cephalosporins, ca October 1949.

Research and development

- C.10 From front: notes on 'Penicillin Purifications', September 1941-*ca* February 1943 (some later notes may not relate to the heading); from back: notes *re* experiments on penicillin and related compounds, *ca* November 1941-*ca* July 1942; notes following heading 'Penicillin: Mode of Action etc... 10.1.45', January-April 1945; notes following heading 'Proactinomycin', April-September 1945; 1 further page of notes, January [?1946].
- C.11 Notebook inscribed 'Spiraca and Arctium' on cover. Partly in Abraham's hand, partly in another's hand.

Notes on various experiments, July 1944-*ca* May 1945.
- C.12 Notebook inscribed 'Abstracts' inside cover.

Notes on various compounds, *ca* 1945-*ca* 1949.
- C.13 General notes headed 'Use of moulds in primitive medicine', *ca* 1945-*ca* 1949.

Included at back is a letter to Abraham *re* arrangements for his lecture on 'Penicillin Chemistry', Oslo, 9 April 1946.
- C.14 Notebook (cover missing) entitled 'Penicillin Abstracts'.

Notes on penicillin and on various other compounds and processes, *ca* 1948-*ca* 1950.
- C.15-C.206 Penicillin reports 1944-1946**
- Copies of reports (many are entitled 'Progress Reports') by various organisations in the UK and the USA detailing the progress of chemical research on penicillin, with related papers and correspondence.
- There are a number of different series of reports; these sequences have been maintained or reconstructed where identification was possible.

Research and development

- C.15-C.146 Committee for Penicillin Synthesis (CPS) reports, 1944-1946.
- Copies of typescript reports by various organisations, including the Sir William Dunn School of Pathology, ICI Ltd (Dyestuffs Division), Imperial College London, Merck & Co. Inc., Glaxo and the Squibb Institute of Medical Research. The reports are in a numbered sequence, 'CPS 1-698'. A few are missing.
- Mostly progress reports and studies on particular processes involving penicillin and related compounds. A few reports contain manuscript annotations by Abraham.
- C.15, C.16 3 copies of the index to the series.
- 2 copies include manuscript annotations.
- 2 folders.
- C.17-C.26 Reports: nos CPS 1-106, January-June 1944 (a few dated 1943).
- 10 folders.
- C.27-C.37 Reports: nos CPS 107-207, January-June 1944 (a few dated 1943).
- 11 folders.
- C.38-C.56 Reports: nos CPS 208-299, March-October 1944 (mostly June-October).
- 19 folders.
- C.57-C.77 Reports: nos CPS 300-399, September 1944-February 1945.
- 21 folders.
- C.78-C.99 Reports: nos CPS 400-502, December 1944-May 1945 (with a few possibly earlier).
- 22 folders.
- C.100-C.121 Reports: nos CPS 503-599, April-August 1945 (with a few earlier).
- 22 folders.

Research and development

- C.122-C.146 Reports nos CPS 600-698, July 1945-May 1946.

25 folders.
- C.147 Papers relating to meetings of the Committee for Penicillin Research,
November 1944-September 1945.

With a few other papers found with this material.
- C.148-C.168 Copies of reports by various organisations, including Glaxo Laboratories Ltd,
Boots Pure Drug Co. Ltd and Imperial College of Science and Technology,
1941-1945.

Many reports are inscribed 'Professor Sir R[obert]. Robinson'.

Research and development

- C.148-C.161 Incomplete series of reports numbered PEN.1 - PEN.150, January 1941-July 1945. The series was found unevenly distributed in 2 parts, one group of reports being tied together with a label, 'Dr Abraham'. The larger group is referred to below as the 'main part of the series'.
- Some later reports are stamped 'property of the Therapeutic Research Corporation of Great Britain Ltd'.
- C.148-C.157 Main part of the series.
- 10 folders.
- C.158-C.161 Reports labelled 'Dr Abraham'.
- 4 folders.
- C.162-C.168 Incomplete series of reports numbered PEN.X. 1 - PEN.X. 54, July 1942-March 1945.
- Some reports are stamped 'property of the Therapeutic Research Corporation of Great Britain'. This series appears to be related to that in C.148-C.161, the reports being very similar in structure and content.
- 7 folders.
- C.169-C.177 Incomplete series of reports (copies), numbered PEN.C. 3 - PEN.C. 107, May 1943-September 1945.
- Reports are mostly by official bodies, such as the National Research Council and include conference reports.
- See C.202-C.206 for further reports from this series.
- 9 folders.
- C.178-C.183 Copies of reports entitled 'Ministry of Supply, Penicillin Production Control...Technical Papers Received from USA', 1942-1945.
- The material includes various different series of reports which were found in a mostly disarranged state. Sequences have been re-constructed where identification was possible. /...

Research and development

- /... Included at C.179 is a carbon copy of a typescript by Ernst Chain entitled 'Brief account of the circumstances which led to the discovery of the chemotherapeutic properties of penicillin at the Sir William Dunn School of Pathology, Oxford'.
6 folders.
- C.184, C.185 Typescript papers, mostly minutes etc, *re* the business of the General Penicillin Committee, 1942-1944.
With a few related reports found with this material.
2 folders.
- C.186 Correspondence between Sir Robert Robinson and the Therapeutic Research Corporation of Great Britain, October 1942-December 1943; papers *re* meetings on penicillin research, 1942-1943.
Contents of a file.
- C.186-C.201 Miscellaneous reports and other papers, with brief correspondence, 1942-1945.
The material is mostly typescript, with manuscript papers in an unidentified hand. At C.197 is a letter (1943) from Sir Robert Robinson to Ernst Chain.
There was no indication of any original organisation of these papers and no attempt at re-arrangement has been made.
16 folders.
- C.202-C.206 Contents of a file inscribed 'Penicillin History..Pen Reports..Oxford University'. Copies of typescript reports, 1942-1944.
Most of the reports are from the 'PEN.C' series (see C.169-C.177) and appear to fill some gaps in the numbered sequence. Included at C.205 is brief correspondence between Sir Robert Robinson and Sir Edward Mellanby, 1943.
5 folders.

Research and development

- C.207-C.286** **LABORATORY NOTEBOOKS AND PAPERS** **1946-1983, n.d.**
- Binders and notebooks containing manuscript notes etc by Abraham and his research assistants at the Sir William Dunn School of Pathology. The material principally documents experiments relating to the development of the cephalosporins and other antibiotics and includes tables of results, graphs, and photographs. The notes are chiefly by research assistants, though many of the binders and notebooks contain notes in more than one hand.
- Arranged chronologically, though material has been kept together where identified as the work, or chiefly the work, of a particular individual.
- 'Cephalosporin' is abbreviated to 'Ceph' on the dividers found in the binders.
- C.207 Notebook, January 1946-July 1948. Notes in an unidentified hand.
- Mostly *re* experiments involving B. Subtilis and ayfivin; a few other notes from back *re* experiments on an antibiotic produced by Staphaur[?eus].
- Paginated 1-185.
- C.208 Notebook, July-December 1948. Notes in same hand as C.207.
- Mostly *re* experiments involving ayfivin, continued from C.207; a few other notes from back; 1 loose page of notes at front dated June 1946.
- Paginated 186-230, of which 186-220 have been used.
- C.209 Large binder, December 1948-November 1953. Notes mostly in Abraham's hand; the remainder in an unidentified hand.
- Separated into sections by dividers labelled as follows: 'Alvein' (one page dated February 1949); 'Bacilysin' ([ca April]-May 1949); 'Ayfivin' (December 1948-November 1953); 'Pu[?m]ulin' (February 1951); 'Ageritin' (December 1952); 'Nisin' (June 1950-January 1952); 'Micrococcin' (October [?1951]-January 1952); 'Techniques' (pages dated September 1949, February-March 1950).
- C.210 Large binder, June 1949-February 1957. Notes partly in Abraham's hand and partly in an unidentified hand.
- Separated into sections by dividers labelled as follows: 'Cephalosporin' (June-October 1949); 'Cephalosporin N' (November 1949-June 1954); 'Methionine C.14' (June-August 1954); 'Synnematin B' (October 1954); 'Bacitracin' (1955, 1956); 'Ceph N / C14' (September 1955); 'Ceph P' (December 1949-1952, 1957); 'Nonin' (February 1957).

Research and development

- C.211 Notebook inscribed 'Margaret Ann Keren Pill', June 1949-March 1950.
- Re* experiments on various compounds including ayfavin, penicillin and cephalosporins, with index and further notes from back.
- Paginated 1-159.
- C.212 Notebook inscribed 'Ann Pill', 1950-1951.
- Mostly *re* experiments on Cephalosporin N, with index from opposite end.
- Paginated 1-156. Included at the front is a loose set of notes paginated 1-29, with a few unpaginated pages.
- C.212A Notebook in the hand of Ann Pill, undated.
- Headed 'Methods and preparations' on first page. Brief notes, probably for reference purposes.
- C.213 Large binder, 1951-1962. Notes mostly in Abraham's hand; the remainder in an unidentified hand.
- Separated into sections by dividers labelled as follows: 'Ceph C' (July 1954-February 1961); 'Desacetyl Ceph C' (February 1960-March 1961); 'Ceph C_c' (January 1958-July 1960); '[¹⁻¹⁴C] Ceph C Acetate' (June 1959-October 1961); 'Rydon Smith Comp[ound] (Cephalosporidine)' (May 1961-March 1962); 'Penicillinase on C, C_A & C_C' (January 1958); 'Penicillinase' (January 1960-*ca* February 1962); 'Ceph C Nuchar Expts' (January-February 1958); 'C_A pyridine production' (January 1958-March 1960); 'C_A Nicotinamide' (February-June 1958); 'C_A Sulphapyridine Sulphathiazole' (June-July 1958); 'C_A Glyoxaline' (December 1961); 'Ceph C conc HCl' (June 1958-December 1959); 'Mixed crystalline acid from Ceph C spots 1+2+3' (October-November 1958); 'Separated cryst. acids 1, 2 & 3' (November 1958-November 1961); 'Ceph C performic oxidation product' (November 1958-March 1959); 'Benzoyl Ceph C' (March 1959); 'Thiazole acylation etc' (October 1958-April 1959); 'Ceph C Nucleus' (July-September 1959); 'Secretin' (October 1955-October 1957); 'Pancreozymin' (March-April 1959); 'Ceph C structural considerations' (March-April 1959); 'Techniques' (one page dated May 1962); 'Polyacetylene Dr [?Landor]' (February-March 1962); Unlabelled (possibly a continuation of 'Techniques'), includes 2 graphs dated January 1951, and 1962.
- C.214 Paperback notebook inscribed 'M. Read' on cover, *ca* May-*ca* October 1953.
- Contains experimental data (details of the nature of experiments are not given) and general notes on chemistry and human anatomy.

Research and development

- C.215 Notebook inscribed 'M.L. Read' on cover, July 1954-September 1955.
Re experiments involving various compounds including penicillinase, synnematin and Cephalosporins C and N.
- C.216 Notebook inscribed 'M.L. Read' on cover, October 1955-October 1956.
Re experiments involving various compounds including penicillinase and Cephalosporins C and N.
- C.217 Notebook inscribed 'Mary L. Read' on cover, October 1956-January 1958.
Re experiments involving various compounds including secretin, Cephalosporin C, bacitracin and penicillinase.
- C.218 Notebook inscribed 'Mary L. Read' on cover, January 1958-December 1958.
Mostly *re* experiments involving Cephalosporin C.
- C.219 Notebook in the hand of Mary L. Read, December 1958-March 1960.
Mostly *re* experiments involving Cephalosporin C.
- C.220 Notebook inscribed 'M. Loveridge' inside cover (in the same hand as C.214-C.219), March 1960-November 1961.
Mostly *re* experiments involving Cephalosporin C.
- C.221 Notebook inscribed 'M. Loveridge' inside cover (in the same hand as C.214-C.220), November 1961-February 1962.
Mostly *re* Cephalosporins C and G.
- C.222 Large binder, June 1955-February 1958. Notes in unidentified hand.
Mostly *re* experiments involving penicillin and Cephalosporins C and N.

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C.223 Large binder labelled 'Ceph C D[?]s 1961', October 1960-July 1962. Notes in unidentified hand.

At beginning: notes *re* experiments involving various compounds including α -aminoadipic acid and Cephalosporin C, October 1960-January 1961. Then separated into sections by dividers labelled as follows: 'Run 8 [^{1-14}C] - valine (January 1961-March 1962); 'Run 13 [^{1-14}C] - acetate 24hr' (February-April 1961); 'Run 16 [^{1-14}C] acetate 24 hrs' (May-July 1961); '[^{1-14}C] - acetate 48 hrs' (June 1961); 'Compound P [?] Run 17 48 hr Ac' (October, November 1961); '[^{2-14}C] - α Aad Run 18' (July 1961); '[^{3-14}C] - cystine Run 19' (September 1961-May 1962); '[^{2-14}C] α Aad R.24' (November 1961-July 1962); 'Run 28 α - oxo - glutarate 5 ^{14}C ' (April-December 1961); 'Media and washed mycelium expts' (October 1961-February 1962); 'Synthesis of Δ α - aminoadipic acid' (March-May 1961); 'Synthetic [wash] Cephalosporidine etc' (March-July 1962); 'Radioactivity standards and backgrounds' (April 1961-February 1962).

C.224 Notebook inscribed M.L.R. Sharp, September 1961-April 1962.

Re experiments on various compounds including acetic acid, carboxylic acids and Cephalosporin C.

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C.225 Large binder inscribed 'M.L.R. Sharp' on spine, March 1962-December 1963.

Separated into sections by dividers labelled as follows: 'D, L Valine uptake' (December 1963); 'Benzyl penicillin prepn' (November, December 1963); 'Est. of cpds [?compounds] 1&2 from ceph C' (March-May 1962); ' α - Aad -' (April-May 1962); 'Penicillaminic acid' (May 1962); 'Lysine . Arginine' (May-June 1962); 'Cephalosporidine synthesis spectra etc' (April-September 1962); 'Imidazole 1-acetic acid spectra' (May-June 1962, with a few pages dated October 1960); 'Dimethoxybenzoyl 7ACA' (September 1960, June 1962); 'DMB₂ 7ACA' (June-October 1962); '7ACA' (July 1962); 'Hydrolysed mycelium experiments' (July-September 1962); 'L - saccharopine' (September 1962); 'p-nitro-phenolchloracetate' (October 1962-November 1963); 'Acetyl methionine' (December 1962); 'Hog acylase I' (December 1962); 'N-chloroacetic DL- α -NH[?]' (December 1962-Dec 1963, with one page dated April 1960); ' γ -OH valine, γ -OH valine lactone' (April 1963); 'Rotation of a.a. (α -Aad) ex fermentation + "peptides" [?] (glutathione, saccharopine)' (April-July 1963); 'Uptake of D & L α Aad by washed [? susp]' (July-October 1963); 'Ceph N degredaⁿ products (maps)' (February-April 1963); 'Ceph C est. by elution' (February, March 1963); 'Disintegrated cells homogeniser' (October, November 1963); 'N-ethyl [?morpheline] [?] buffer' (January 1963); 'Ceph C stand[ard]' (November 1962); 'Addⁿ of C¹⁴ cystine to anaerobic resuspension' (November 1963); 'C¹⁴ NaOAc' (October, November 1960, October 1962); 'Instruments Hilger' (May-October 1962); 'Instruments N. Chicago counter' (May 1962-June 1963); 'X-press Expt. 2 [?]' (Miriam)' (November 1963); 'Background IDL counter' (April, May 1962); 'M.Wts [Molecular Weights]' (undated).

C.226 Notebook in unidentified hand, May-August 1963.

Mostly *re* 'Pyo Enzyme Experiment' and 'X-Press Experiment'.

C.227 Large binder inscribed 'JMT' on spine, October 1963-August 1965.

Separated into sections by dividers labelled as follows: 'Uptake after sonication' (November, December 1964); 'Cell-free system. sonicator' (January 1964); 'Demaine's and Aida's buffers' (January 1964-August 1965); 'p-Fluorophenylalanine' (May, June 1965); 'Glaxo extract - SH measurement' (May 1965); 'Measurement of SH DTNB' (March-May 1965); 'N-chloroacetate α - Aad acid' (September-December 1964); ' Δ expts sonication' (October 1964-January 1965); 'Model expts α - keto adip[ic]' (January 1965); 'Pimafucin' (November, December 1964); 'Assays Ceph C and Ceph N' (September 1964); 'X-Press' (July-October 1964); 'Isolation D-valine from Cephalosporium' (May 1964); 'X-Press 3 experiment' (January 1964); 'Cell-free system homogeniser' (February 1964); 'Disintegration of mycelium' (homogeniser) (October, November 1963); 'Nessler's solution' (June-September 1964); 'Nessler's model experiment' (September 1964); 'Conway vessels' (July 1964); 'Optical configuration D and L Alanine D and L Tyrosine' (April, May 1964); ' α -Amino-adipic acid' (June 1964); '70% ECOH extractions MSE homogeniser' (February 1964); '[¹⁴C Benzyl penicillin potassium salt' (January 1964);
/...

Research and development

- /...
- 'Bacilysin - chromatogram (Mrs Lomakina)' (January 1964-March 1965); 'Bacilysin' (February-July 1964); 'Dowex column alanine & tyrosine' (June 1964); 'Ceph C absorption measured (Hilger)' (October 1963-July 1964); 'Assay For Prof. Jones (D.P.)' (October 1963); 'Production curve of Ceph N & Ceph C' (November 1963); 'Nuclear Chicago plateau' (November 1963); 'Calibration of Warburg manometers' (April 1964); 'Colony counts sonicator' (January-April 1965).
- C.228
- Large binder inscribed 'GFN Peptides' and 'Takano-san' on cover and 'G.F. Newton' inside cover. The label 'Paul' appears on the spine. October 1964-December 1968.
- Separated into sections by dividers labelled as follows: '2 ϕ BWA 1' (January 1967); '2 ϕ BWA 2' (January 1967-November 1968); 'PBG2/3[?] G/C5, G.10 col' (July [?1967]); 'PBG2/3 G10 GC3 G10 G/C4 G10' (June, July 1967); 'PBG2&3 Ac [?Els] G10' (January-September 1967); 'PB G1' (January 1969); 'PBG2' (undated); 'PBG3' (undated); 'PBG4' (one page dated March 1968); 'TCB+PB G25-70% PYR' (February-April 1968); 'GCB+PB Separation of GSO₃H & Taurine on G10 - HOAc' (March, April 1968); 'TCB+PB 2 ϕ BWA[?]' (April 1968); 'TCB+PB2 ϕ BWA POOL P₃' (May-August 1968); 'POOL P₂ 2 ϕ BWA 2' (May 1968); 'POOL P₁ 2 ϕ BWA3' (May-June 1968); 'Analysis of pools from 2 ϕ BWA col[?]' (June 1968); 'P₂ middle ex. 2 ϕ BWA 2 [?] 2 ϕ BWA 4' (June 1968); 'TCB+PB Pool "GSO₂H" 2 ϕ BWA 5' (October 1964-December 1968).
- C.229-C.232
- Loose pages of notes, originally from a binder, 1964-1965. Contents of a file inscribed 'Joan Roscoe'.
- Separated into sections by dividers labelled 'A-H'. Included among numerous topics and experiments are the following: Section A: Contents [index to sections A-G only]; B: 'Medium of H.J.O. Rogers, record of B. subtilis A14 culture' (January-June 1965); C: 'Test run on Rogers' medium, investigation of inocula' (September, October 1964); D: 'Bacilysin production [etc]' (October-December 1964); E: 'Expt. To see if [?chloramphenicol] can be extracted [etc]' (December 1964-January 1965); F: 'Treatment of bacilysin sample & freeze-drying, preparation of large quantities of acetone extract' (February-May 1965); G: 'Expt. To follow glucose utilization & bacilysin pro[?dn], further attempts to establish the identity of the radioactive & postulated bacilysin spot' (April-July 1965); 'Shikimic acid' (July, August 1965); H: 'Comparison of zones given by Cephalosporin C and bacilysin 208' (August 1965).
- Paginated 1-275.
- 4 folders.

Research and development

- C.233 Notebook inscribed 'LDS [Leon D. Sabath] Rabbit Expts' on cover, February 1965-January 1966.

Re the study of penicillin antibodies in rabbits.

- C.234 Large binder, January 1965-April 1972, with one page dated 1964.

2 pages in the index (see below) headed 'Bronwen Loder'.

Separated into sections by dividers labelled as follows: 'Index'; 'GA, GC, CV' (January 1968-July 1969); 'L-C-D-V' (July 1969-September 1969); 'L-C-L-Y' (June-September 1969); 'C-L-V Cu precipitate' (July-September 1969); 'Trityl cpds [?compounds]' (January-March 1965); 'S-benzyl cysteine' (February-December 1965, February 1969); 'Hydrazide - AC' (March-December 1965); 'Mycelium expts AC-ACV' (May 1965-January 1966); 'Mycelium expts GC' (April 1968-November 1969); 'HS-' (May 1965-January 1966, November 1968-February 1970); 'Sonication expts' (November 1965); 'Enzymes' (June 1965, March-June 1968); 'Actinonin' (January-November 1965, one page dated October 1964); 'Actinonin M. Jago' (June 1962); 'Misc' (September 1965, February 1969-June 1970); 'Atta Rhozities gargylophera' (January 1971-April 1972); 'DMB' (October 1970-September 1971). Loose material at front.

- C.235 Large binder labelled 'P.B.[Bronwen] Loder' on spine, 1968-1972.

Separated into sections by dividers labelled as follows: Unlabelled pages at beginning *re* experiments involving Park nucleotides, Cephalosporin N and other compounds (October 1969-June 1971); 'Ceph N' (September 1969-May 1970); 'Methods' (January 1968-September 1969, November 1971); 'ACV' (November 1971-July 1972); '¹⁴C-D-Val + α KIV' (November 1971); 'Resolution of α Aad' (February-May 1972); 'Hydroxamic acids' (June-October 1970); 'Glu.Gly Glu.Ala Cy SO₃H.Gly' (January 1969-February 1972); 'Photoplasts' (May-December 1971); 'Cuprous mercaptides' (September 1969-July 1972); 'CFS Ceph. Sp' (May 1970-March 1972); 'CFS Penicillium' (May 1969-June 1972); 'Ceph sp. Sonicates' (May 1970-July 1970); 'P4 Complex' (June 1970-January 1971); '7-ACA' (February 1968-July 1972, one page dated November 1965); 'PS and slow spot' (November 1970-February 1971); 'Glaxo copper precipitate' (June 1969-July 1970); 'Cuprous mercaptides' (August-December 1970); 'Esters' (March 1969-August 1970); 'Model mixture a[?]mino acids' (March, April 1969); 'ORD' (March-September 1969); 'Amino acid markers' (September-November 1969); 'Phenylacetyl Ceph C & pen[icillin] N' (March-June 1970); 'Ceph October uptake expts' (October 1969-December 1971).

- C.236 Large binder labelled 'T.J.B.' on spine, 1965-1982. Notes in Abraham's hand.

Separated into sections by dividers labelled as follows: 'P. chrysogenum SC 6140'; 'Ceph C standards' (November 1975);
/...

Research and development

/... 'Streptomyces' (January 1972, July 1974-October 1975); 'B.subtilis 6633 Rapid assay' (March 1972); 'Pen'[icillin]ase Pseudomonas' (October 1972-October 1974); 'Pen'[icillin]ase B. cereus 569 H' (July 1968, March-June 1974); 'D-amino acid oxidase - Aspergillus' (February 1968-February 1959, July 1973); 'Q176 / C21 P. chrysogenum' (January 1968-May 1973, June 1979); 'E.coli penicillin acylase' (February-March 1974, January 1982); 'Ceph CW 19' (July 1973-October 1974); 'Acremonium' (January-February 1973); 'Cephalosporium C91' (November 1965-November 1971).

Paginated in part from back 1-128.

C.237 Large binder labelled 'J. Walker Bacilysin. Production expts. Early purification expts' on spine. 1966-1969.

Separated into sections by dividers labelled as follows: 'Protease' (February, March 1967); 'NMR' (September 1968-March 1969); 'Bacilysin hydrolysis' (October, November 1968); 'Mass spectra' (May-November 1968); 'Crystallization' (September, October 1968); 'Terreic acid' (October 1968); 'I.R. spectrum bacilysin' (September 1968); 'Bacilysin detection' (March 1969); 'O.R.D.' [no notes]; 'LAP' (February 1969); 'Action on fungi & yeasts' (June 1966-April 1969); 'Bioautography bacilysin lactone [?]' (May 1969); 'cbz bacilysin' (March, April 1969); 'Effect of bacilysin on B. subtilis' (June 1969); 'Production of bacilysin by Warburg' (March 1966); 'N-acetylglucosamine bacillin' (January 1966-January 1969); 'Phenylacetyl bacilysin' (May 1969); 'B. subtilis mutants' (December 1966-July 1969); 'B. subtilis extracellular supernatant' (June, July 1969); 'A14 intracellular' (August, September 1969); 'Bacillin N-acetylglucosamine' (December 1968-June 1969); 'Agar AB' (December 1966-April 1969).

C.238 Large binder labelled 'J.E. Walker Bacilysin. Sephadex A25. Large scale purificatⁿ. Compounds P1, P2, P3. Tyrosine. CrCl₂ redⁿ'. 1968, 1969.

Separated into topics by dividers labelled as follows: 'Purification (cont)' (January-December 1968); 'P1, P2, P3' (September 1968-October 1969); 'p-nitrophenol TFA' (June 1968); 't-BOC Ala.Ala-' (November 1968); 'CrCl₂ reduction' (September, October 1968).

C.239, C.240 'Amino acid analyses - bacilysin J.E. Walker', contents of a file so inscribed.

Chromatogram graphs from experiments by J.E. Walker, with a few accompanying data sheets, 1968, 1969.

2 folders.

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- C.241 Large binder labelled 'Sylvia Main Book I' on spine, 1966-1968, with a few notes dated 1965.
- Separated into sections by dividers labelled as follows: 'Fungal luciferin' (January-February 1966); 'Mycelium expts' (January 1966-May 1968); 'Glaxo compounds' (January 1966-February 1967); 'Glaxo ceparin [appears as 'ceporin' in the notes]' (May-July 1967); '7ACA' (July 1967); '7ACA tosylate' (February, March 1968); 'ACV and GSH' (January 1966-May 1967); 'Ethylene imine' (January, February 1968); 'Assays' (February 1966-November 1967); 'Polyamino styrene resin' (June-July 1966); 'N-phenylmaleimide [?]' (July-December 1966); 'Whatman ion exchange cellulose Amino Ethyl AE11' (August 1966); 'Anion exchange cellulose cellex PAB' (September 1966); 'B-Lactamase' (May 1966-April 1968); 'Actinomycin D' (June 1966); 'Spectra of tyrosine & tryptophan' (July 1966); 'Desacetoxy cephaloglycin & cephaloglycin' (January, February 1967); 'Miscellaneous' (March 1967-December 1968, with a few pages December 1965); 'Safety' (undated).
- Loose notes at front.
- C.242 Large binder labelled 'Sylvia Main Book II' on spine, 1967, 1968.
- Separated into sections by dividers labelled as follows: 'Index'; '7ACA' (June 1967-April 1968); 'Ceph C + ENH₂ cap:' (February-May 1967); 'Ceph C + cysteine' (April, May 1967); 'Ceph C + α & β - ala' (July-October 1967); 'Ceph C + Lys[sine] & polylys' (July-September 1967); 'Ceph C + NH₃' (July-October 1967); 'Reactions with B-lactamase' (February-October 1967); '3-methyl Ceph C' (August, September 1967); 'Deacetyl Ceph C' (October 1967); 'Ceph C + heavy metals' (October, November 1967); 'Ceph C + NaBH₄' (September-November 1967); 'Misc' (February-November 1967).
- C.243-C.250 Loose pages of notes, originally from a binder, 1968-1970. Contents of a box labelled 'Jeremy and Anne'.
- Separated into sections by dividers labelled as follows: 'Antibodies to B-lactamase' (October 1968-[?November] 1970); 'Antibodies to C & G' (October 1968-July 1969); 'Antibodies to dc + [?dyl] c' (June-September 1969); ' ϕ assay' (December 1968-March 1970); 'Antibodies to rabbit RBC' (November 1968-April 1970); 'Animal log' (May-September 1969); 'Reaction pen G etc ERBC BGG' (November 1968-May 1970); 'B-lactam conjugates' (October 1968-June 1970); 'Haemagglutinate of pools v.s. various cells' (October 1969-June 1970); 'Hapten inhibition' (September 1969-April 1970); 'Purification of antibodies' (August-October 1969); 'Ouchterlony' (September, October 1969); 'Quant. ppts' (September-December 1969); '7ACA Δ^2 [?] Δ^2 ' (October 1969-May 1970).
- 8 folders.

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- C.251-C.268 Notes etc (1 original binder, the remainder loose pages from binders), 1978-1983.
- Numerous references indicate that this material was the work of Dr J.S. Jayatilake. The notes are all in the same hand.
- The loose notes in C.251-C.267 were found together.
- C.251-C.254 Loose notes, October 1978-November 1980. Contents of a file inscribed 'Synthesis of ISON and conversion of ISON [arrow] Pen[icillin] N by an [?epimerase]'.
Paginated 1-78.
4 folders.
- C.255-C.264 Loose notes, 1979, 1980. These notes appear to be a continuation of the material in C.251-C.254.
- Separated into sections by dividers labelled as follows: Labelled 6-APA' (October, November 1979); 'Penicillinic acid sulfone (hot and cold)' (January-[ca June] 1979); '(LLD) ACV' (March 1979-May 1980); '(LLD) ABV' (ca April 1980); '(LLD) ASV' (March-September 1980); '(LLD) GCV' (September 1979); '(DLD) ACV' (July, August 1980); '(LLD) CCV' (September 1979-September 1980); '(LLD) ACB' (March-December 1980); '(LD) - [?Decanboxy] ACV (UCV)' (September, October 1980); '(LD) Adipyl CV' (November 1980); 'Adipyl-L-cystein dipept.' (January 1981); '(LD) CV-dipeptide' (April [?1980]).
- Paginated 78-161 (some material is unpaginated).
- 10 folders.
- C.265-C.267 Loose notes, October 1982-February 1983. Contents of a file inscribed 'Synthesis of "cold" & "hot" ACG Attempted labelling expts'.
- In the same hand as C.251-C.264.
- 3 folders.
- C.268 Large binder labelled 'GSJ 4 Penicillin chrysogenum. Prepⁿ of extract & experiments'. 1981, 1982.
- Separated into sections by dividers labelled as follows: 'P. Chrysogenum ext. G25/S/N & G25[?]N' (April 1981); 'P. Chry: G25 NS/N CV dipept Activ[ity] / Inhi[bition]' (March, April 1981); 'P. Chryso: Assay of ASO-50, 50-65, 65-80, 80+' (April, May 1981); 'P. Chrys: protein fraction DEAE seph[?] A50' (May 1981);
/...

Research and development

/...

'P. Chrysogenum Dyno mill II / DEAE - [?sol]' (May 1981); 'R.1221 P/C harvest[?]' (May 1981); 'Gel-electro phoresis' ([?May or June 1981]); 'P/C R1221/1 Dyno mill large scale' (June 1981); 'P. Chrysogenum Dyno mill small scale' (June 1981); 'P/C Dyno mill 0-80% DEAE-seph R1221/2' (June 1981); 'Dyno-mill R1221/3' (June, July 1981); 'Dyno-mill R1221/4' (July 1981); 'P/C R1221/2 DEAE/AS/0.5[?]0.2' (July 1981); 'G100 calibration' (July 1981); 'P/C R1221/5 DEAE/AS G100' (July 1981); 'ACV activity' (July, August 1981); 'ACV activity 1,2&3% ACV [?]' (August 1981); 'R1221/6 extract G100 / mol wt.' (August 1981); 'Effect of catalase triton x-100 G100 extract' (August 1981); 'ACV [?dimer] / [?] P. Chrys & acrem.' (August 1981); 'Km ACV - IN [?Isopenicillin N] in P.C.' (August 1981); 'G100 column' (September 1981); 'P₁ value' (September 1981); 'Km - Deter[mination]' (September 1981); 'ACV [?dimer] activit / also with C. acremonium' (September 1981); 'R1223 / harvest time antibiotics production' (September 1981); 'Effect of co-factors' (October 1981); '1. Effect of α -ketoglu[tinate] 2. DEAE in MOPS' (October 1981); 'Dyno mill R1225/1' (October 1981); 'Stability in various buffers' (October 1981) 'R1225/2 Extract prep':- 'TRIS' 7 & 8' (December 1981); 'Activity Bacilysin samples' (December 1981); 'R1225/3 dyno mill' (December 1981); 'R1225/4' (December 1981); 'R1225/5' (January 1982); 'R1225/6' (February 1982); 'R1225/7' (March 1982); 'Prep - Gel expts' (March 1982) ; 'Harvest of P₂ in "old" & "new" media Dyno mill extracts' (April 1982); 'Use of chromatofocussing phenylsepharase columns' (April 1982); 'P₂ in "old" - large scale Dyno mill' (April 1982); 'Chromatofocussing 2nd expt' (May 1982); 'Use of phenylsepharase at 35% AS concⁿ' (May 1982); '1. Harvest of P₂ in old media in fermentor 2. P₂ / new / shake flasks' (May 1982); P₂ (350g) - Dyno mill extract' (May-July 1982).

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- C.269-C.282 Loose notes, originally from a binder, 1979.
- Separated into sections by dividers labelled as follows: Untitled notes at front (September 1979); 'Dialysis in Fe etc [?1h]' (September 1979); 'Dialysis 68 [?1h]' (August, September 1979); 'Ph 66' (August 1979); 'Co-factors 64 65' (August 1979); '50,000g 61' (July 1979); '20,000g 50,000g 60' (July 1979); '+ - DTT 20,000g 59' (June, July 1979); 'GSJ - ACV 20,000g 58' (June, July 1979); 'diff[erential] assay 55' (June 1979); 'ACV: time' (April 1979); 'ACV / PL concⁿ' (February-May 1979); A[encircled C]V + ACV 76' (October 1979); 'A[encircled C]V' (October 1979); 'A[encircled C]V, ACV 75' (October 1979); 'ACV / CP' (May 1979); 'JEB / ACV / ³H' ³H / ¹⁴C ACV ex JEB' (July-September 1979); ³H - isopen N' (February-April 1979); 'N purifⁿ' (June-July 1979); '1153 N - C [?]' (January-July 1979); 'C91 / ³H αad' (February, March 1979); 'dialysis DTT 1h asc 72' (September 1979).
- 14 folders.
- C.283 Binder inscribed 'Henry Chmara Amidotransfer' on cover, 1979 (with a few notes dated 1978 near back).
- Topics covered include 'Purification of amidotransferase from E-coli ESS 22-31' (October 1979); 'Action of Bacilysin in vivo inhibition of amidotransferase' (August 1979); 'Purification of amidotransferase from C[?oryne]bacterium 168' (July 1979); 'Purification of amidotransferase from Sup. 105000g' (May 1979); 'Purification of amidotransferase from E-coli MRE 600' (March 1979); 'Purification of a new part of E. coli MRE 600 and some aspects of interaction with bacilysin and anticapsin' (February 1979).
- Loose notes at back.
- C.284 Notebook inscribed 'C.P. Pang Analytical PAGE Isopenicillin N syn[?e]thetase', June 1982-November 1983.
- Title on first page is 'Gel electrophoresis'. This topic appears to cover all the notes in the book.
- C.285 Notebook in Abraham's hand.
- From front: notes *re* visits to universities and institutions in the USA and *re* various chemical processes. From back: notes on atomic physics, isotopes and various biochemical processes. References to published sources indicate a possible date *ca* 1948.
- C.286 Manuscript numerical data, possibly relating to experiments, n.d.
- Found loose in unmarked file.

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C.287-C.357

MEDICAL RESEARCH COUNCIL

1949-1987

In July 1949 the MRC's Antibiotics Research Station at Clevedon began to produce culture fluids from the *cephalosporium* fungus for study by the Sir William Dunn School of Pathology. In early 1952 Abraham's colleague Guy Newton was sent to Clevedon to help speed up the supply of Cephalosporin N. The improved supply enabled Abraham's team to isolate almost pure Cephalosporin N. In 1957, following Glaxo's difficulties in producing sufficient quantities of Cephalosporin C for the Dunn School's requirements, Clevedon workers discovered a mutant strain of the fungus which gave significantly higher yields.

Abraham served on the Scientific Steering Committee to oversee the work of the Antibiotics Research Station, Clevedon.

The majority of the papers relate to the work of the Antibiotics Research Station and its collaboration with the Sir William Dunn School of Pathology.

See C.1042-C.1048 for further correspondence *re* the work at Clevedon.

C.287-C.292

Correspondence between Abraham and C.W. Hale of the Antibiotics Research Station, *re* research on cephalosporin, October 1949-December 1952.

Included are copies of typescript reports by scientists at the Antibiotics Research Station and the Sir William Dunn School of Pathology.

6 folders.

C.293-C.308

Contents of a file inscribed 'EPA corresp. Clevedon - Oxford - NRDC'.

Correspondence, mostly carbon copies of letters from Abraham to B.K. Kelly and G.W. Hale at Clevedon; included also is correspondence between Abraham, the National Research Development Corporation and Glaxo Laboratories Ltd. 1949-1961.

C.293-C.296

1949-1954.

4 folders.

C.297-C.300

1955-1958.

4 folders.

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- C.301-C.307 1959-1961.

7 folders.
- C.308 Letters by Guy Newton to Abraham, ca [March- May] 1952.
- C.309-C.317 Drafts of papers co-authored by Abraham, with related material.

Publication details given where known.
- C.309 1p copy of typescript abstract of a paper entitled 'Properties of some derivatives of cephalosporin C and heterocyclic tertiary bases', by C.W. Hale, Abraham and G.G.F. Newton, *Supplement to International Abstracts of Biological Sciences* (IV International Congress of Biochemistry, Vienna, September 1958); letter from Hale, 1958.
- C.310 'The Influence of Methionine on the Biosynthesis of Cephalosporin N', by C.W. Hale, Abraham and G.G.F. Newton.

18pp copy of typescript draft with manuscript revisions; 2 letters *re* the content and possible publication of the paper, December 1958.
- C.311 'The Cephalosporin C Nucleus (7-Aminocephalosporanic acid)', by G.G.F. Newton and Abraham. Probably published under this title followed by the additional words 'and some of its derivatives', by Bronwen Loder, G.G.F. Newton and Abraham, in *Biochemical Journal* **79**, 1961.

13pp copy of typescript, with draft figures etc, with the first of the above titles and authors.
- C.312 'Formation of the cephalosporin C nucleus (7-ACA) by enzymic hydrolysis of an N-acyl derivative of 7-ACA' by G.G.F. Newton and Abraham.

5pp copy of typescript draft with manuscript revisions.
- C.313 Copies of typescript appendices, possibly to the papers in C.309 and C.310.

2pp copy entitled 'Appendix 1. "Incorporation of 1-¹⁴C Acetate into Cephalosporin C"', by C.W. Hale, G.A. Miller, Abraham and G.G.F. Newton (possibly part of the paper published under this title, with the name P.W. Trown added to the authors, in *Biochemical Journal* **84**, 1962).

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Research and development

- /... 6pp copy entitled 'Appendix 2. "Cephalosporin C_C"', by G.G.F. Newton and Abraham.
- 5pp copy, with manuscript revisions, entitled 'Appendix 3. "Cephalosporin C_A (pyridine)"', by Abraham, G.G.F. Newton and C.W. Hale.
- C.314 'The Separation of Cephalosporin N and Cephalosporin C', by G.G.F. Newton and Abraham.
- 8pp copy of typescript draft with manuscript corrections.
- C.315, C.316 Copies of 5 typescripts detailing various experiments, mostly *re* Cephalosporin C, with manuscript revisions and annotations.
- Found with the draft in C.314; one typescript is inscribed 'separation paper'.
- 2 folders.
- C.317 Typescript report by C.W. Hale, December 1956; data and photographic prints (some mounted onto cards).
- Found with the material in C.314-C.316.
- C.318-C.320 Copies of typescript reports of experimental results by scientists at the Antibiotics Research Station.
- C.318 Reports by C.W. Hale entitled 'The Extraction of antibiotics produced by Malayan actinomycete', January-March 1951.
- C.319, C.320 Various reports, 1957-1959, 1961, n.d.
- 2 folders.
- C.321 Correspondence and committee papers *re* the setting up and business of the Scientific Steering Committee for the work of the Antibiotics Research Station, April 1956-October 1957.
- Abraham was a member of the Committee which was formed in May 1956 to act as an advisory body to the Antibiotics Research Station.

Research and development

- C.322 Miscellaneous correspondence and papers *re* the work of the Antibiotics Research Station, 1956-1958.
- C.323-C.333 Correspondence with the National Institute for Medical Research, 1950-1973.

Re various research on antibiotics and the preparation of papers for publication. Correspondents include Martin Pollock.

Contents of a file inscribed 'NIMR'.
- C.323-C.327 1950-1957.

5 folders.
- C.328-C.333 1958-1968, 1972, 1973, 1978.

6 folders.
- C.334 Miscellaneous typescripts and manuscript notes and diagrams *re* experiments, some possibly for use in the preparation of publications, 1965, 1968, n.d.

Inscriptions on some of the pages indicate collaboration with Glaxo Ltd.
- C.335-C.357 Correspondence and papers *re* applications for research grants by Abraham to the Medical Research Council and correspondence arising, 1953-1985.

Included is correspondence with other organisations and scientists *re* research topics, found with this material and probably related to it; and assessments by Abraham of applications by others for MRC grants.
- C.335-C.341 1953-1970.

7 folders.
- C.342-C.348 1971-1973.

7 folders.

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C.349-C.354 1974-1978.

6 folders.

C.355-C.357 1979-1985.

3 folders.

C.358-C.605 **NATIONAL RESEARCH DEVELOPMENT CORPORATION (NRDC) 1952-1995, n.d.**
(BRITISH TECHNOLOGY GROUP (BTG))

In 1949 the NRDC became involved in the research on Cephalosporin, helping to coordinate the results of the work done at Oxford and Clevedon. Following the isolation of Cephalosporin C in 1953, the NRDC persuaded Glaxo Research Laboratories to join the collaboration. After the elucidation of the chemical structure of Cephalosporin C in 1959 the NRDC took steps to exploit the commercial value of the antibiotic by devising a worldwide patenting and licensing strategy. With the subsequent granting of extensions to some of the patents, sales of cephalosporin antibiotics earned the corporation a total of £152 million in royalties which was shared with inventors.

In order to find methods of producing the Cephalosporin C nucleus (7-ACA) in quantity, the NRDC granted options on licences to the pharmaceutical companies Glaxo, Eli Lilly, Squibb, Smith Kline and French, Merck and Pfizer (USA), Ciba and Farmitalia (Europe) and, later, Fujisawa (Japan). With funding from the Corporation new methods were discovered for the large-scale production of 7-ACA and for the conversion of the penicillin to the cephalosporin ring system, enabling a number of different cephalosporins to be produced.

In 1958 Abraham accepted a consultancy position with the NRDC.

The NRDC later combined with the National Enterprise Board to form the British Technology Group.

See also C.1042-C.1053.

C.358-C.519 Correspondence, with related papers, *re* patenting; the progress of, and the funding of, research on antibiotics (mostly cephalosporins) carried out by Abraham's team and the pharmaceutical companies; the development of marketable drugs by some of the companies; the publication of papers; and matters arising, 1952-1995.

The principal correspondents are NRDC executives and managers, in particular James C. Cain and R.S. Crespi. /...

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- /... The correspondence was found arranged in six separate groups of files. This arrangement has been maintained, though there appears to be no obvious differentiation between these groups in terms of content.
- C.358-C.372 Correspondence, mostly letters to Abraham from the NRDC and patent agents, 1952-1960. Contents of 2 files.
Included is correspondence *re* Abraham's acceptance of the consultancy position.
- C.358-C.362 1952-1955.
5 folders.
- C.363-C.368 1956-1958.
6 folders.
- C.369-C.372 1959-January 1960.
4 folders.
- C.373-C.392 Correspondence etc, mostly carbon copies of letters by Abraham, 1952-1967. Contents of 4 files.
- C.373-C.377 1952-1959.
5 folders.
- C.378-C.382 1960, 1961.
5 folders.
- C.383-C.387 1962, 1963.
5 folders.
- C.388-C.392 1964-1967.
5 folders.

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- C.393-C.413 Correspondence, 1968-1972. Contents of 3 files.

Included is correspondence *re* the patent extension granted to the NRDC in 1972.

Included are a few letters to, or by, other individuals and companies, and draft affidavits by Abraham, mostly in connection with the patent extension referred to above.
- C.393-C.399 1968-1970.

7 folders.
- C.400-C.413 1971, 1972.

14 folders.
- C.414-C.464 Correspondence etc, 1973-1995. Contents of 5 files.

Included are reports on various research topics.
- C.414-C.423 1973-1975.

10 folders.
- C.424-C.438 1976, 1977.

15 folders.
- C.439-C.449 1978-1980.

Included at C.448 is material relating to a dinner held in honour of Abraham on the occasion of his retirement.

11 folders.
- C.450-C.460 1981-1983.

11 folders.

Research and development

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|-------------|---|
| C.461-C.464 | 1985-1992, 1995.
4 folders. |
| C.465-C.493 | Correspondence, December 1958-1966. Contents of 3 files. |
| C.465-C.472 | December 1958-1960.
8 folders. |
| C.473-C.480 | 1961.
8 folders. |
| C.481-C.493 | 1962-1964, 1966. Very few letters are post 1962.
13 folders. |
| C.494-C.519 | Correspondence, 1963-1969. Contents of 4 files. |
| C.494-C.503 | 1963, 1964. With a few letters 1965.
10 folders. |
| C.504-C.512 | 1965, 1966.
9 folders. |
| C.513-C.519 | 1967-1969. Mostly 1967, 1968.
7 folders. |
| C.520-C.523 | Miscellaneous correspondence etc with BTG, 1983-1985, 1988.
4 folders. |

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- C.524-C.532 Copies of assignments and agreements (involving Abraham, Guy Newton, the NRDC and others), with related papers and correspondence, 1954-1967.
- 9 folders.
- C.533, C.534 Accounts produced in accordance with the cephalosporin revenue sharing agreements, with related papers and correspondence, 1959-1963.
- Found with the papers in C.524-C.532.
- 2 folders.
- C.535-C.540 Copies of draft patent specifications for applications filed by Abraham, Guy Newton and the NRDC, 1959-1962.
- 6 folders.
- C.541-C.545 Copies of typescript reports, some co-authored by Abraham, on developments in Cephalosporin C research, with other papers concerning patents, 1959-1962.
- 5 folders.

Research and development

- C.546-C.569 Contents of file labelled 'Cephalosporin C Dossier'.
- Copies of numbered typescript reports by scientists at the Sir William Dunn School of Pathology (including Abraham) and the MRC's Antibiotics Research Station, 1959-ca 1965.
- Some of the reports are also drafts of papers for publication.
- 24 folders.
- C.570-C.574 Copies of typescript 'Reports to the NRDC on Biochemical Studies Relating to Cephalosporins and Penicillins' by the Sir William Dunn School of Pathology, one with manuscript revisions by Abraham, 1969-1973.
- 5 folders.
- C.575-C.583 Copies of typescript research reports on the cephalosporins and B-lactamases by Abraham others, 1969.
- 9 folders.
- C.584 Copy of legal brief relating to a dispute over patents between Dr H.S. Burton and his ex-colleagues at the Sir William Dunn School of Pathology, 1961.
- C.585-C.587 Schedules of patents and patent applications concerning Cephalosporin C, 1960-1971.
- 3 folders.
- C.588-C.604 Miscellaneous papers and correspondence, mostly *re* patents, 1953-1985, 1992, n.d.
- 17 folders.
- C.605 'Cephalosporin Analogue 87/4', a large printed document so entitled produced by Glaxo Group Ltd, ca 1964-1970.
- Containing detailed experimental results and technical information.

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C.606-C.963 **OTHER ORGANISATIONS** **1946-1994, n.d.**

Correspondence and papers, mostly relating to the various stages in the research on Cephalosporin C and other work on B-lactam antibiotics.

The organisations are mostly pharmaceutical companies.

Arranged alphabetically by organisation.

C.606-C.614 **Beecham Group plc** **1970-1991, n.d.**

Beecham was a manufacturer of semi-synthetic penicillins. In 1959 the company succeeded in isolating the penicillin nucleus '6-APA'.

Correspondence, mostly *re* requests for chemical samples for research and exchanges of information.

Included are correspondence and papers *re* the Beecham Colloquium (September 1981): at C.612 are a copy of a transcript of a discussion at the colloquium 'The Control of Antibiotic-resistant bacteria', in which Abraham participated; and a proof, with manuscript corrections, of a paper 'The Design of New Antibiotics and Bacterial Resistance' by Abraham, probably given at the colloquium. Also included at C.614 is correspondence *re* Abraham's assistance to Beecham in patent litigation.

C.606-C.610 1970-1977.

5 folders.

C.611-C.614 1978-1983, 1987, 1988, 1991, n.d.

4 folders.

C.615 **Bristol-Myers Company (USA)** **1973, 1978-1987**

Correspondence *re* studies on B-lactam antibiotics.

Research and development

C.616-C.620 **CIBA Ltd** **1961-1966, 1973-1975**

CIBA was one of the companies granted a licence by the NRDC in the 1960s to research methods of producing the Cephalosporin C nucleus.

Abraham gave a lecture at CIBA, Basle, Switzerland, September 1962.

Correspondence and papers.

Included at C.618, C.619 are manuscript and typescript drafts (some incomplete) of Abraham's lecture entitled, 'Preliminary Experiments on the Biosynthesis of Cephalosporin C', with related correspondence. Also at C.619 is a copy of a 3pp typescript of a talk by Abraham entitled 'Gordon Conference'.

5 folders.

C.621-C.624 **The Distillers Company Ltd** **1949, 1953-1963**

In the 1950s Distillers produced quantities of cephalosporin for use by the Sir William Dunn School of Pathology. The company reached an agreement with the NRDC (1959) for research into Cephalosporin C.

Correspondence etc.

Included is material relating to a patent dispute between Beecham Research Laboratories Ltd and Distillers.

4 folders.

C.625-C.632 **Dyson Perrins Laboratory (Oxford)** **1971, 1978-1991**

The 1970s and 1980s saw various collaborative projects on the biosynthesis of penicillins and cephalosporins involving the Dyson Perrins Laboratory, the Sir William Dunn School of Pathology and Eli Lilly (see C.633-C.881).

Correspondence and papers.

Included is correspondence with Jack Baldwin *re* research on biosynthesis of penicillins and cephalosporins and related articles. Some correspondence relates to appointments to research and other posts, including refereeing.

At C.628-C.630 are manuscript and typescript drafts of an article by Abraham and Baldwin 'The Biosynthesis of Penicillins and Cephalosporins', *Natural Products Reports* 5 (Royal Society of Chemistry), 1988, with correspondence *re* publication.

/...

Research and development

- /... At C.631 are unidentified manuscript and typescript drafts found with the material in C.628-C.630.
8 folders.
- C.633-C.881** **Eli Lilly and Company** **1954-1994**
- Eli Lilly signed an agreement with the NRDC in January 1959 for a research programme aimed at producing substances related to Cephalosporin C (including its nucleus). This project was unsuccessful, but in early 1960 the NRDC granted the company an option on a licence allowing it to research processes of converting Cephalosporin C to its nucleus (7-ACA). It was the only licensee to achieve a breakthrough in this area, paving the way for large-scale production of the nucleus. Eli Lilly introduced its first cephalosporin antibiotic in 1964.
- In the following years Eli Lilly funded collaborative research projects on the biosynthesis of penicillins and cephalosporins involving the Sir William Dunn School of Pathology and the Dyson Perrins Laboratory (see C.625-C.632).
- C.633-C.694 Correspondence, with related papers, mostly *re* research on cephalosporins, 1954-1990.

The correspondence covers a number of divisions of the company in the USA and the UK.
- C.633-C.642 1954, 1957-1962.

Some correspondence 1957-1959 relates to the preparation of crude secretin.
10 folders.
- C.643-C.662 1965-1971.

Included at C.653-C.659 are manuscript and typescript drafts, some incomplete and disarranged (with proof at C.661), of a paper entitled 'Cephalosporin C' by Abraham and P.B. Loder in *Cephalosporins and Penicillins: Chemistry and Biology*, ed. by E.H. Flynn, New York 1972. Related correspondence is at C.649-652 and C.660-C.662.
20 folders.
- C.663-C.677 1972-1976.
15 folders.

Research and development

- C.678-C.686 1977-1985.
- At C.683 is a copy of a typescript of Abraham's introduction to *Chemistry and Biology of B-lactam Antibiotics* (Volume 1), edited by Robert B. Morin and Marvin Gorman, New York and London, 1982. At C.684 is a proof with corrections of 'Biosynthesis of Penicillins and Cephalosporins', a chapter by Abraham in *Beta-Lactam Antibiotics for Clinical Use, Clinical Pharmacology 4*, edited by Sherry F. Queener *et al.*, New York 1986.
- 9 folders.
- C.687-C.694 1986-1990.
- 8 folders.
- C.695-C.697 Drafts and copy of an agreement, December 1985, between Eli Lilly, the University of Oxford, Abraham and Jack Baldwin relating to co-operation on the B-lactam Biosynthesis Project, with correspondence etc *re* the agreement and related matters, 1985, 1986.
- 3 folders.
- C.698-C.833 Experimental notes, originally in a large ring binder, by one of Abraham's research workers. Included are graphs, tables of results, photographs, a few letters and other related papers. The notes are similar in appearance and content to those in C.207-C.286 which are in, or taken from, ring binders.
- Contents of 4 boxes labelled '1' to '4'. Notes on pieces of card found in the boxes are inscribed 'JAH', probably indicating that these notes were the work of Joyce A. Huddleston, a junior colleague of Abraham. The notes appear to relate to some of the collaborative work between Eli Lilly and Oxford University referred to above.
- Found with the remainder of the Eli Lilly papers and correspondence in this sub-section.
- C.698-C.734 Notes, contents of 'Box 1'.
- Listed as two groups of folders for ease of reference.
- C.698-C.714 Separated by dividers labelled as follows: ' α p: DS,T,ESS', November 1979; 'time course substrates centⁿ [centrifugation]', October, November 1979; 'cofactors undia / dialysed', October 1979; 'D-M -20°C myc[elium] 73/2', October 1979; 'D-M/2 73', September 1979; 'D-M 70', September 1979; 'Dr Young's cpd', July 1977; 'Lu43, 44 PS', September-November 1980; 'Ferrocyl deriv[atives]', June-September 1976; /...

Research and development

/... 'clav[ulanic] acid', July, August 1976; 'GL cpds', June-September 1976; 'SGW Bioassays', March-October 1976, April 1978; 'Proto: C', April, May 1978; 'Proto: N, C 120, 250', May 1978; 'Proto stabilisers', June 1978; 'Pen N: ESS', June 1976-October 1977; 'Pen N: T', November 1976, July 1979; 'C, N + BI', February, March 1978; 'BI: cephs', January 1978; 'IN / N bioassay', February, May 1979; 'PL control', July 1978; 'Separations N, C etc', January 1977-December 1978; '10% NaCl', July 1975; 'ACUSO₃H elp.', October 1975, February 1976; December 1977; 'analyser: cephs cephs oxidised', November 1977; 'μ-NH₂ Lilly solv 1', June, July 1978; 'ODS - 2', March-July 1978.

17 folders.

C.715-C.734

(Continued from C.698-C.714). 'C₁₈ Porasil [?]', April 1975-May 1979; 'Liposomes', April 1978-January 1979; 'REV', February, March 1979; 'GSH, ACVSH [?]', July, 1975-February 1976; 'ox. stds', May 1975; 'XAD-2', July 1978; 'Lilly: N sulphoxides', March 1976; 'Axcorsil [?]', February 1975-March 1977; 'Purifⁿ of Pen N by [?]; Sepⁿ 7-[?] Ceph C & Pen N by acidⁿ', March 1975; 'Pen N [to] penillic acid', March-September 1975; 'Pen purifⁿ - [?]', June 1974-May 1976; 'TP-1 TP-2', April, May 1977; 'Detⁿ of efficiency of counting', July 1975-July 1977; 'Streptomyces lipmanii', February-October 1975; 'C91 growth expr', May 1977-April 1978; 'G25 Pen purifⁿ 1', July, August 1975; '2', September, October 1977; 'penillic acid', September, October 1977; 'C91 peptides', May-September 1976; 'C91 cuprous mercaptide', January-December 1975; 'Pen N [to] αaad [Pen] SO₃H', June, August 1977; 'αaadgly', October 1975-May 1977; 'A. nidulans TCA extract', January, May 1975.

20 folders.

C.735-C.778

Notes, contents of 'Box 2'. This box was also inscribed 'Lilly / SWQ 3H / 14C'.

Listed as two groups of folders for ease of reference.

C.735-C.757

Separated by dividers labelled as follows: 'L - 2, 33H[?]val 10/1', November 1975-January 1976; 'L-3-3H val 8/1', February-October 1976; 'C. acremonium mutants (Lilly)', April-July 1975; 'ACV: intra and extracellular', August-October 1975; 'Lilly: ¹⁴C val [to] ACV', June 1975; 'L-3H-val 3H / ¹⁴C = 7/1', September-December 1976.

23 folders.

Research and development

- C.758-C.778 (Continued from C.735-C.757). 'L-2-3Hval', January, February 1977 (included at C.758 are a few letters to Abraham from Douglas Young of Sussex University, 1975-1977; included at C.759 is copy of a 9pp draft of paper entitled 'The Stereochemistry of B-lactam Formation in Cephalosporin Biosynthesis', by Abraham, Joyce A. Huddleston *et al*, *Biochemical Journal* **169**, 1978); '3H / ¹⁴C cysteines expr 1', February-April 1977; 'Expr 2', June-September 1977; '[?] cys XAD', July 1976-April 1977.
- 21 folders.
- C.779-C.811 Notes, contents of 'Box 3'.
- Listed as two groups of folders for ease of reference.
- C.779-C.793 Separated by dividers labelled as follows (with page of contents at beginning): 'LLD - ACV(1)', August 1978-January 1979; 'LLD - ACV(2)', November 1976-January 1979 (chiefly 1978); 'Ceph C ex [?]', February 1976-October 1977.
- 15 folders.
- C.794-C.811 (Continued from C.779-C.793). 'DTT, cys: [?]', August, September 1977; 'C91 ceph C resuspⁿ [resuspension]', February 1976-July 1977; 'ACV content', March 1976; 'toxy content', March, April 1976; 'glass wool', January 1977; 'Radioactive cpds', January-November 1975; 'C91 Protoplast exprs ¹⁴Cval', January 1975; 'CV', February-October 1975; 'DLD-ACV', March-July 1975; 'CV(2)', February-November 1975; 'Toxin 1', January, February 1978; 'N acetyl ceph C', May-February 1976; 'N acetyl Pen N', May, June 1975; 'G10 s[?]pn acids', July 1975-November 1976.
- 18 folders.
- C.812-C.833 Notes, contents of 'Box 4'.
- Separated by dividers labelled as follows (with page of contents at beginning): 'mo198', October 1978; '³N / MIT', November 1978-January 1979; '[?]lysate] Demain Oxford', July 1978; 'Pen N expr 3', April, May 1978; 'Demain ESS', February 1978; 'effect of Demain buffer', February, March 1978; 'Demain 3H Pen N', January, February 1978; '3H Pen N 2 tube 3', January-March 1978; 'evapⁿ bioassay', January-March 1978; 'tris / mops', January 1978; '3H Pen N [pH] 7.5, 6.5, 4.5', December 1977; '1078 ESS tris / mops', December 1977; '3H Pen N 2', October-January 1978; 'ESS cof[actors] +/- AccoA', October 1977; '3H 1 Pen N', September-November 1977; '250 rpm ESS co f. bio', September 1977; '250 ESS [?] [?]', September 1977; '250 rpm [?]', August, September 1977; 'Demain expr', August 1977; '250 rpm ESS', August 1977.
- 22 folders.

Research and development

- C.834-C.881 Contents of a file entitled 'SWDSOP – DP [Sir William Dunn School of Pathology – Dyson Perrins] collaboration 1984-'.

Papers and correspondence, 1985-1994, with a few papers, 1961, 1962.

Mostly copies of reports *re* the collaborative research carried out by Eli Lilly and Oxford University. There is also material relating to published papers and correspondence, 1985-1994.

For related material see C.1071-C.1077.
- C.834 'Isolation, sequence determination and expression in *Escherichia coli* of the Isopenicillin N-synthetase gene from *Cephalosporium acremonium*', by Abraham *et al.*, *Nature* **318**, 1985.

2 copies of typescripts, one headed 'working copy' with manuscript revisions, the other headed 'final copy'; letter *re* publication.

Further correspondence etc relating to this paper is in C.836, C.837.
- C.835-C.865 Drafts and copies of various reports etc, and papers *re* the exchange of information between Eli Lilly and Oxford, 1985-1989.

None of the reports appear to be by Abraham, though his manuscript revisions are found on some.

31 folders.
- C.866 'Acyl coenzyme A: 6-aminopenicillanic acid acyltransferase from *penicillium chrysogenum* and *aspergillus nidulans*', by Abraham *et al.*, *FEBS Letters* **262**, 1990.

6pp copy of typescript of paper.
- C.867-C.874 'Isolation of deacetoxycephalosporin C from fermentation broths of *penicillium chrysogenum* transformants: construction of a new fungal biosynthetic pathway', by Abraham *et al.*, *Proceedings of the Royal Society B* **248**, 1992.
- C.867-C.871 Correspondence *re* preparation and publication of the paper, September 1991-December 1992.

Included are typescript drafts, some with manuscript revisions by Abraham.

5 folders.

Research and development

- C.872 Further typescript drafts, some incomplete, with manuscript notes by Abraham.
- C.873, C.874 Material printed out from a floppy disc found with the papers in C.867-C.872.
- 2 further drafts of the paper, with other pages of text probably related to the paper.
- 2 folders.
- The original discs are included at C.873.
- C.875 2pp manuscript draft by Abraham, entitled 'The Production of Cephalosporins by a Transformant of *Penicillium chrysogenum*', of an introduction for a paper, with revised typescript version and further 1p typescript draft.
- Possibly early drafts of the paper 'Production of deacetoxycephalosporin C by transformants of *Penicillium chrysogenum: antibiotic pathway engineering*', by Abraham *et al.*, *Industrial Microorganisms* (possibly a publication by the American Society of Microbiology), [?1993].
- C.876 8pp copy of typescript for unidentified publication entitled 'Production of deacetoxycephalosporin C by introduction of modified bacterial isopenicillin N epimerase and penicillin N expandase genes in *Penicillium chrysogenum*'.
- C.877-C.879 Miscellaneous correspondence, with reports, *re* progress of research, 1988-1991, 1994.
- 3 folders.
- C.880, C.881 Miscellaneous typescript reports etc by the Lilly Research Laboratories, 1961, 1962, 1971.
- 2 folders.
- C.882-C.913 **Glaxo Group Ltd** **1957-1985**
- In 1956 the NRDC arranged for Glaxo to join in the research on Cephalosporin C, chiefly to find ways of increasing the yields of the antibiotic from strains of the *cephalosporium* fungus. This was achieved after much painstaking work involving repeated mutations of the mould. /...

Research and development

- /... Glaxo's huge investment in the research bore fruit in 1964, with the introduction of its drug 'Ceporin' ('cephaloridine') into medicine.
- Correspondence etc mostly *re* research on Cephalosporin C, the progress of 'cephaloridine', publications and matters arising.
- C.882-C.889 1957-1964.
- Included is correspondence *re* cephalosporin nomenclature.
- 8 folders.
- C.890-C.897 1965-1968.
- Included at C.891, C.892 are a draft and a later copy of the script of a Glaxo film entitled 'Antibiotic from the sea'. Abraham assisted in the production of the script and appeared in the film, though not as a speaker.
- Included also is correspondence etc *re* the Conference on Cephalosporidine at New College Oxford, 13-16 March 1967, which Abraham attended; at C.895 is a copy of a typescript of an introductory talk given by Abraham at the conference entitled 'Cephaloridine. Historical Remarks'.
- 8 folders.

Research and development

- C.898-C.905 1969-1972.
- Included is correspondence etc *re* the International Conference on Cephalosporins, Brighton, 11-13 May 1970, in which Abraham participated. At C.901 is a copy of a typescript draft of a review of the conference by Abraham and P.B. Loder: 'Cephalosporins', *Postgraduate Medical Journal*, Supplement vol. 46, October 1970.
- 8 folders.
-
- C.906-C.913 1973-1985.
- Included is correspondence *re* a proposal by Glaxo to enter into a collaborative research project (which the company would finance) with the Sir William Dunn School of Pathology.
-
- C.914-C.921 **Imperial Chemical Industries Ltd (ICI)** **1953-1988**
- Abraham held a consultancy position with ICI, 1955-1958.
- Scientific correspondence *re* research on the cephalosporins and other antibiotics, 1953-1963, 1970, 1981-1988. Mostly 1953-1963.
- 8 folders.
-
- C.922-C.928 **Merck & Co. Inc.** **1950-1981**
- Merck was one of the companies licensed by the NRDC in the early 1960s to work on the production of the Cephalosporin C nucleus.
- Correspondence *re* research on Cephalosporin C and other antibiotics, 1950, 1953, 1958-1981.
- 7 folders.
-
- C.929-C.940 **Microbiological Research Station (Porton Down)** **1948-1992**
- The station supplied microorganisms and microbial products to research workers. In 1961 it began a Cephalosporin C production project to assist with the research programme overseen by the NRDC.
- Correspondence, with copies of reports, *re* work on Cephalosporin C and B-lactamases, 1948, 1950, 1956-1978, 1992. Mostly 1959-1978.

Research and development

C.941-C.943 **Pfizer Inc. (Chas. Pfizer & Co. Inc.)** **1960-1986**

Pfizer was one of the companies licensed by the NRDC in the early 1960s to work on the production of the Cephalosporin nucleus.

Correspondence *re* research on Cephalosporin C and other antibiotics, 1960-1962, 1977, 1978, 1985, 1986. Mostly 1960-1962.

3 folders.

C.944, C.945 **Smith, Kline & French Laboratories** **1960-1975**

Smith Kline & French was one of the companies licensed by the NRDC in the early 1960s to work on the production of the Cephalosporin C nucleus.

Correspondence etc, mostly *re* research on Cephalosporin C, 1960-1962, 1972-1975.

2 folders.

C.946-C.962 **Squibb Institute of Medical Research** **1946-1983**
(E.R. Squibb & Sons Inc.)

Squibb was one of the companies licensed by the NRDC in the early 1960s to work on the production of the Cephalosporin C nucleus.

C.946-C.949 Correspondence and papers *re* Cephalosporin C and proposed visits and conferences etc, 1946, 1957-1966.

Included is correspondence *re* arrangements for Abraham's participation in the Sixth Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC), Philadelphia, USA, October 1966.

4 folders.

C.950, C.951 Correspondence etc, chiefly *re* a legal case involving E.R. Squibb and Sons Inc, 1971.

Included is a draft of an affidavit by Abraham in connection with this case.

2 folders.

Research and development

- C.952-C.960 Lectures by Abraham: the Squibb Lectures for 1972 at Rutgers University, New Jersey, 20, 21 September; and at the annual meeting of the Infectious Diseases Society of America, Atlantic City, 25-27 September 1972.
- C.952 Correspondence *re* arrangements for both events and correspondence arising, 1971, 1972.
- C.953-C.957 Drafts etc of the Squibb Lectures.

Abraham delivered 2 lectures which were published as 'Biosynthesis and Enzymic Hydrolysis of Penicillins and Cephalosporins', University of Tokyo Press, 1973.
- C.953 'Biosynthesis of Penicillins and Cephalosporins', first Squibb lecture.

In the published version the title of the lecture is 'Aspects of the Biosynthesis of Penicillins and Cephalosporins'.

26pp manuscript draft with revisions; copy of revised typescript version with addenda.
- C.954-C.956 'B-lactamases and their Role in Resistance to B-lactam Antibiotics', second Squibb Lecture.

58pp typescript draft, with manuscript revisions, and figures etc.

3 folders.
- C.957 Copy of proof with corrections.
- C.958 Lecture given at the annual meeting of the Infectious Diseases Society of America as a contribution to the topic 'Enzymic Degradation of Antibiotics'.

47pp manuscript draft with revisions entitled 'Enzymic Degradations of the Penicillins and Cephalosporins', with 4 further pages, possibly part of another draft version; typescript tables and data etc, probably relating to the lecture.
- C.959, C.960 Correspondence arising from the lectures, chiefly *re* the publication of the Squibb Lectures, October 1972-March 1974.

2 folders.

Research and development

C.968-C.972 **University of Edinburgh** **1965-1981**

Correspondence *re* research on B-lactamases,

The principal correspondent is Martin Pollock. General correspondence is included.

5 folders.

C.973-C.976 **University of Newcastle-upon-Tyne** **1974-1983**

Correspondence etc, chiefly with R.J. Stoodley of the School of Chemistry, *re* research on B-lactamases.

Includes correspondence *re* arrangements for a lecture by Abraham at the University, November 1974, and a B-lactamase workshop, April 1979.

4 folders.

C.977-C.986 **University of Sheffield** **1962-1974**

Correspondence and papers *re* research on actinonin, 1962-1968, 1974. Almost all the material is 1962-1968.

The NRDC funded work on actinonin undertaken jointly by Abraham's department and chemists at the University of Sheffield working under David Ollis, Professor of Organic Chemistry.

10 folders.

C.987, C.988 **University of Surrey** **1972-1981**

Correspondence *re* biosynthesis of penicillins and other research on B-lactam antibiotics, 1972, 1973, 1979-1981.

The principal correspondent is Robert Thomas. Included is a typescript draft with manuscript corrections (in a hand other than Abraham's) of a paper entitled 'The Interaction of Nocardicins with B-Lactamase II', by Abraham *et al* (publication details unknown).

2 folders.

Research and development

C.989 **University of Sussex** **1973-1982**

Correspondence mostly *re* research involving chiral cysteines.

The principal correspondent is Douglas Young of the School of Molecular Sciences.

C.990-C.1016 **BACILYSIN RESEARCH** **1957-1991**

The antibiotic bacilylsin, produced by a number of strains of *Bacillus subtilis*, was first encountered by Abraham and his co-workers in 1946. Preliminary work on the production and purification of bacilylsin was carried out by Abraham and Guy Newton, but the work ended in 1948 due to insufficient resources and the Dunn School's increasing interest in cephalosporins. Abraham and his colleagues returned to research on this antibiotic in the early 1960s.

This material was found in a number of files which were tied together.

C.990-C.995 Correspondence etc *re* research on bacilylsin and related substances, 1957, 1962-1975, 1981-1991. Contents of a file.

The correspondents comprise Abraham's colleagues and other scientists working in various countries.

6 folders.

C.996-C.1009 Published papers, 1965-1970 or [?after].

C.996, C.997 'Production and Purification of Bacilylsin', by Abraham, G.G.F. Newton and H.J. Rogers, *Biochemical Journal* **97**, 1965.

C.996 13pp manuscript draft with revisions; later typescript draft with manuscript revisions (including draft figures).

C.997 Proof with manuscript corrections; re-print with manuscript annotations.

C.998, C.999 'Observations on the Structure of Bacilylsin' by Abraham *et al*, *Biochemical Journal* **97**, 1965.

Research and development

- C.998 24pp typescript draft, with manuscript revisions, and draft figures.
- C.999 Proof.
- C.1000 'Experiments relating to the Biosynthesis of Bacilysin', by Abraham and J. Roscoe, *Biochemical Journal* **99**, 1966.
21pp manuscript draft with revisions; later incomplete 2pp typescript draft with manuscript revisions; re-print.
- C.1001 'Isolation of Bacilysin and a New Amino Acid from Culture Filtrates of *Bacillus subtilis*', by Abraham and J.E. Walker, *Biochemical Journal* **118**, 1970.
Copy of 11pp typescript and figures etc; proof.
- C.1002, C.1003 'The Structure of Bacilysin and Other Products of *Bacillus subtilis*', by Abraham and J.E. Walker, *Biochemical Journal* **118**, 1970.
- C.1002 15pp typescript draft, with manuscript revisions, and legends for figures etc.
- C.1003 Copy of revised typescript and proof.
- C.1004 'Antibiotic Production and Sporulation in *B. subtilis*', by Abraham and J.E. Walker, [?1970 or after]. Publication details unknown.
7pp typescript draft with manuscript revisions.
- C.1005 'Effect of Bacilysin on Certain Fungi and Yeasts', by Abraham and J.E. Walker, [?1970 or after]. Publication details unknown.
2pp typescript draft, possibly incomplete, with manuscript revisions; copy of typescript revised version, with photographs for figures.
- C.1006 'Carbobenzoxy Derivative of Bacilysin', by Abraham and J.E. Walker, [?1970 or after]. Publication details unknown.
Copy of 2pp typescript and photographs for figures.

Research and development

- C.1007 25pp untitled manuscript draft of paper *re* experiments on bacilylsin, with revisions, [?1970 or later].
- C.1008, C.1009 Untitled drafts of paper *re* experiments on bacilylsin, [?1970 or after].
- C.1008 35pp typescript draft of main text with manuscript revisions.
- C.1009 Part of another typescript draft of the paper with manuscript revisions; copy of typescript draft, with manuscript revisions, of captions for figures etc, with photographs.
- C.1010, C.1011 Correspondence with various scientists and organisations *re* research on bacilylsin, 1962-1965.

A few letters relate to the preparation of some of the papers in C.996-C.1009.

2 folders.
- C.1012-C.1014 Reports, experimental results and research programmes etc *re* studies on bacilylsin compiled by Abraham and his co-workers, 1962-1965, *ca* 1966.

Mostly typescript, some with manuscript annotations.

3 folders.
- C.1015, C.1016 Miscellaneous notes and data, mostly manuscript, some possibly relating to the preparation of the papers in C.996-C.1009.

2 folders.
- C.1017-C.1037 LEGAL CASES 1978-1989**
- Papers and correspondence relating to Abraham's involvement in legal cases between pharmaceutical companies in the USA. The disputes concerned patents for cephalosporin antibiotics.
- C.1017-C.1031 Eli Lilly and Company v Premo Pharmaceutical Laboratories, 1978-1980.

Research and development

The dispute was over an alleged infringement of an Eli Lilly patent relating to cephalixin. Abraham appeared in court as an expert witness for Eli Lilly.

C.1017-C.1030

Correspondence and copies of documents relating to the case, 1978-1980.

Documents include affidavits by Abraham and a copy of his testimony.

14 folders.

C.1031

Material for draft of unidentified paper: mostly photographs mounted onto pieces of paper, with captions, and loose photographs.

Found with the papers in C.1017-C.1030.

Research and development

- C.1032-C.1037 Correspondence and papers *re* legal disputes concerning a patent for crystalline cefadroxil monohydrate belonging to the Bristol-Myers Company, 1986-1989.
- The material chiefly relates to the case Bristol-Myers Company v Biocroft Laboratories Inc., 1987. Abraham sent a declaration on behalf of Bristol-Myers.
- At C.1036, C.1037 are two large files of documents: 'Exhibits to the Declaration of Sir Edward P. Abraham' and 'Exhibits to the Declaration of Jack E. Baldwin'.
- 6 folders.
-
- C.1038-C.1067 'CEPHALOSPORIN C HISTORY' 1948-1995, n.d.
- Contents of a box so inscribed.
-
- C.1038-C.1041 Contents of a folder: correspondence and papers mostly relating to the early years of the Sir William Dunn School of Pathology's research on antibiotics from the *cephalosporium* fungus, 1948-1949, 1952, 1961.
- Included is correspondence between Howard Florey and Dr Blythe Brooke, who in 1948 was asked by Professor Giuseppe Brötzu to notify scientists in Britain of the latter's work on cultures from *cephalosporium*; correspondence between Florey and Brötzu; and detailed report and summary of work done by the Dunn School from December 1948-March 1949.
- 4 folders.
-
- C.1042-C.1048 Correspondence between Abraham and various organisations and individuals covering the different stages of the research on Cephalosporin C, with related papers, 1952-1964.
- Correspondents include Guy Newton, the NRDC and the Antibiotics Research Station of the Medical Research Council.
- 7 folders.

Research and development

- C.1049-C.1053 Papers relating to a petition by the NRDC, ca 1958-1960, to the Comptroller of Patents for him to require Dr H.S. Burton to join other inventors in assigning the Cephalosporin N patent to the NRDC.
- Burton was formerly a junior colleague of Abraham who worked on Cephalosporin P and during the early research on Cephalosporin N. He subsequently claimed that his contribution to the work on Cephalosporin N should have entitled him to inclusion in patents other than Letters Patent Number 745208.
- C.1049, C.1050 Contents of a file labelled 'Statement, counterstatement and evidence on behalf of Sir Howard Florey and others'.
- Copies of declarations, statements etc, with other documents used for reference, 1952-1959.
- 2 folders.
- C.1051, C.1052 Contents of a file inscribed 'Evidence in reply on behalf of Sir Howard Florey and others', 1949-1960.
- 2 folders.
- C.1053 Copy of 'Comptroller's Report on the application of NRDC to direct H.S Burton to join with others in assigning the Cephalosporin N (Penicillin N) patent to NRDC', 1962; newspaper cutting relating to this application or a case closely connected with it.
- C.1054-C.1059 'Cephalosporin N history', contents of a file so inscribed.
- C.1054 'A New Type of Penicillin from a Species of Cephalosporium', by Abraham and Guy Newton, VI International Congress of Microbiology, Rome 1953, *Riassunti delle Comunicazioni*, Vol. 1.
- 3pp typescript draft of the paper with manuscript revisions.
- C.1055 'Isolation of Penicillamic Acid and D- α -aminoadipic acid from Cephalosporin N', by Abraham and Guy Newton, *Nature* **172**, 1953.
- C.1056 'Cephalosporin N: a New Type of Penicillin', by Abraham *et al*, *Nature* **629**.
- Proof of article, n.d.

Research and development

- C.1057 2 typescript reports on Cephalosporin N research at the Sir William Dunn School and the Antibiotics Research Station, with manuscript annotations or corrections, 1952-*ca* 1958.
- C.1058 Brief correspondence *re* Abraham's requests for chemical samples from overseas universities, 1953.
- C.1059 Typescript lecture programme on Bacteriology and Immunity at the Sir William Dunn School of Pathology, Trinity Term, 1959.
- C.1060-C.1062 Correspondence and papers, including copy of affidavit by Abraham (and copy of his affidavit for an earlier petition), *re* the petition of the NRDC to extend the term of a patent (Letters Patent No. 953695), 1976.
- The patent concerned the Cephalosporin C nucleus (7-ACA). The petition was successful, the term being extended for four years.
- 3 folders.
- C.1063-C.1067 Miscellaneous papers and correspondence, 1962-1995.
- C.1063 Royal Society Conversazione 23 June 1977.
- 3pp typescript by Abraham and S.G. Waley entitled 'The Development of the Cephalosporin Family of Antibiotics' for exhibit at the Conversazione.
- C.1064 'A Glimpse of the Early History of the Cephalosporins', a speech by Abraham at the Harvard Club dinner, May 1978.
- Copy of 19pp typescript of speech.
- C.1065-C.1067 Miscellaneous correspondence *re* cephalosporin research and the history of Cephalosporin C, 1962-1979, 1995.
- Included at C.1066 is a script for a BBC External Services radio programme '*Report from Britain* no. 151', 1965, which mentions Abraham's work and includes a quote by him.
- 3 folders.

Research and development

- C.1068-C.1114** **MISCELLANEOUS PAPERS** **1945-1991, n.d.**
- C.1068 Abraham's 'Report to the Rockefeller Foundation on activities in the USA during the tenure of a Fellowship from April to October 1948'.

Copy of 19pp typescript draft with manuscript corrections.
- C.1069 'The X-ray analysis of the structure of Cephalosporin C', by Dorothy Crowfoot Hodgkin and E.N. Maslen, *ca* 1961.

Copy of 16pp typescript draft with manuscript revisions by Abraham; referee's comments and response; data found with the article.
- C.1070 'Broadcast for Australia' by Howard Florey, *ca* 1962-1964.

Copy of 9pp incomplete typescript draft of script inscribed 'HWF' (Florey's initials) on first page.
- C.1071-C.1088 Typescript reports, with some manuscript notes, on experiments by some of Abraham's research workers, 1984-1990.

The reports appear to relate to work carried out in collaboration with Eli Lilly and Company (see also C.834-C.881). Some have annotations and revisions by Abraham.
- C.1071-C.1074 D. Perry.

Reports etc *re* work on isopenicillin N synthesase, 1983-1985.

4 folders.

See H.213-H.226 for related material.
- C.1075-C.1082 P.A. Whiteman (né Fawcett).

Reports *re* work on penicillin acylase etc, 1984-1990.

8 folders.

See H.85-H.91 for related material.

Research and development

- C.1083-C.1088 M.S. Thorniley.
Reports *re* work on E-coli and *C. acremonium* etc, 1985, 1986.
6 folders.
See H.254, H.255 for related material.
- C.1089-C.1114 Miscellaneous papers, 1945-1985, 1991, n.d.
Included are reports, manuscript notes, experimental data; at C.1114 is a
laboratory manual.
- C.1089-C.1100 1945-1985, 1991.
12 folders.
- C.1101-C.1114 N.d.
14 folders.

SECTION D

PUBLICATIONS

D.1-D.288

D.1-D.270 DRAFTS

D.271-D.288 EDITORIAL CORRESPONDENCE

Publications

D.1-D.275⁰ DRAFTS 1956-1998, n.d.

Arranged chronologically.

Undated drafts are at D.253-D.270.

D.1 'Some Chemical and Biological Properties of New Antibiotics of the Penicillin Group', co-authored with G.G.F. Newton, *Chemical Science and Industry USSR* 1, 1956.

40pp photocopy of a typescript, with manuscript corrections and additions; 1p manuscript notes by another.

D.2-D.10 Articles and book reviews by Abraham for *Endeavour*, contents of a file.

D.2, D.3 'The Antibiotics in Microbiology', *Endeavour* 18, October 1959.

Correspondence *re* publication with corrected proofs of article.

2 folders.

D.4 Review: *Recent Progress in Microbiology*, edited by G. Tunevall, Oxford 1959.

Correspondence *re* publication; 1p photocopy of typescript draft of review and cutting of printed version.

D.5 Review: 'Antibiotics in Medicine', *British Medical Bulletin* 1960 16, No.1.

Letter with 1p photocopy of typescript of review.

D.6 Correspondence *re* publication of an article 'New Penicillins, Cephalosporin C and Penicillinase', with G.G.F. Newton, *Endeavour* 20, 1961.

D.7 *The Molecular Basis of Antibiotic Action*, by E.F. Gale *et al*, Chichester 1972.

Letters *re* review request with 1p photocopy of printed version of review.

Publications

- D.8 Review: *Fifty Years of Antimicrobials: Past Perspectives and Future Trends*, edited by P.A. Hunter *et al.*, The Society for General Microbiology, 1995.
- Correspondence *re* publication; 1p manuscript and 1p typescript drafts of review, with corrected version.
- D.9 Correspondence *re* unidentified article by Abraham *re* Cephalosporin C, February-December 1960; letter requesting review of a book, 1955.
- D.10 Correspondence with *Endeavour* *re* orders for binding cases, 1958-1968.
- D.11 'Antibiotics', *Enciclopedia Medica Italiana*, 1959 or later.
- Correspondence *re* publication, 1959; 26pp copy of typescript draft (with bibliography) with manuscript corrections.
- D.12 'The Chemistry and Classification of Antibiotics', with G.G.F. Newton, *British Medical Bulletin* **16**, 1960.
- 20pp copy of typescript draft (with tables and references) with manuscript corrections and additions.
- D.13 'Derivatives of Cephalosporin C formed with certain Heterocyclic Tertiary Bases', with C.W. Hale and G.G.F. Newton, *Biochemical Journal* **79**, 1961.
- Letter *re* preparation, 1960; 15pp copy of typescript draft (with references etc) with manuscript corrections; 3 typescript pages of other drafts and figures, probably related to the article.
- D.14 'New Penicillins, Cephalosporin C and Penicillinase, with G.G.F. Newton, *Endeavour* **20**, 1961.
- 17pp copy of typescript draft (with references and figures) with manuscript corrections and additions.
- D.15, D.16 'The Cephalosporins: history and scientific background', *Medical News* **48**, 1963.
- D.15 Correspondence *re* publication; 7pp copy of typescript draft, with manuscript revisions, etc and copy of revised version with figure.

Publications

- D.16 Copy of published version of the article, with extensive manuscript revisions and copy of revised version with figure etc, n.d.
- D.17 'Production of a Cephalosporinase by *Pseudomonas pyocyanea*', with M.Jago and A. Migliacci, *Nature* **199**, 1963.

4pp copy of typescript draft with manuscript corrections; proof with manuscript corrections; reprint; copy of typescript, with figures, describing experimental results, probably related to the article.
- D.18-D.20 Reviews for *Nature*, contents of a file.
- D.18 Joint review article by Abraham covering a number of publications on antimicrobial agents and chemotherapy (mostly published in 1963), including *Antimicrobial Agents and Chemotherapy - 1962. Proceedings of the Second Interscience Conference on Antimicrobial Agents and Chemotherapy, Chicago, Illinois, October 31-November 2 1962*, American Society for Microbiology 1963.

Correspondence *re* review requests; 8pp photocopy of review article; corrected proof.
- D.19 *Antimicrobial Agents and Chemotherapy - 1963. Proceedings of the Third Interscience Conference on Antimicrobial Agents and Chemotherapy, Washington DC, October 18-30 1963*, American Society for Microbiology 1963.

Correspondence *re* publication; 3pp typescript draft of review with manuscript corrections and copy of later typescript draft; corrected proof.
- D.20 *Antimicrobial Agents and Chemotherapy - 1964. Proceedings of the Fourth Interscience Conference on Antimicrobial Agents and Chemotherapy, New York, October 26-28 1964*, American Society for Microbiology, [?1965].

4pp copy of typescript draft of review; proof; copy of typescript probably relating to one of the reviews in D.18-D.20.
- D.21 Obituary for Professor Donald Devereux Woods, *British Medical Journal* **2**, 1964.

2pp copy of typescript obituary and cutting from off-print.

Publications

- D.22 'The Cephalosporin Story', *New Scientist* **24**, No. 217, 1964.

6pp copy of typescript draft, with manuscript corrections, and figures; letter *re* publication.
- D.23 'The Chemistry of New Antibiotics', *The American Journal of Medicine* **39**, 1965.

21pp copy of typescript draft (with references and figures) with manuscript corrections; letter *re* publication.
- D.24-D.26 'Enzymic Behaviour of the Cephalosporins', with L.D. Sabath, *Enzymologia* **29** (memorial volume to Professor H. von Euler), 1965.
- D.24 Correspondence *re* an article which Abraham contributed to a 1963 volume dedicated to von Euler on the occasion of his 90th birthday (apparently later published in the *Biochemical Journal*), October-November 1962.
- D.25, D.26 Correspondence *re* publication of 'Enzymic Behaviour of the Cephalosporins', with 1p copy of typescript 'summary' of the article and copy of typescript of article for the 1963 volume (see D.24). 1965, 1966.

2 folders.
- D.27 'The Cephalosporins', with G.G.F. Newton, *Advances in Chemotherapy* **2**, 1965.

Proof with manuscript corrections and revisions; correspondence *re* publication.

See C.562, C.563 for a draft of this paper.
- D.28 Review for *Nature* (published in 1965): *Advances in Drug Research*, London 1964.

Letters *re* publication; 2pp copy of typescript of review and proof.
- D.29, D.30 'Experiments relating to the Biosynthesis of Bacilysin', with J. Roscoe, *Biochemical Journal* **99**, 1966.

Publications

- D.29 21pp copy of typescript draft (with references and figures) with manuscript revisions.
- D.30 Later copy of typescript draft with manuscript corrections.
- D.31 Review for *British Medical Journal: Biochemical Studies of Antimicrobial Drugs*, Cambridge University Press 1966.

Correspondence re publication and 2pp copy of typescript of review with manuscript corrections.
- D.32 'The Cephalosporin C Group', *Chemical Society Quarterly Reviews* **21**, No. 2, 1967.

Proof with manuscript corrections.

See C.567 for typescript [?draft] of paper.
- D.33-D.114 Articles and radio broadcasts by Abraham on Howard Florey arising from the latter's death in February 1968, with related material.
- D.33 Appreciation of Florey in obituary notice by various writers, *The Lancet*, 2 March 1968.

Letter of thanks; 1p of typescript message of appreciation; off-print.
- D.34 Appreciation of Florey in obituary notice by various writers, *British Medical Journal*, 2 March 1968.

1p copy of typescript message of appreciation with manuscript corrections; photocopy of off-print; letter of thanks.
- D.35 Obituaries for *Oxford Magazine*, 31 May 1968, and [?Lincoln College Magazine].

Abraham's obituary for [?Lincoln College Magazine] was a revised version of the one he wrote for *Oxford Magazine*.

Correspondence re obituary for *Oxford Magazine*, with corrected proof and copy of re-print with manuscript revisions; 2 copies of typescript drafts (8pp and 9pp) of obituary for [?Lincoln College Magazine] with manuscript corrections.

Publications

- D.36 'Lord Florey', *Chemistry in Britain* 4, No.9, May 1968.
Letters re 3pp typescript draft with manuscript corrections; 2pp copy typescript.
- D.37 2pp manuscript draft, with revisions, of obituary; copy of typescript corrected version; off-print. Publication unknown. [?1968].
- D.38 1p untitled typescript draft of obituary with manuscript corrections by Abraham and another, [?1968]. Publication unknown.
- D.39 Short account of Florey's life, Sunday Times Magazine, 1969.
Correspondence re publication, May 1969; 1p copy of typescript draft, with manuscript corrections, of short account of Florey's life inscribed 'Sunday Times April 1969'.
- D.40-D.89 'Howard Walter Florey, Baron Florey of Adelaide and Marston 1898-1968', *Biographical Memoirs of Fellows of the Royal Society* 17, November 1971.
In March 1968 Abraham was asked to write the Memoir for which he undertook a great deal of research into Florey's life in Australia and at Oxford. Despite having to negotiate some sensitive issues, he produced an article considered by most to be authoritative and very interesting.
- D.40-D.57 Correspondence and papers re Abraham's preparation of the memoir, 1968-1971.
Correspondents include individuals and organisations with access to documentary records, former colleagues of Florey and his family and acquaintances.
- D.40-D.47 1968, 1969.
8 folders.
- D.48-D.57 1970-October 1971.
10 folders.

Publications

- D.58-D.64 Correspondence arising from publication of the memoir, mostly letters of thanks from fellow scientists in receipt of copies, with congratulations and comments, September 1971-1972, 1974.
- 7 folders.
- D.65 Copy of off-print of memoir.
- D.66-D.89 Correspondence and papers used by Abraham as background for preparation of the memoir.
- D.66-D.69 Correspondence between Florey and the Medical Research Council *re* grants and assistance provided by the latter for research on penicillin, 1939-1946.
- 4 folders.
- D.70, D.71 Carbon copies of extracts of letters by Florey, Lady (Ethel) Florey and Norman Heatley to John F. Fulton and Lucia Fulton, 1940-1945. Paginated 1-66.
- Contents of a file.
- 2 folders.
- D.72 Photocopies of letters by Florey to John F. Fulton, 1947-1954.
- Contents of a file.
- D.73 Photocopies of correspondence relating to Florey's fact-finding tour to Australia and New Zealand in 1944 to visit medical establishments and photocopy of his report of the tour, 1945.
- D.74 Letters to Abraham from Florey, with related material, 1953-1968.
- D.75 Miscellaneous correspondence of Florey, mostly photocopies, with related papers, 1945-1968.

Publications

- D.76 Correspondence *re* Florey's life, 1957-1969.
- D.77-D.89 Miscellaneous printed and typescript material, manuscript notes by Abraham and correspondence relating to Florey's life.
Photographs in D.79.
- D.90, D.91 Article on Florey in *A Biographical Dictionary of Scientists*, London 1974.
- D.90 8pp manuscript draft and 2 typescript drafts, all with manuscript revisions.
- D.91 Correspondence *re* publication with further copy of typescript draft, 1972; copy of proof with manuscript corrections.
- D.92 Review for *Nature* **282**, No. 5735 (Autumn Books Supplement, November 1979) entitled 'Florey's creative power': *Howard Florey: The Making of a Great Scientist*, by Gwyn Macfarlane, Oxford University Press 1979.
Correspondence *re* publication and letter arising; 11pp copy of typescript of review and proof with manuscript corrections; re-print.
- D.93 Revised notice for Florey in *Dictionary of National Biography 1986-1990*, Oxford 1996.
Copy of proof with manuscript revisions.
- D.94-D.99 Other obituaries and articles on Florey written before his death, 1950-1968.
- D.94 2pp typescript biographical notes on Florey for unknown publication, inscribed '1950' on first page.
- D.95 'The New Provost of Queen's', *Oxford* (published by the Oxford Society), 1962. A short article on Florey following his election to the Provostship of Queen's College.
Correspondence *re* publication; 2pp typescript draft; proof with manuscript corrections.

Publications

- D.96 Short article on Florey for 'News and Views', *Nature*, probably published in 1963.
Copy of letter enclosing 1p typescript of article.
- D.97 Two 12pp typescript drafts with manuscript revisions and inserts, entitled 'Stock obituary notice for *The Times* – 5 yearly revision', ca 1955-ca 1965; off-print of published obituary in *The Times*, 1968.
- D.98 'H.W. Florey – Nobel Prize for Medicine and Physiology 1945', 1968.
19pp copy of typescript obituary so entitled, probably written by Abraham.
- D.99 Correspondence *re* declined invitation to write obituary, 1968.
- D.100-D.102 Broadcasts on Florey by, or with a contribution by, Abraham.
- D.100 B.B.C. radio broadcast: 'Obituary on Lord Florey', by Abraham, recorded 1 March 1965.
Correspondence *re* script, with contract; 2pp typescript draft script with manuscript corrections, inscribed 'Oxford studio'.
- D.101 'Portrait of Lord Florey', B.B.C. Radio Four, 28 March 1969.
Abraham contributed an interview to the programme. The other speakers were Dr C.M. Fletcher, Dr Sanders, John Prestwich and Norman Heatley.
Correspondence *re* preparations; contract; 4pp photocopy of typescript script, with manuscript corrections, inscribed 'corrections put in by M[argaret] Florey'; photocopied scripts of other speakers on the programme; contract; 1p manuscript draft of a script, found with the other material in this folder and possibly related to it.
- D.102 Correspondence *re* plans for a possible archival film featuring Florey, Abraham and / or Norman Heatley, 1966, 1967.
- D.103 Miscellaneous correspondence etc with members of Florey's family, *re* obituaries of Florey by Abraham and *re* other matters connected with his death, 1966-1969.

Publications

- D.104, D.105 Miscellaneous correspondence and papers, mostly *re* publications (by individuals other than Abraham) and broadcasts on Florey and the history of penicillin, 1968-1989.
- Included is a transcript, entitled 'HWF on penicillin', of part of an autobiographical tape recording by Florey, with manuscript corrections by Abraham. An inscription by Abraham on the first page states that the recording was made towards the end of Florey's life.
- Found with the material in D.33-D.103.
- 2 folders.
- D.106-D.113 Correspondence and papers *re* fundraising for a memorial stone to Florey in Westminster Abbey (unveiled 2 November 1981) and preparations for the unveiling ceremony, with correspondence arising. 1980-1983. A few photographs are included.
- Included at D.113 is brief correspondence *re* Abraham's preparation of his Royal Society Biographical Memoir of Florey, 1968.
- 8 folders.
- D.114 Obituary of Mary Ethel Hayter Florey, Lady Florey, by Abraham, *British Medical Journal*, 1966 or 1967.
- 2pp copy of typescript obituary and letter *re* publication, October 1966.
- D.115 'Behaviour of alpha-Aminoadipoyl and Glutamylcysteines in the Presence of Intact and Disrupted Mycelium of a *Cephalosporium* sp.', with P. Bronwen Loder and G.G.F. Newton, *Biochemical Journal* **112**, 1969.
- This paper appears to have incorporated another paper, 'Synthesis and Some Properties of alpha-Aminoadipoyl and Glutamy Cysteines', with P. Bronwen Loder, which was initially written separately.
- Letter *re* submission of the 2 original papers; typescript drafts, with manuscript revisions, of the 2 papers.
- D.116 Copy of typescript draft of combined paper with manuscript corrections; figures.

Publications

- D.117 'Some Properties of Two Cell-bound Beta-lactamases from *Bacillus cereus* 569/H', with S. Kuwabara, *Biochemical Journal* **115**, 1969.
- 2 copies of typescript drafts with manuscript revisions; correspondence *re* publication.
- D.118 'Biosynthesis of Peptides containing alpha-Aminoadipic Acid and Cysteine in Extracts of a *Cephalosporium* sp.', with P. B. Loder, *Biochemical Journal* **123**, 1971.
- First page of typescript of article; letter *re* submission of the paper.
- D.118A 'Specificities of Haemagglutinating Antibodies Evoked by Members of the Cephalosporin C Family and Benzylpenicillin', with J.M.T. Hamilton-Miller, *Biochemical Journal* **123**, 1971.
- Proof with manuscript corrections.
- D.119 Review for unknown publication: *Yeast Mould and Plant Protoplasts*, edited by J.R. Villanueva *et al.*, New York 1973.
- 2pp typescript draft with manuscript corrections; proof.
- D.120 Draft paper with the draft title 'On the (role / involvement) of microbial penicillin- and cephalosporin- acylases and / in the biosynthesis (mechanism) of Beta-lactam antibiotics'. The authors were originally given as Abraham and E.J. Vandamme, though Abraham's name has been crossed out. Inscribed 'summer '73 Oxford Univ'.
- Copy of 37pp manuscript (hand other than Abraham's) and typescript draft, with manuscript revisions by Abraham.
- D.121-D.123 Articles contributed by Abraham to *Methods in Enzymology*, Vol. **30**, New York 1974.
- D.121 'Acetyl Esterase, a Citrus Enzyme', with P.A. Fawcett.
- Correspondence *re* preparation of paper; 7pp typescript draft with extensive manuscript revisions; later typescript draft and revised (or final) version.

Publications

- D.122 ' δ -(α -Aminoadipyl)cysteinylvaline Synthetase', with P.A. Fawcett.
6pp typescript and proof with manuscript corrections.
- D.123 Correspondence *re* publication, with a few miscellaneous papers.
- D.124 'Biosynthesis and Enzymic Hydrolysis of Penicillins and Cephalosporins',
University of Tokyo Press 1974.

Paper resulting from an E.R. Squibb Lecture.

35pp copy of typescript with references and figures.
- D.125 'Synthesis of Tritium-labelled Isopenicillin N, Penicillin N and 6-
Aminopenicillanic Acid', with J.J. Usher and P. B. Loder, *Biochemical
Journal* **151**, 1975.

Letter *re* publication of this paper and the one described in D.126; first page
of copy of typescript article; proofs with manuscript corrections.
- D.126 'Behaviour of Tritium-labelled Isopenicillin N and 6-Aminopenicillanic Acid as
Potential Penicillin Precursors in an Extract of *Penicillium chrysogenum*, with
P. A. Fawcett and J.J. Usher, *Biochemical Journal* **153**, 1975.

First page of copy of typescript article; proof with manuscript corrections.
- D.126A 'Biosynthesis of Penicillins and Cephalosporins', with P. A. Fawcett,
Biosynthesis IV: The Chemical Society Specialist Periodical Reports.

34pp copy of typescript of paper with references, figures etc; proof with
manuscript corrections.
- D.127 'Synthesis of δ -(α -Aminoadipyl) cysteinylvaline and its Role in Penicillin
Biosynthesis', with P. A. Fawcett, J. J. Usher, J. A Huddleston, R. C.
Bleaney, J. J. Nesbitt, *Biochemical Journal* **157**, 1976.

Correspondence *re* publication; 32pp copy of typescript draft with manuscript
corrections.

Publications

- D.128 Review for *The Times Literary Supplement* entitled 'Bad news for bacteria', 17 December 1976: *Penicillin in Perspective*, by David Wilson, London 1976.
- Correspondence *re* publication; typescript draft with extensive manuscript revisions and 6pp corrected version; copy of proof; off-print.
- D.129 Review for *The Times Literary Supplement* entitled 'The Molecular Key', 12 August 1977: *New Worlds in Chemistry*, London 1976.
- Correspondence *re* publication; 4pp copy of typescript of review; off-print.
- D.130 'The Stereochemistry of B-lactam Formation in Cephalosporin Biosynthesis', with J. A. Huddleston *et al.*, *Biochemical Journal* **169**, 1978.
- 11pp copy of typescript draft with manuscript revisions.
- D.131-D.177 Articles by Abraham on Ernst Boris Chain arising from the latter's death in August 1979.
- Included at D.172-D.177 are papers relating to a symposium held on the occasion of Chain's 70th birthday.
- See D.228-D.230 for material relating to Abraham's notice for Chain in the *Dictionary of National Biography*.
- D.131 Obituary for the *Biochemical Society Bulletin* Vol.1, no.5, 1979.
- Correspondence *re* publication and 4pp copy of typescript of obituary; off-print and copy of re-print.
- D.132 Correspondence *re* obituary by Abraham for *The International Journal of Environmental Studies*, September-October 1979.
- D.133 2 copies of typescript obituaries probably by Abraham, one with annotations by him, for unknown publications.
- D.134 Article on Chain in *A Biographical Dictionary of Scientists*, London 1982.
- Correspondence etc *re* publication and 3pp copy of typescript of the article.

Publications

- D.135-D.170 'Ernst Boris Chain', *Biographical Memoirs of Fellows of the Royal Society*, 29, 1983.
- D.135-D.141 Correspondence etc *re* preparation and drafting of the memoir, 1979-July 1983.
- Included are a few letters *re* Abraham's assistance to others compiling publications on related topics and *re* other matters such as arrangements for the cataloguing of Chain's papers; and 3 photographs at D.141, including one of Chain in later years (inscribed '1976' on back).
- 7 folders.
- D.142-D.159 Drafts of the Memoir.
- D.142-D.145 Extensive and detailed manuscript notes on Chain's life and career extracted from cited correspondence and other documentary sources.
- 4 folders.
- D.146-D.148 Early manuscript draft, apparently incomplete, with extensive revisions.
- (paginated 1-98, with gaps).
- 3 folders.
- D.149-D.152 Typescript draft inscribed '1st Draft' with manuscript revisions.
- Paginated 1-60.
- 4 folders.
- D.153-D.158 Copy of later typescript draft, with bibliography etc, probably the draft circulated to various individuals for comment.
- At D.158 is a page of typescript suggested alterations to the text inscribed 'Trevor Williams', with manuscript annotations by Abraham.
- D.159 A few typescript and manuscript pages from draft (or drafts), different to those described in D.146-D.158; drafts of figures; a few miscellaneous manuscript notes.

Publications

- D.160 Re-print of the Memoir.
- D.161-D.163 Correspondence arising from publication of the Memoir, mostly letters of thanks from members of the scientific community and friends in receipt of a copy, with congratulations and comments, 1983, 1984, with a few letters 1985-1988.
- Included are a few letters *re* Abraham's assistance to others compiling publications on related topics.
- 3 folders.
- D.164-D.170 Typescript and printed background material and correspondence, used in the preparation of the Memoir.
- D.164 Correspondence between Abraham and Chain mostly in connection with the former's preparation of the Royal Society *Biographical Memoir* of Florey, 1969.
- Included is a copy of a funding application made by the Sir William Dunn School to the Rockefeller Foundation in 1939 which is the subject of the correspondence.
- D.165 Copies of correspondence of Chain, 1969-1976.
- Letters by Chain to Sir Bernard Katz in which Chain complains of lack of recognition in Britain, 1969.
- Correspondence with Government ministers and leading scientists *re* issues in biochemical and general scientific research, 1971-1976.
- Correspondence *re* controversies at Imperial College London, 1974, 1977.
- Correspondence with Sir Robert Robinson, mostly *re* the history of penicillin, March-May 1974.
- D.166 Correspondence, mostly between Abraham and Sir Robert Robinson, concerning claims made by Chain about his role in the development of penicillin, April 1974-January 1975; 2 unrelated letters by Abraham and Chain (copy), 1969, 1979 (found with the other material in this file).

Publications

- D.167-D.170 Miscellaneous typescript and printed material (some photocopies) and manuscript notes by Abraham relating to Chain's career and the development of penicillin.
- 4 folders.
- D.171 Stock obituary of Chain for *The Times*.
- Correspondence *re* offer to write obituary and acceptance, and *re* drafting, November 1972-January 1973, and 4pp typescript draft of notice with manuscript revisions; copy of revised (or final) typescript version.
- D.172-D.177 'Biologically Active Substances – exploration and exploitation', a symposium to mark Chain's 70th birthday held at the Royal Society, 15, 16 June 1976.
- The papers relating to this event, at which Abraham gave a paper, were found with the material in D.135-D.170.
- D.172, D.173 Correspondence *re* arrangements, with programme etc, and a few letters arising, 1975, 1976.
- 2 folders.
- D.174-D.177 'The Biosynthesis of B-lactam Antibiotics', Abraham's paper.
- D.174 14pp manuscript draft with revisions; 2 typescript drafts, one incomplete, with manuscript revisions; copy of 2pp typescript outline.
- D.175 Copy of typescript corrected version.
- D.176, D.177 Publication of Abraham's paper in *Biologically Active Substances – Exploration and Exploitation*, edited by D.A. Hems, Wiley 1977.
- Correspondence *re* publication, 1976, 1977, and proof of Abraham's paper with manuscript corrections.
- 2 folders.

Publications

- D.178 'Transport and Metabolism of Bacilysin and Other Peptides by Suspensions of *Staphylococcus aureus*, with D. Perry, *Journal of General Microbiology* **115**, 1979.

Proof with manuscript corrections.
- D.179 'Incorporation of ^3H from δ -(L- α -Amino[4,5- ^3H]adipyl)-L-cysteinyl-D-[4,4- ^3H]valine into Isopenicillin N', with Joseph O'Sullivan, Roger C. Bleaney and J. A. Huddleston, *Biochemical Journal* **184**, 1979.

Proof with manuscript corrections.
- D.180 Review for *Endeavour*, [?1979]: 'Antibiotics: isolation, separation and purification', *Journal of Chromatography Library* Vol. **15**, edited by M.J. Weinstein and G.H. Wagman, [?1978].

Correspondence *re* publication; 2pp typescript of review with manuscript corrections.
- D.181 'A Spectroscopic Study of Metal Ion and Ligand Binding to B-Lactamase II', with G. S. Baldwin, Alphonse Galdes, H. A. O. Hill and S. G. Waley, *Journal of Inorganic Biochemistry* **13**, no.3, 1980.

17pp copy of typescript draft (with reference, figures etc) with manuscript corrections.
- D.182 'Penicillin Biosynthesis: Conversion of Deuterated δ -(L- α -Amino adipyl) - L - Cysteinyl - D - Valine to Isopenicillin N by a Cell-free Extract of *Cephalosporium acremonium*', with J. E. Baldwin *et al*, *Chemical Communications* 1981.

5pp copy of typescript draft.
- D.183-D.189 'The B-lactam Antibiotics', *Scientific American* **244**, No.6, 1981.
- D.183 Correspondence *re* publication, February-May 1981.

Included a few letters, 1979, concerning other matters.
- D.184 Correspondence arising, July-October 1981.

Publications

- D.185 28pp typescript draft with manuscript revisions entitled 'Penicillins, Cephalosporins and Their Successors'. Included are a few manuscript notes.
- This appears to be an early draft of 'The B-lactam Antibiotics'.
- D.186 Revised version of the draft in D.185 (with the same title).
- D.187, D.188 Draft drawings and photographic prints for illustrations, some with annotations on back, others mounted on to annotated cards; manuscript notes and drafts for captions; typescript drafts of captions, with manuscript revisions.
- 2 folders.
- D.189 Off-print.
- D.190 'Conversion of Isopenicillin N into Penicillin N in Cell-free Extracts of *Cephalosporium acremonium*, with G.S. Jayatilake and J.A. Huddleston, *Biochemical Journal* **194** (part 2), 1981.
- Copy of 12pp typescript draft with manuscript corrections.
- D.191-D.195 'Biosynthesis of B-Lactam Antibiotics', with J. O'Sullivan, in *Antibiotics IV: Biosynthesis*, ed. by J.W. Corcoran, Berlin 1981.
- D.191 Correspondence *re* publication, 1978-1980.
- D.192-D.194 30pp typescript draft (with references, figures etc) with manuscript revisions.
- 3 folders.
- D.195 Proof with manuscript corrections.

Publications

- D.196 'Biosynthesis of Penicillins and Cephalosporins in Cell-free Systems', with J. O'Sullivan and J.A. Huddleston, *Philosophical Transactions of the Royal Society*, 1980 or 1981.

6pp copy of typescript with biographical note on Abraham.
- D.197-D.208 'Isolation and Properties of an Inducible and a Constitutive B-Lactamase from *Pseudomonas aeruginosa*, with M. Berks and K. Redhead, *Journal of General Microbiology*, 1982.

Various drafts and other material *re* the preparation and publication of this paper. Contents of 4 files.
- D.197-D.201 Contents of a file.
- D.197 Correspondence *re* preparation and publication of the paper, 1978-1981.
- D.198-D.201 Typescript and manuscript drafts and reports, one headed with manuscript corrections.

4 folders.
- D.202 Typescript draft of report headed 'Paper II' with manuscript corrections.

Contents of a file.
- D.203-D.205 Contents of a file.
- D.203, D.204 Typescript drafts, some incomplete, with manuscript corrections, and figures.

2 folders.
- D.205 Figures with manuscript annotations, photographic prints and manuscript notes.
- D.206-D.208 Contents of a file.
- D.206 Typescript draft with manuscript revisions.

Publications

- D.207 Later typescript drafts (submitted for publication) and brief correspondence *re* publication, 1981.
- D.208 Proof.
- D.209 'Inhibition of Glucosamine Synthetase by Bacilysin and Anticapsin', by H. Chmara, *Journal of General Microbiology*, [?1984]. A paper was revised by Abraham prior to publication.

Found with the material in D.197-D.208.

Letter *re* publication, 1984; copy of typescript draft, with manuscript revisions by Abraham, and figures.
- D.210 'Stoichiometry of Oxygen Consumption in the Biosynthesis of Isopenicillin N from a Tripeptide', with R. L. White *et al*, *Biochemical Journal* **203**, 1982.

Correspondence *re* publication; 8pp copy of typescript of article; correspondence *re* publication of a later paper in the *Biochemical Journal*, 1984.
- D.211 Copy of typescript of a paper entitled 'Penicillin Biosynthesis: Oxygen Stoichiometry of Isopenicillin N Synthesis in a Cell-free System', with R. L. White *et al*, on which is inscribed the same publication reference as for the paper described in D.210. The texts of the articles are different; the authors are the same.
- D.212 'Penicillin Biosynthesis. Dual Pathways from a Modified Substrate', with R. M. Adlington *et al*, *Journal of Chemical Studies: 'Chemical Communications'*, 1983.

5pp copy of typescript of paper; 3pp manuscript notes found with typescript.
- D.213 'Conversion of $^{17}\text{O}/^{18}\text{O}$ Labelled δ -(L- α -Aminoadipyl)-L-cysteiny-D-valine to $^{17}\text{O}/^{18}\text{O}$ Labelled Isopenicillin N in a Cell-free Extract of *Cephalosporium acremonium*, with R. M. Adlington *et al*, *Tetrahedron* **39**, 1983.

8pp copy of typescript of paper, with figures.

Publications

- D.214, D.215 'Stereochemistry of the Incorporation of the Methyl Groups of 'Chiral Methyl Valine' into Methylene Groups in Cephalosporin C', with C.-P. Pang *et al*, *Journal of Chemical Studies: 'Chemical Communications'*, 1983.
- D.214 Letter *re* preparation; 23pp photocopy of typescript draft with manuscript revisions.
- D.215 Copy of typescript draft with revisions (later than those in D.214).
- D.216-D.220 'History of B-lactam Antibiotics', a chapter in *Handbook of Experimental Pharmacology*, Vol. **67/1: Antibiotics Containing the Beta-Lactam Structure**, Part 1, edited by A.L. Demain and N.A. Solomon, Berlin 1983.
- D.216 Correspondence etc, mostly *re* preparation and publication, 1979-1984.
- D.217 34pp copy of typescript draft of Abraham's chapter, with letter.
- D.218, B.219 Copy of typescript draft with manuscript revisions.
Stamped '23 Nov. 1982' on first page.
2 folders.
- D.220 Proof and off-print.
- D.221, D.222 'Purification of Isopenicillin N Synthetase', with C.-P. Pang *et al*, *Biochemical Journal* **222**, 1984.
- D.221 20pp copy of typescript, with figures, and correspondence *re* publication; manuscript notes (hand other than Abraham's).
- D.222 Proofs with manuscript corrections.

Publications

- D.223 'Stereochemistry of the Incorporation of Valine Methyl Groups into Methylene Groups in Cephalosporin C', C.-P. Pang *et al.*, *Biochemical Journal* **222**, 1984.
- Correspondence *re* publication; proof with manuscript corrections.
- D.224 Review article entitled 'Benefactors' Benefactor' for *The Times Literary Supplement*, 27 January 1984: *The Legacy of Alfred Nobel: The Story Behind the Nobel Prizes*, by Ragnar Sohlman, London 1983.
- Correspondence *re* publication; 7pp copy of typescript draft of review; proof; off-print.
- D.225, D.226 Review entitled 'The Shooter and the Shot': *Alexander Fleming: The Man and the Myth*, by Gwyn Macfarlane, London 1984. The review was published in a special supplement by *Nature*, 'Spring Books', April 1984.
- D.225 Copy of 9pp typescript 'first draft' with manuscript revisions; copy of revised draft and copy of off-print; correspondence *re* publication.
- D.226 Letter to Abraham from Max Perutz, December 1985, enclosing a copy of his review of Macfarlane's book, entitled 'Lucky Alec', for comment.
- On Perutz's typescript are minor manuscript annotations by Abraham.
- D.227 Review for *FEBS Letters*, [?May] 1984: *The Target of Penicillin. The Murein Sacculus of Bacterial Cell Walls. Architecture and Growth*, edited by R. Hakenbeck *et al.*, Berlin 1983.
- Correspondence *re* publication and 2pp copy of typescript of review.
- D.228-D.234 Contents of file inscribed 'Oxford University Press'.
- D.228-D.230 Notice for Ernst Chain in *Dictionary of National Biography 1971-1980*, Oxford 1986.
- For the main body of papers relating to Abraham's articles on Chain see D.131-D.177.
- D.228 Correspondence mostly *re* the invitation to contribute and publication, including press copy of the article, 1985, 1986.

Publications

- D.229 6pp manuscript draft with revisions; 9pp typescript draft with manuscript revisions.
- D.230 Copy of revised typescript draft with further manuscript revisions; copy of version sent to publishers.
- D.231, D.232 Notice for Sir Harry Jephcott in *Dictionary of National Biography 1971-1980*, Oxford 1986.
- D.231 Correspondence *re* preparation and publication, December 1984-1985, and 1 letter arising, 1989.
- D.232 7pp typescript draft with manuscript corrections; copy of typescript inscribed 'Edited version'; background material.
- D.233, D.234 Correspondence with Oxford University Press *re* Abraham's involvement in various publications, 1979-1991.
- D.233 Correspondence *re* proposed book on penicillin by Abraham, 1979, 1980.

No definite plans for the book emerge from this correspondence.
- D.234 Miscellaneous correspondence etc, 1985-1991.

Relates to Abraham's advisory role in various publications including the *History of the University of Oxford*, Oxford 1992.
- D.235-D.240 Chapter for proposed book *The Cephalosporin Antibiotics*.

The title of Abraham's chapter was 'Cephalosporins 1945-1985'. The publishers, Adis Press Ltd (New Zealand), eventually abandoned publication of the book. The material was published instead in a special supplement to Adis Press's international supplement *Drugs*, 1987.
- D.235-D.237 Correspondence etc *re* proposed publication and proof of the chapter (at D.237), 1984-1986.

3 folders.

Publications

- D.238 34pp copy of typescript draft of the chapter, with references etc.
- D.239, D.240 Correspondence *re* publication of Abraham's original chapter in the supplement *Drugs*, and proof with manuscript corrections, 1987.
2 folders.
- D.241 'Purification and Initial Characterization of an Enzyme with Deacetoxycephalosporin C Synthetase and Hydroxylase Activities', with J. E. Baldwin *et al.*, *Biochemical Journal* **245**, 1987.
Typescript draft with manuscript revisions; 31pp copy of typescript revised version and figures.
- D.242-D.245 'Factors Affecting the Isopenicillin N Synthetase Reaction', with D. Perry and J.E. Baldwin, *Biochemical Journal* **255**, 1988.
- D.242 Correspondence *re* preparation and publication, 1987, 1988.
- D.243 Typescript and manuscript draft of the article, with extensive manuscript revisions.
- D.244 2 typescript drafts with manuscript revisions, one including manuscript drafts of figures.
- D.245 17pp copy of typescript inscribed 'copy for press', with figures etc.
- D.246 'Acyl Coenzyme A: 6-aminopenicillinanic Acid Acyltransferase from *Penicillium chrysogenum* and *Aspergillus nidulans*', with P.A Whiteman *et al.*, *FEBS Letters* **262**, 1990.
Typescript draft with manuscript revisions and inserts; 6pp typescript revised version inscribed 'Final copy revised', with figures.

Publications

- D.247-D.250 'Selective Reminiscences of B-lactam Antibiotics. Early Research on Penicillin and Cephalosporins', for 'Roots' column, *BioEssays: Advances in Molecular, Cellular and Developmental Biology*, Vol. 12, No.12, December 1990.
- The 'Roots' column presented first-hand accounts of key discoveries or breakthroughs in the biological sciences.
- D.247 Correspondence *re* publication with 18pp copy of amended [?final] typescript of article.
- D.248 17pp manuscript draft of article with revisions and 1p manuscript notes; typescript draft with manuscript revisions.
- D.249 Copy of revised typescript version.
- D.250 Off-print.
- D.251, D.252 Review for *Nature*, published 1990: *Miracle Cure. The Story of Antibiotics*, by Milton Wainwright, Blackwell 1990.
- D.251 6pp typescript draft with extensive manuscript revisions; copy of revised version.
- D.252 Brief correspondence etc *re* publication and proof with manuscript corrections.
- D.253-D.270 Undated publications.
- D.253 'Possible Intermediates in the Biosynthesis of Cephalosporin', with G.G.F. Newton.
- Copy of 11pp typescript draft so entitled, with manuscript corrections.
- D.254 'The Cephalosporins'.
- Copy of 8pp typescript draft with manuscript revisions.

Publications

- D.255 'Enzymes Involved in the Biosynthesis of Cephalosporin C.'
Copy of 7pp typescript draft, so entitled, with manuscript corrections.
- D.256 'Biosynthesis of Penicillins and Cephalosporins', with G.G.F. Newton.
Copy of 40pp typescript draft, with manuscript corrections, and index of subjects.
- D.257, D.258 'B-Lactamases and their Rôle in Resistance to B-Lactam Antibiotics'.
58pp copy of typescript draft so entitled, with figures.
2 folders.
- D.259-D.265 Untitled manuscript and typescript draft of a book on antibiotics, with extensive manuscript revisions, n.d.
The draft is divided into sections or chapters on particular antibiotics.
7 folders.
- D.266-D.270 Miscellaneous material relating to unidentified publications, or possible publications, by Abraham, n.d.
The material mostly consists of parts of manuscript and typescript drafts and notes.
5 folders.
- D.271-D.288 EDITORIAL CORRESPONDENCE 1948-1998**
- Correspondence and papers *re* refereeing of papers intended for publication, general editorial business and publications by Abraham.
Shorter correspondence is at D.284-D.288.

Publications

D.271-D.274 ***The Biochemical Journal*** **1949-1988**

Abraham served on the Editorial Board, ca 1955-1960.

Included is correspondence re publication of papers by Abraham in the Journal found with the editorial correspondence.

4 folders.

D.275, D.276 **Elsevier Publishing Company** **1960-1964**

Correspondence, including re-print, mostly with Elsevier Publishing Company, re *Comprehensive Biochemistry*, edited by Marcel Florkin and Elmer H. Stotz, Elsevier 1962.

Abraham wrote a chapter for Volume 2.

2 folders.

D.277-D.281 ***The Journal of Antibiotics*** **1988-1998**

Abraham was an Emeritus Member.

Mostly re the business of the Editorial Board.

5 folders.

D.282 **Pharmacological Reviews** **1960-1962**

Correspondence re review by Abraham of a book *The Cephalosporins for Pharmacological Reviews* 14, 1962.

D.283 **Sherry F. Queener** **1983-1987**

Correspondence etc mostly with Sherry F. Queener re *Beta-Lactam Antibiotics for Clinical Use*, edited by Queener et al., New York 1986.

Abraham contributed a chapter to the book.

Publications

D.284-D.288

Shorter correspondence

1948-1998

Arranged chronologically.

5 folders.