Catalogue of the papers and correspondence of

Norman George Heatley OBE

(b. 1911)

Relating to the research and development of penicillin
1939-1942

by Jeannine Alton and Peter Harper

CSAC catalogue no. 96/7/83

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GENERAL INTRODUCTION

PROVENANCE

The material was received from Dr. Heatley at various dates between January 1980 and June 1983.

Norman George Heatley was born in 1911 and educated at Tonbridge School and at St. John's College, Cambridge, where he graduated in 1933. From 1933 to 1936 he worked under J. Needham at the School of Biochemistry, Cambridge, on microchemical methods applied to biological problems, and obtained his doctorate in 1936.

On 3 September 1936 Heatley came at the invitation of Professor (later Lord) Florey to the Sir William Dunn School of Pathology, Oxford, initially to work with E.B. (later Sir Ernst) Chain and, later, from 1 October 1939, directly with Florey. This close collaboration continued to June 1941 when Heatley accompanied Florey to America, bearing with him his research notebooks and sketches for apparatus; he remained there until June 1942. After his return to Oxford he resumed work at the Dunn School, and was a Nuffield Research Fellow of Lincoln College 1948 - 78. He was awarded the Order of the British Empire in 1978 for his contributions to scientific research.

DESCRIPTION

The core of the material is the group of three laboratory notebooks (A.1 - A.3) kept by Heatley to record the research on penicillin at the Sir William Dunn School of Pathology, October 1939 - June 1941, and the various sketches and diagrams of apparatus made by him in 1941 (C.1 - C.5).

These contemporary records have been usefully expanded by narratives and explanatory notes prepared by Heatley for the present collection and quoted (in part) with permission in the catalogue entries, and by extracts taken by him from his personal diaries for 1939 - 42 which refer to his research.

The correspondence and reports exchanged between Heatley and Florey at D.1 - D.4 is a set of photocopies, included here to provide a complete account of the collaboration between the two on the penicillin project.

SECTION A LABORATORY NOTEBOOKS A.1 - A.4

These are the books referred to and explained in B.1 as 'Oxford V', 'Oxford VI' and 'Oxford VII' and 'the foolscap book'. The first three of these were taken to U.S.A. by Florey and Heatley in July 1941 and 'sealed by UK censor' (C.4). Details of the first mouse protection test on 25 May 1941 are recorded in 'Oxford VI', which has already been used as historical material in written and broadcast accounts of the penicillin story.

The three 'Oxford' books are all the same size and format, of beige-covered cloth with ruled pages. All bear inside the front cover Heatley's name, the address of the Dunn School, and the message 'This book is of great value to the owner, who will be very grateful to any finder who will return it to him'.

A.1 'Oxford V'

Laboratory notebook inscribed 'Oxford Vol.V' (dated July 1939-March 1940). Pages numbered 3-271, with an index and several unnumbered pages at end. The penicillin work begins on p.35.

Entries are in blue and red ink, with an occasional note in pencil. There is a ms. note in the hand of P. (later Sir Paul) Fildes pasted into one of the unnumbered pages at end of book.

A.2 'Oxford VI'

Laboratory notebook, pages numbered 1-281, with an index at end.

The first entry ('Summary of Previous Work on ... Production of Penicillin') is dated March 31 1940. The famous experiment on 'Curative Effect of Penicillin' on 25 May 1941 is recorded on pp.126-129. Entries are in blue and red ink, all by Heatley.

A.3 'Oxford VII'

Laboratory notebook, pages numbered 1-281, with an (incomplete) index and a few unnumbered pages at end.

The first entry is headed 'The Position with Regard to the Penicillin Work, on December 1st 1940', and the last 'The Absorption of Penicillin from Under the Tongue' is dated 18 May 1944.

Continued

Laboratory notebooks

A.3 (Cont'd.) Entries and diagrams are in blue and red ink, all by Heatley.

There is a photograph of apparatus pasted into the end page of the book.

A.4 Green ledger-type notebook.

This is the 'unlabelled green hardback foolscap cashbook' described by Heatley in B.1 as containing 'information on chemicals and equipment ordered and received between May 25th and October 26th 1940, and on routine batches "A" to "W".' Heatley also adds 'At least two record books similar to F ["the foolscap book"] have been lost'.

Entries in blue and red ink are all by Heatley. There are a few entries in ink and in pencil, in another hand.

SECTION B NARRATIVES AND DIARY ENTRIES B.1 - B.8

B.1 'Early work by N.G. Heatley relevant to penicillin'

21 pp. typescript account prepared by Heatley for the present collection. It explains the methods of recording used in the laboratory notebooks (A.1 - A.3) and in making extracts from his diaries (B.4 - B.6) and is the most helpful introduction to the use of the documents. As well as giving an account of the research, it includes brief autobiographical details, a list of visitors to the Dunn School interested in penicillin, and other items of background information.

B.2 'Addendum'

pp.22 and 23 supplementary to above, added by Heatley, June 1983.

B.3 4 pp. typescript account of various aspects of work at the Dunn School, supplementary to B.1, added by Heatley, November 1982.

B.4-B.7 'Extracts from the Personal Diary of N.G. Heatley'

These are photocopies of the extracts; the original diaries remain in family hands.

The extracts cover three phases of activity: 3 September 1939-26 June 1941 (at the Dunn School, Oxford); 3 July-15 December 1941 (in U.S.A., with Florey and then at Peoria); 16 December 1941-29 June 1942 (in U.S.A., at Merck Research Laboratories, New Jersey). They were originally made by Heatley 'in the mid 1970 s' according to an introductory note attached to B.4, and now appear at B.5-B.7. In 1982 Heatley prepared a fuller series of extracts for the early research at the Dunn School, and this is at B.4.

B.4 'Extracts ... for the period September 30th 1939 to June 26th 1941'

29 pp. typescript. This is a fuller version of B.5, prepared by Heatley in 1982 for the present collection, and includes some explanatory material, expansions of abbreviations and the like, which appear in square brackets.

Narratives and diary entries

B.5 17 pp. typescript earlier version of B.4. Attached is a note by Heatley, dated January 1980, explaining the tripartite division of the material.

B.6 'Extracts ... Part 2. From Friday, June 27th 1941'

13 pp. typescript.

Describes visits to various institutions and laboratories in U.S.A. with Florey, and Heatley's work at the U.S. Department of Agriculture's Northern Regional Research Laboratory at Peoria, Illinois, where his assigned collaborator was A.J. Moyer (see B.8). Heatley worked there 14 July-30 November 1941.

B.7 'Extracts ... Part 3. From December 16th 1941'

15 pp. typescript. There is a note at the end of p.15 'Extracted and typed by N.G.H. February 1979'.

The entries run 16 December 1941 to 29 June 1942 (the date of Heatley's embarcation for return to Britain). During this period Heatley was an employee of Merck & Company Inc., working in their Research Laboratories at Rahway, New Jersey.

B.8 4 pp. typescript relating to A.J. Moyer.

Includes 'Statement of research on penicillin' and 'applications for U.S.S. Patents on Penicillin Production', various dates, March-June 1944.

See G. Macfarlane, Howard Florey. The Making of a Great Scientist, O.U.P. 1979, p.340, p.342.

SECTION C — DESCRIPTIONS AND DIAGRAMS OF APPARATUS C.1 - C.5

C.1 'Apparatus for the continuous extraction of penicillin'

12 pp. typescript on American quarto paper, with photocopy diagram of apparatus.

In an attached note dated 18 November 1982, Heatley writes:

'This full account of the extraction apparatus used at Oxford from the end of 1940 was written by NH to help anyone construct or use the apparatus. It is much more detailed than the brief account in "Antibiotics ..." by Florey et al. (1949. O.U.P., pp.644-6). It and the drawings were almost certainly made before NH went to U.S. with HF at the end of June 1941, but this copy was made by NH soon after arriving in Peoria, Ill.

Copies were given to Merck & Co. Inc. and perhaps to others, but as far as is known no apparatus of this type was ever made - apart from that at Oxford'.

C.2 'Apparatus for the continuous extraction of penicillin from crude culture fluid at room temperature'.

11 pp. photocopy typescript with 1p. photocopy diagram of apparatus.

This is another version of above, made in January 1983 by Heatley. In an introductory note he states that 'the original drawing and draft were made by NH, probably in February 1941'. The original drawing is retained by him.

C.3 'Note added June 1st 1983'

2 pp. typescript extracts from Florey's letters to Heatley, various dates, 3 November 1941-4 May 1942, commenting on the efficiency of extraction methods in practice on the apparatus at Oxford.

C.4 'Notes made on the Clipper between Lisbon and New York, July 1st/2nd 1941'

6 pp. ms., and 6 pp. typed copy (made by Merck & Co. Inc.)

In an attached note dated 17 November 1982 Heatley explains that the notes summarised 'most of the Oxford procedures for preparing penicillin', and were written from memory during the flight 'because NH's notebooks had been sealed by UK censor'.

Descriptions and diagrams of apparatus

C.5 'Some suggestions for a pilot-scale penicillin extraction plant'

7 p. typescript with ms. corrections (2 copies), with 3 figures all signed N. G. Heatley and dated 16 September 1941.

One of the drafts bears a ms. note 'Copy (and diagrams) given to Dr. Foster of Merck & Co., when he visited Peoria on September 18th, 1941'.

In an attached note dated 18 November 1982, Heatley writes:

'This report was written by NH during July-September 1941 at the Northern Regional Research Laboratory of the U.S. Department of Agriculture, Peoria, Ill.

Based on the same principles used in the extraction apparatus in use at Oxford in 1941, it is somewhat larger, has a secondary column for back-extracting penicillin into watery solution, a device for automatically raising and lowering the exit tube for penicillin-rich solvent, and sampling tubes at intervals down the main column. The acid, solvent, and crude penicillin solution would be delivered by proportioning pumps.

The proposals were highly speculative. Copies were given to Merck & Co. Inc. and perhaps to others, but as far as is known no apparatus of this kind was in fact constructed. At the end of 1941 or early 1942 the much better deliberate emulsification, followed by passage through a Sharples centrifuge, which was proposed by Florey, was probably widely known, and the Podbielniac counter-current solvent extractor was also known at this time or earlier - perhaps much earlier.'

SECTION D CORRESPONDENCE WITH H.W. FLOREY D.1 - D.4

All these are photocopies, supplied by Heatley, a few with annotations by him. They include exchanges of letters and cables, accounts of interviews and discussions, progress reports on research, and a little personal news. They complete the record of the collaboration of Florey and Heatley on penicillin research.

D.1 Letters and summaries of visits sent by Heatley to Florey, 26 July 1941-7 June 1942.

Includes Heatley's 'Rough notes on Corn Steep Water' and 1p. 'Report on work carried out at the Northern Regional Research Laboratory, Peoria, on penicillin production, July 15-August 22, 1941'.

With a short descriptive note by Heatley.

D.2 Letters from Florey to Heatley, 28 September 1941 to 4 May 1942.

The first letter is from New Haven and has a ms. note by Heatley; the others are from the Dunn School and include a little news of research and colleagues there.

With a short descriptive note by Heatley.

D.3 'Report to Dr. Weaver from Dr. Florey, on penicillin'

3 pp. typescript account of visits by Florey and Heatley, or by Florey alone, to various manufacturing chemists and pharmaceutical houses in U.S.A. and Canada to discuss the production of penicillin. n.d., but dated by Heatley as 'in or after September 1941'.

D.4 'Summaries of interviews and visits made by HWF and NGH, or later, by NGH alone.

Early notes largely dictated by HWF to NGH, usually on day of interview'.

Entries run 2 July-12 December 1941. With a short descriptive note by Heatley, quoted (in part) above.