

CONTEMPORARY SCIENTIFIC ARCHIVES CENTRE

Catalogue of the papers and correspondence of

TORKEL WEIS-FOGH

(1922-1975)

Compiled by Jeannine Alton and Julia Latham-Jackson

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Cambridge University

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GENERAL INTRODUCTION TO THE COLLECTION

Torkel Weis-Fogh was born in Aarhus, Denmark, in 1922, the son of a banker and accountant. In 1940 he became a student at Copenhagen University and his earliest researches were in soil microbiology. However, in 1947 he started work as research assistant to the distinguished Danish physiologist and Nobel prizewinner August Krogh, and the study of the desert locust Schistocerca Gregaria, begun in Krogh's laboratory, was to occupy Weis-Fogh for much of his life.

After Krogh's death in 1949, Weis-Fogh continued as head of the laboratory until 1953, amassing a wealth of data relating to the flight mechanics of the desert locust (see Section B). A year at the Copenhagen Institute of Neurophysiology was followed by four years at Cambridge with a Rockefeller Fellowship followed by a Balfour Studentship. At the end of this period Weis-Fogh wrote to Sir James Gray: 'Hanne [Weis-Fogh's first wife] and I know very well how much we have to thank you and Lady Gray for. Cambridge just reshaped us and in such a pleasant way that we did not protest in the process. It was an immensely valuable time for us and one we shall never forget and often remember'. (See G.47.)

During his last year at Cambridge, in the course of his research into the workings of insect flight muscle, Weis-Fogh isolated a new type of rubber-like protein in insect cuticle. The discovery was announced at the XVth International Congress of Zoology, July 1958 (see B.136), and the protein was later named 'resilin' (from the Latin resilire - to spring back). Both the work surrounding the discovery of resilin and subsequent research into its physical and chemical properties are well documented in this collection. See especially Section C.

The years 1958-66 were spent in Copenhagen as Professor of Zoophysiology (a chair specially created for Weis-Fogh), and most of his research during that time was concentrated on analysing the new protein. In 1966 he returned to Cambridge as Professor of Zoology and Head of the Department of Zoology, and this position enabled him to pursue several related research interests simultaneously (see introduction to Section D). An investigation into the mode of formation of insect cuticle, mainly carried out during 1967 - 69, led to a study

of the molecular basis of resilin and elastin, and the discovery of a new contractile mechanism in the spasmonemes of protozoa. In connection with these studies Weis-Fogh was also instrumental in the setting up of the Biological Microprobe Laboratory, Department of Zoology, Cambridge, to develop techniques of electron-probe X-ray microanalysis on frozen-hydrated soft biological material. These projects are not so well documented as Weis-Fogh's earlier work, since much of the research was continued after his death.

Weis-Fogh never lost his early interest in the problems of insect flight and he returned to them with renewed vigour during this period. In 1973 he published a paper containing a mathematical explanation for the flight of very small insects which orthodox aerodynamic theory had been unable to account for. For background material to this paper see D.48 - D.53. This discovery was named by Sir James Lighthill 'the Weis-Fogh mechanism of lift generation'. Weis-Fogh was to have collaborated with Lighthill in a major project to study biological fluid dynamics, but plans for this were interrupted by his death. For material relating to this see D.58 - D.62.

Unhappily, in 1971 Weis-Fogh's wife was killed in a car accident in which he himself was badly injured. Although he returned to his laboratory after only a few months and was committed to extensive research projects, it seems unlikely that he ever recovered from the shock and bereavement, or indeed from the physical damage which he sustained. The correspondence for 1972-75 documents several relapses of health during this period (see especially F.45, F.61, F.65), and the obituary of Weis-Fogh by E. Bredsdorff (see A.1) mentions bouts of depression that at times 'could be so deep that we feared for his life'. Sadly these fears turned out to be only too well-founded, and Weis-Fogh committed suicide in Cambridge on 13 November 1975.

To the end of his life Weis-Fogh retained strong links with Denmark. He remained a Danish citizen (see A.9) and maintained a cottage at Tibirke to which he returned whenever he could. He was bilingual and when thinking on paper would transfer at random from English to Danish and back again. Much of the material in the collection is in Danish and this has normally been indicated in the catalogue. He also maintained close links with colleagues in the United States. In 1961 he was invited to give the Prather Lectures in Biology at Harvard

University, and his subsequent tour of universities and laboratories in the US provided many valuable contacts with whom he continued to maintain close ties through correspondence and through meetings at conferences and symposia (see Sections F and G).

Weis-Fogh's papers were received from the Department of Zoology, by courtesy of Dr. D.A. Parry, Head of the Department, in instalments during 1978 after the removal of departmental material or that related to continuing research projects. This meant that Weis-Fogh's ordering, especially of the later correspondence, had been broken and there are some omissions (see especially Section D). However, the collection still comprises a very full range of working papers, photographs and data and some unpublished material. Weis-Fogh kept some correspondence with the papers to which it related, and this has been left in place; general scientific correspondence is presented in alphabetical order in Section G and an index of correspondents will be found on pp. 108-120.

Titles and descriptions in inverted commas are those which appear on the documents. Danish titles are usually translated or summarised for the benefit of the English reader.

The help of Mr. George Mewis and Mr. Barry Fuller in identifying photographs and documents, and of Dr. P.C.H. Wernberg-Møller in advising on some of the Danish material is gratefully acknowledged.

SECTION A BIOGRAPHICAL AND PERSONAL A.1 - A.30

Very little personal material survives. This can largely be attributed to Weis-Fogh's personal circumstances towards the end of his life and in particular after the death of his first wife in 1971. Fortunately the correspondence in Sections F and G contains many exchanges of a more personal nature interleaved with scientific matters.

Of particular interest is the correspondence in A.9 conveying Weis-Fogh's decision to retain Danish citizenship after the death of his first wife, even though it could have been more advantageous to his career to become a British citizen. He retained a cottage in Denmark and returned there whenever possible for holidays or to write; many of the drafts and correspondence in the collection are headed 'Tibirke', the location of his Danish home.

Material relating to Cambridge University 1966-75, when Weis-Fogh was Professor of Zoology and Head of the Department of Zoology is also included here (A.10 - A.22).

Biographical and personal

- A.1 Xerox copies of obituaries from The Times, Politiken (by T. Norman) and Christ's College Magazine (by E. Bredsdorff).
- A.2 3 pp. typescript by J.W.S. Pringle 'The research work of Professor T. Weis-Fogh', and concluding remarks delivered by D.A. Parry at the Society for Experimental Biology Memorial Symposium to Weis-Fogh, 4 January 1977.
- A.3 Xerox copy of a memorial address (in Danish) by C. Overgaard Nielsen, delivered to the Royal Danish Academy, 7 May 1976.
- A.4 Curricula vitae, mostly prepared for entries in biographical dictionaries. Folder also includes miscellaneous bibliographies.
- See pp.101-107 and introductory note for the most complete bibliography of Weis-Fogh's scientific publications.
- See E.75 for a collection of reprints of papers by Weis-Fogh and colleagues.
- A.5 Miscellaneous collection of photographs, mostly taken in August Krogh's laboratory where Weis-Fogh worked 1947-53. Includes a photograph of Krogh himself and several of Weis-Fogh.
- A.6 Notebook belonging to Hanne Weis-Fogh, containing laboratory notes in her hand dated 1956. Apart from a few (mostly unsigned) carbons of letters (see, e.g., F.12, G.4, G.8) this is the only item in the collection relating to Weis-Fogh's first wife. Her death in a car accident in 1971 was a blow from which, according to E. Bredsdorff (see A.1), Weis-Fogh never really recovered.

Bibliographical and personal

A.7-A.9 Membership of societies.

A.7 Correspondence re Weis-Fogh's election to the following societies:

Institute of Biology	1968-69, 1971
Royal Entomological Society	1969-70
Royal Danish Academy (in Danish) (<u>re</u> transfer from Danish to foreign membership)	1970-71
Society of General Physiologists	1974
American Society of Naturalists	1975

A.8 Correspondence re Weis-Fogh's election as a Foreign Honorary Member of the American Academy of Arts and Sciences. 1974

A.9 Correspondence with Otto Lowenstein who wanted to initiate Weis-Fogh's candidature for foreign membership of the Royal Society. In a letter of 17 March 1971 he wrote: 'I am convinced that were you a British National you would already be one of us in the Fellowship, and so I feel that there is a very good chance that your candidature will be successful in the not too distant future'. Weis-Fogh's reply indicates that he was considering applying for British citizenship at that time, but the correspondence was interrupted by the accident in which his wife was killed and he himself badly injured. As a result, he decided to retain Danish nationality, while continuing to work in Cambridge because, as he wrote to Lowenstein, 'I feel a great need for continuity in my life which otherwise could become too tenuous'.

The folder also contains an assessment by Weis-Fogh of his scientific work up to 1971.

Biographical and personal

- A.10-A.22 Cambridge University, 1966-75
- A.10 Folder labelled 'Fitting of TWF rooms, 1966'.
Contains correspondence (mainly with J.W.L. Beament)
and plans re alterations to the professorial rooms in the
Department of Zoology, Cambridge.
- A.11 Xerox copies of newspaper reports on an explosion
in the Department of Zoology, 17 August 1970.
Folder includes a letter from Weis-Fogh re temporary
arrangements for a study while repairs were being
carried out on the damaged floor of the building.
- A.12 Xerox copy of an article by Weis-Fogh about Danish
Universities, entitled 'The Wizard's Cauldron',
written for the Cambridge Review, 9 May 1969.

This is not mentioned in the list of publications on
pp.101-107.
- A.13 Cambridge Philosophical Society. Correspondence
1967-68 and 1974 (re William Bate Hardy Prize).

See also G.154.
- A.14 Cryobiology Discussion Group. Brief correspondence
and notices of meetings, 1970-72.
- A.15 Heads of Department Dining Club. Correspondence
1967, 1973. Not indexed.
- A.16 Scandinavian Studies Fund. Correspondence re
grant applications, etc. 1967-73.
- A.17 Society for the Application of Research. (Weis-Fogh
served on the Board of Advisers.) Correspondence
and notices of meetings, 1968-69.
- A.18 Brief correspondence, reports, etc. re two Cambridge
University Expeditions (to Malindi and Quintana Roo)
of which Weis-Fogh was a patron, 1974.
- A.19 Correspondence with the General Board of the
Faculties re leave of absence 1969-70, 1971, and
re renewal of Weis-Fogh's work permit, 1968, 1969.

- A.20 Miscellaneous correspondence re university or college matters and the Department of Zoology, 1967-75. Not indexed.
- A.21 Correspondence re proposal to award an Honorary Degree to Mogens Fog, 1969. Includes biographical tributes by Weis-Fogh and E. Bredsdorff.
- A.22 Correspondence with colleagues, and with Cambridge University Registry re award of Honorary Degree to Hans H. Ussing, 1969-70. Includes biographical notes and tributes to Ussing's work by Weis-Fogh and others, and arrangements for Ussing's visit.
- A.23-A.26 Miscellaneous correspondence of biographical and personal interest (in alphabetical order), 1956-73.
- A.23 D.J. Bradley 1958 (on Weis-Fogh's wind tunnel)
 Sir Alan Cottrell 1973 (Weis-Fogh's carbon only)
 C. Ellenby 1956 (on Weis-Fogh's election to a Balfour Scholarship)
 O.R. Frisch 1967 (Weis-Fogh's carbon only, on mss. of George de Hevesy)
- A.24 Sir Harry Goodwin 1973 (Weis-Fogh's carbon only, on his early botanical teachers)
 Sir Alan Hodgkin 1963, 1964
 T.R.R. Mann 1967, 1974
- A.25 Lady May Mellanby 1955 (on the death of Sir Edward Mellanby), 1961
- A.26 -. Nielsen 1973 (Weis-Fogh's carbon only, on a trip to Denmark with his 82-year old mother)
 M.G.M. Pryor 1960
 Lord Rothschild 1961 (on a visit to Cambridge by Weis-Fogh and his wife)
 U. Smith 1972 (on Weis-Fogh's second marriage)

Biographical and personal

A.27-A.29 Miscellaneous personal correspondence: social invitations, brief personal exchanges, etc., 1955-75. Not indexed.

A.27 A - J

A.28 K - R

A.29 S - Z

A.30 Folder labelled 'Plans for Sabbatical 1975/6'. Includes correspondence with D. Davenport, N.V. Kokshaysky, K. Schmidt-Nielsen and T.Y.-T. Wu, 1974-75. Several of the letters mention the highly successful symposium organised by Weis-Fogh and Sir James Lighthill in Cambridge, September 1975 (see F.66 - F.70 and introduction to Section F) and reveal him making detailed plans for research and travel less than two months before his death.

See also G.69, G.139.

SECTION B EARLY WORK AND RESEARCH ON LOCUST FLIGHT 1941-58
B.1 - B.143

The material is presented as follows:

- | | |
|--------------|--|
| B.1 - B.49 | Early research and work in August Krogh's laboratory, 1941-53 |
| B.50 - B.66 | Work on locust flight muscle, 1953-56 |
| B.67 - B.143 | Material relating to the 'Biology and Physics of Locust Flight', 1948-58 |

Each sub-section is preceded by an introductory note.

This Section covers Weis-Fogh's research up to the discovery in 1958 of a hitherto unknown protein in insect cuticle, which was later named resilin (see B.136 and Section C).

Much of the research done during this period remained an important basis for further experimental work, and Weis-Fogh used some of these hitherto unpublished results in later papers (see C.26, D.40 - D.42). The majority of the material is in Danish and this is usually noted as part of the description of each item. Titles and descriptions in inverted commas are those which appear on Weis-Fogh's folders or notes, but the words 'in Danish' indicate that the original title has been translated.

B.1-B.49

EARLY RESEARCH AND WORK IN AUGUST KROGH'S
LABORATORY 1941-53

Weis-Fogh's earliest scientific work, on soil micro-biology, was carried out at the Molslaboratoriet, Aarhus, while he was studying for his Mag. Scient. at Copenhagen University. The work resulted in the award in 1944 of the Gold Medal of Copenhagen University, and a paper 'Ecological investigations on mites and collembolus in the soil' (1948) which laid new foundations for detailed research in this subject. Virtually no papers survive for this period (though see B.1).

In 1947 Weis-Fogh became research assistant to the distinguished Danish physiologist August Krogh in his private laboratory at Gentofte, and on Krogh's death in 1949, Weis-Fogh became head of the laboratory until its closure in 1953. The main subject for study in the laboratory was the desert locust Schistocerca gregaria, with which most of the papers in this Section are concerned. While Krogh's main interest was in physiology and metabolism, Weis-Fogh undertook a study of the mechanics and energetics of locust flight using a specially constructed roundabout to which specimens were attached (see B.6, B.13, B.49), and a wind tunnel of which he wrote in 1971: 'I believe I was the first to study animal flight in the wind tunnel under conditions sufficiently close to those of free flight to be practical (sic) and biologically meaningful' (see A.9, letter to O. Lowenstein).

An extensive amount of material has survived from this important period in Weis-Fogh's life which provided the foundations of his later research. Some of it was reworked and transferred to other Sections (see C.27, D.40, D.41) but enough remains to give an idea of the quantity and variety of data collected. The material is presented chronologically except where a group of items on the same subject has been kept as a sequence (see, e.g., B.30 - B.43).

Item B.49 relates to a film 'How locusts fly' made by Weis-Fogh and Martin Jensen in 1952 which illustrated some of the apparatus used in the laboratory and the results obtained.

See also A.5 for photographs of Weis-Fogh in the laboratory.

Early work and research on locust flight

- B.1 Small light brown notebook containing notes in Danish on experiments with flying locusts 4 September 1949-15 May 1950. These occupy only the first few pages of the book, while the rest is empty except for one page of notes dated 16 July 1942. Inside the front cover is a list of headings relating to Weis-Fogh's earliest work on soil biology and there is evidence that some pages have been torn out. The original title of the notebook is illegible, but Weis-Fogh subsequently labelled it 'Measurement of thoracic pressure. Primary' (in Danish).

See also B.7.

Also included here is correspondence re Weis-Fogh's 1948 paper 'Ecological investigations on mites and collembolus in the soil', mainly requests for reprints but with some scientific content (not indexed), 1948-49, 1955-64, 1972.

See also G.7, G.16, G.50.

- B.2 Envelope labelled 'Cuttlefish drawings' (in Danish) with a note by Weis-Fogh '1946?'. It contains several biological drawings, presumably done while he was working for his Mag. Scient. at Copenhagen, 1941-47.

There is also a much smaller envelope containing rough pencil drawings with ink notes on tiny pieces of card. These are undated.

- B.3 Three reports prepared for the Anti-Locust Research Centre on work in August Krogh's laboratory. They are:

A.L.R.C.S.C. 7/48. 'Research on locust flight'.
2 pp. typescript by Krogh and Weis-Fogh, 9 January 1948.

A.L.R.C.S.C. 13/48. 'Report on a visit to the
laboratory of Professor Krogh, Copenhagen'.
2 pp. typescript by R.C. Rainey, 18 May 1948.

A.L.R.C.S.C. 14/48. 'Report on locust research carried
out in Professor Krogh's laboratory, Copenhagen, January
to June 1948'.
3 pp. typescript by Krogh and Weis-Fogh, 9 June 1948.

Folder also includes a copy of a letter, dated 29 October 1947, from August Krogh to the Director of the Anti-Locust Research Centre in which he writes: 'Mr. Weiss Fogh began work on the 16th after obtaining his degree as M.Sc. on the 10th. I find Weiss extremely good, with much initiative and very conspicuous powers of observation and planning of experiments'.

Early work and research on locust flight

- B.4 Notes and drawings mostly dated 1948, and some photographs of experimental apparatus. The work covered in this folder resulted in the publication of a paper entitled 'An aerodynamic sense organ stimulating and regulating flight in locusts' (Nature, 1949).
- B.5 Folder containing anatomical drawings of locusts by Weis-Fogh. These were reproduced and the copies were used extensively by Weis-Fogh in experimental work, lecturing and published papers.
- B.6 Photographs of experimental apparatus, flying locusts, etc. Includes several photographs of the laboratory's wind-tunnel and of the specially constructed roundabout on which suspended locusts could be induced to fly for several hours. See also B.13, B.49.
- B.7 Two envelopes containing records of changes in intrathoracic pressure of a tethered 'flying' desert locust, 1949-50. See also B.1, D.40.
- B.8 Set of cards containing notes re conditions for photography of flying locusts and dragonflies, 1950-52. Attached to some of these are locust wings marked with white paint as described in the draft commentary to the film 'How locusts fly' which Weis-Fogh made in collaboration with the engineer Martin Jensen. (See B.49).
- B.9 3 envelopes containing photographs of locusts, dated 24-26 January 1950.
- B.10 2 envelopes labelled 'Schistocerca gregaria. Ventilation' containing photographs, tables, graphs, calculations, etc., mostly dated 1950.
- B.11 Correspondence with K. Sawyer and N.W. Wootten re method of suspending flying locusts in the laboratory. Folder includes:

Letter from Sawyer and Wootten dated 22 March 1950, enclosing several drawings.

Copy of a report on their research at the Chemical Defence Establishment, Porton, dated 14 December 1949.

Weis-Fogh's notes for his reply to the letter, and his draft of the first paragraph.

Early work and research on locust flight

- B.12 Correspondence with Leigh E. Chadwick. Detailed scientific correspondence re locust flight, 1950-52.
Folder also contains notes on articles by Chadwick and others on insect flight.
See also G.27 for further correspondence with Chadwick.
- B.13 Envelope containing data re experiments with locusts flying on a specially constructed roundabout, November 1951-October 1952.
See also B.6, B.49.
- B.14 Set of notes in Danish on wing inertia. They are dated February-March 1951 and paginated from 1-18.
- B.15 Further notes on wing inertia. Those at the front of the folder continue the pagination of B.14, but there are also additional diagrams, tables and calculations, mostly dated 1952.
- B.16 Set of notes in Danish containing aerodynamic calculations based on data derived from photography, 22 July 1952.
- B.17 3 envelopes containing photographs of dragonflies (Odonata). The envelopes are labelled (in Danish) as follows:
 'Odonata. Small flight muscle under contraction'
 'Odonata. Small direct wing muscle'
 'Odonata. Pterothorax [viewed] from in front with varying wing positions'
The negatives of these photographs, which are filed at B.47, are dated September 1951.
- B.18 Envelope containing photographs illustrating the anatomy of the dragonflies Sympetrum and Aeshna. These correspond to negatives in B.47 dated September 1951. Also included in this folder are some earlier notes and drawings, 1948, 1950.
- B.19 Notes on dragonflies 1951, 1952, labelled (in Danish) 'Aeshna, Flight, heat production and ventilation'. The notes have been sorted into sections at a later date and a summary added by Weis-Fogh.
- B.20 Notes on flight, ventilation and heat production of Vespa Crabro and Sphinx (in Danish). Most of the notes on Vespa Crabro are dated 1952 with 2 pp. of later additions. The notes on Sphinx (3 pp.) are dated 1957.

Early work and research on locust flight

- B.21 Folder containing notes, diagrams and some printed matter in Danish and English comprising a survey of the literature relating to glycogen.
- B.22 Laboratory records of experiments re the hydration of glycogenes, 1952.
- B.23 Miscellaneous notes, graphs, etc. re glycogen, some dated 1952.
- B.24 Ms. and typescript drafts on the subject of fuel storage and weight economy. Weis-Fogh published 2 papers on these topics in 1952 (see bibliography included in A.4).
- B.25 Ms. headed 'Work in progress' dated October 1952. Lists the various lines of research currently being pursued in the laboratory, with a brief indication of their state of completion.
- B.26 Folder labelled 'Lift regulation' (in Danish) containing notes and diagrams, some dated 1952, and a draft headed 'The regulation of the lift' in a mixture of English and Danish.
- B.27 Set of cards containing data from experiments with flying locusts. The cards are numbered 1-11 and dated 13-16 January 1953.
- B.28 Folder labelled 'Resistance' containing notes and graphs re locust flight experiments, many dated 1953.
- B.29 Folder labelled 'Vingeorgan'. Contains laboratory data re experiments to determine conditions for locust flight, dated August 1953, and brief drafts in a mixture of English and Danish headed 'Induction of rhythmical wing movements' and 'Wind and lift as inductive flight stimuli'.
- B.30 Folder containing notes, graphs and experimental data (in Danish), 1948, 1949, re the effect of temperature changes on the flight performance of locusts.
- B.31 Folder containing notes, graphs and experimental data (in Danish), some dated February 1950, re the effect of temperature on locust flight.
- B.32 Laboratory records (in Danish) of experiments on thorax temperature and metabolic rate, October-December 1952. Folder also contains a graph dated 1954.

Early work and research on locust flight

- B.33 Notes, graphs and drawings (in Danish) for experimental work on thorax temperature, 1952. Includes information re equipment, etc. Also included here is a set of notes paginated 1-15b headed (in Danish) 'Thorax temperature. 14.8.52. Muus and TWF'. See F.6-F.8 for paper by Muus and Weis-Fogh on this subject, 1956.
- B.34 Notes and graphs re calibration of experimental equipment, December 1951-January 1953 (in Danish).
- B.35 Notes, tables and graphs on thorax temperature and radiation, paginated 1-60, and dated 16 December 1952- 7 January 1953 (in Danish).
- B.36 Notes, graphs, drawings and tables on thorax temperature, paginated 1a-25, and dated 7-12 January 1953 (in Danish).
- B.37 Undated draft in a mixture of Danish and English headed 'What can we say about radiation?'
- B.38 Notes and graphs re experiments with flying locusts, 1949-50, originally included with B.37 above (in Danish).
- B.39 Laboratory notes on thorax ventilation, pages 5-54a, dated 11 April-9 June 1953 (in Danish).
- B.40 Laboratory notes on thorax ventilation, pages 55-118, dated 10-24 June 1953 (in Danish).
- B.41 Notebook labelled 'Thorax temperature versus heat production' (in Danish) containing tables and calculations dated June 1953. There are also a number of graphs on loose sheets at the front of the book.
- B.42 Folder headed 'July 1953. Abdominal ventilation' containing records of experiments (in Danish).
- B.43 Miscellaneous ms. drafts in English and Danish for a paper or papers on the metabolic rate and ventilatory mechanism of flying locusts. The folder also includes a typescript headed 'The ventilatory mechanism during flight of insects in relation to the call for oxygen', a paper delivered at the XIV International Zoological Congress, Copenhagen, 1953, and later published (see List of Publications, pp.100-107 and E.75).
- B.44 Notebook containing notes and drafts in Danish for various articles on insect flight, some dated 1953.

Early work and research on locust flight

- B.45 Album of negatives most of which are records of laboratory work with locusts, 1948-49. Several of the negatives are annotated in Danish with details of the photographic equipment used, etc., and some are dated. The front cover is labelled 'Album no.1. Negativ No.1-276'.
- B.46 'Album no.2. Negativ No.277-522', containing further records of laboratory work. The date 20 September 1950 appears on negative no.461.
- B.47 'Album no.3. No.523-723'. Negatives of photographs taken in the laboratory c.1950-52. See also B.17, B.18.
- B.48 'Album no.4. No.724-'. Negatives of photographs taken in 1953 and 1957.
- B.49 Folder containing material re a film entitled 'How locusts fly' made by Weis-Fogh and Martin Jensen in 1952. The film was distributed by Dansk Kulturfilm and won first prize for scientific documentary films at a congress in Pisa a year or two later. It lasted for 25 minutes and showed locusts flying on Weis-Fogh's specially constructed roundabout (see B.6, B.13) and suspended on an aerodynamic balance in front of a wind tunnel. It included a section in slow motion so that the sequence of wing positions could be observed.
- The contents of the folder are as follows:
- Envelope labelled 'Dansk Kulturfilm. Herr Erik Olsen', containing 2 sets of photographs of flying locusts.
- Notes in Danish re apparatus and conditions for photography, 1952.
- Set of English captions for the film. Typescript with ms. corrections.
- Typescript set of Danish captions.
- Correspondence with Dansk Kulturfilm (in Danish) 1953-56, and with people wishing to show the film, 1956-71. Not indexed. Includes a letter from Weis-Fogh to A. Berbenni, 7 August 1961, which contains a clear statement of the purpose and results of the film.
- See also G.27, G.108.
- For further material re Martin Jensen, see Index of Correspondents.

B.50-B.66 WORK ON LOCUST FLIGHT MUSCLE 1953-56

In 1953 August Krogh's laboratory was closed down and Weis-Fogh went to work at the Institute of Neurophysiology at Copenhagen where he collaborated with Fritz Buchthal in experiments on locust flight muscle. At the end of 1954 he moved to Cambridge where he continued the experiments, and the work resulted in the publication of 3 joint papers in 1956 and 1957.

Laboratory notes and data from both Cambridge and Copenhagen have survived and there are also several drafts of one of the published papers (B.64-B.66). The arrangement of the material is chronological, in so far as this is possible.

Early work and research on locust flight

- B.50-B.55 The following items were originally kept together in a bulky folder labelled (in Danish) 'Muscle experiments, Cambridge'. For ease of reference some material has been removed and put into separate folders. The original folder remains at B.55 with some of its more miscellaneous contents. The papers are in a mixture of English and Danish, the latter being predominant.
- Not all the experimental work covered here was done in Cambridge; some of the folders contain papers dating from 1954 when Weis-Fogh was still working with Fritz Buchthal in Copenhagen.
- B.50 Notes on apparatus and method, 20 March 1954. Description and drawings of a vacuum myograph specially constructed for this set of experiments on muscle. Some of the drawings are in another hand.
- B.51 Set of notes dated 7 July 1954, paginated 1-8 providing a general introduction to the experiments. Contains sketches illustrating the principles involved, lists of symbols for mathematical calculations, examples of layout for tables containing results, etc.
- B.52 Set of notes describing experiments to determine the optimum conditions for the survival of locust flight muscle once it had been dissected out, 1953-54. The majority of the notes relate to the composition of the saline in which the muscle was kept. See also G.29.
- B.53 Set of notes labelled 'Tetanus. Shortening and force at 10-12° C', containing records of experiments April-October 1955.
- B.54 2 undated ms. drafts:
 'Maximum force and shortening during tetanus of locust flight muscle' (English and Danish)
 'Tetanic force and shortening in locust flight muscle'
- B.55 The original folder with its remaining contents, which include notes, graphs, drawings, tables, 1954-55, and 2 letters from Fritz Buchthal (see introduction to Section, p. 20). one of which is dated 26 January 1955.

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- B.56-B.66 The following items were kept with the above folder and are obviously related to it. They all contain further data re experiments with locust flight muscle. In the titles that follow 'G' stands for 'grasshopper' which is Danish for locust. The majority of the material is in Danish.
- B.56 Folder labelled 'G.57 to G.71. Average of all experiments at 10°C' (in Danish). Contains tables of experimental data and some graphs, all undated.
- B.57 Folder labelled 'G.59-71. Average of all experiments at 10°C' (in Danish). Contents similar to previous folder.
- B.58 Folder labelled 'Average curves at 10°C. G.63-G.71'.
- B.59 Folder labelled 'Average. Temperature experiment' (in Danish). Laboratory notes and tables.
- B.60 Folder labelled 'Average of G.70 & 71 at different temperatures'. Contains graphs and tables.
- B.61 Folder containing graphs illustrating average shortening of muscle at 10°C.
- B.62 Folder containing graphs and tables re the abdominal muscles. Much of the material is in another hand.
- B.63 Folder containing typescript notes and tables dated 14 September 1954, summarising the results of some of the muscle experiments, with comments added in red, 2 August 1960.
- B.64 Ms. and typescript draft headed 'Twitch contraction of isolated flight muscle of locusts', dated 13 July 1956. The draft is in a mixture of English and Danish and was very extensively revised before publication.
- B.65 Further ms. draft of the same paper, dated July 1956, in English, and much closer to the published version. Both this and the ms. portions of B.64 above are entirely in Weis-Fogh's hand although the authorship of the paper is ascribed to him jointly with F. Buchthal and P. Rosenfalck.
- B.66 2 incomplete typescript drafts of the same paper with ms. corrections and 1 copy of the finished typescript. One of the incomplete drafts is dated 21 November 1956.

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B.67-B.143 MATERIAL RELATING TO THE 'BIOLOGY AND PHYSICS OF LOCUST FLIGHT'

The material is divided into 2 sections. B.67 - B.77 covers Parts I - V all of which were published in R. Soc. Lond. Phil. Trans. B, and B.78 - B.143 covers Parts VI - IX of which only Part VIII was published (in J. exp. Biol.), although Weis-Fogh later produced several papers based on material collected for Parts VI and VII (see, e.g., C.26, D.40-D.42).

See also G.60, G.76.

B.67-B.77 Parts I - V

The original concept, formed in about 1952, was for a series of 10 papers to be written by Weis-Fogh in collaboration with Martin Jensen, covering all aspects of the biology and physics of locust flight. Parts I - IV were published in 1956, but the discovery of resilin by Weis-Fogh in 1958 (see B.136 and Section C) followed by his return to Copenhagen as Professor of Zoology disrupted work on Part V with the result that it was finally published only in 1962, after major revision (see B.74 - B.77).

B.67 2 pp. ms. notes headed 'Why positive criticism is badly needed', explaining the difficulties of getting the results of experimental work done in Krogh's laboratory into a form suitable for publication. The ms. ends by itemising the material in preparation on 'The flight of locusts' as 2 papers on flight muscles, 3 on physiology and 10 on biology and physics 'which are in the process of preparation and are approaching their final stage'. The notes are undated but probably belong c.1953-54.

B.68 Ms. draft of titles for the 10 papers with an indication of the number of pages, figures and tables for each paper. The arrangement differs considerably from that published with Papers I - IV in 1956. The date is probably 1953-54.

Also filed with the above is an undated draft of a letter to the editor of the Proceedings of the Royal Danish Academy about the possibility of publishing the papers, and instructions from various journals re the form in which papers are to be submitted.

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- B.69 Correspondence with Weis-Fogh's collaborator, Martin Jensen, and with the Royal Society about the publication of the papers.
- B.70 Ms. draft of references and acknowledgements for Parts I - VIII. Folder also includes brief notes for the typist, and cards (one dated 21 March 1955) listing the number of words, legends to figures and tables for each part.
- B.71 'Basic principles in insect flight. A critical review'. Typescript draft of Part I with ms. corrections by Weis-Fogh. This draft corresponds in broad outline to the published version but there are several detailed differences.

Folder also includes typescript draft of a preface to the series and a ms. introduction to Part I.
- B.72 'The aerodynamics of locust flight'. Ms. and typescript draft of Part III. The typescript, which is in Danish, has corrections by Martin Jensen (the author of the published paper) and there is also a draft of the introduction in his hand. The first item in the folder is a heavily-corrected summary of chapter and section headings for the paper by Weis-Fogh, in a mixture of Danish and English.

For correspondence re this paper see under M. Jensen in Section G.
- B.73 Several drafts of the final section of the paper that was published as Part IV, although it was originally to have been Part III (see B.68). There are 2 uncorrected typescripts, a third typescript with extensive ms. corrections, and several ms. versions, mostly unfinished and some in Danish and/or note form.
- B.74 'Strength and elasticity of locust cuticle'. Early typescript of Part V by Martin Jensen. The folder also contains some notes by Weis-Fogh for Part V.
- B.75 Ms. of the second version of Part V written by Weis-Fogh in September-October 1958, after he had discovered resilin (see B.135) but before it had been named (see C.5). Some related notes and drawings are included at the back of the folder.
- B.76 Part of the typescript of Part V as sent to the Royal Society in February 1959 with the figures that were omitted from the published version. Folder also includes the final typescript and photographs on which some of the drawings were based.

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- B.77 Correspondence with J.W.S. Pringle and the Royal Society,
1956, 1959-62 re preparation of Part V for publication.

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B.78-B.143 Parts VI - IX

The bulk of the material in this Section relates to Part VI. Items B.78 - B.98 consist of drafts and notes for this part written c.1952-58, and these are followed by a large amount of background material (laboratory notes, etc.) which was originally filed with the drafts. A few of these items overlap with material in the first part of Section B (see especially B.99 - B.102), but most relate to experiments performed while Weis-Fogh was in Cambridge 1955-58. The work for Part VI on elasticity (see B.103 - B.132) is closely related to the experiments on locust flight muscle described in B.50 et seq.

There is also quite a lot of background material for Part VII, but very little for Part VIII (which was finally published in 1964) or Part IX. Part X was to have been a final summary, but there are no traces in the collection of any draft for such a paper.

The disposition of the Parts is as follows:

Part VI - drafts	B.78 - B.98
- background material	B.99 - B.123
Part VII	B.124 - B.137
Part VIII	B.138 - B.139
Part IX	B.140 - B.142
Parts VI, VII, IX	B.143

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B.78-B.98 Part VI - drafts

- B.78 Early ms. notes and drafts for Part VI variously headed as follows:
- 'Knowledge on the basic flight process of insects'
 - 'Principles of the flight system of the desert locust'
 - 'The morphological, mechanical, and elastic principles of the flight system of the Desert Locust'
- B.79 'Principles of the flight system of the desert locust. 1st draft'. 74 pp. ms., written when Weis-Fogh was at the Institute of Neurophysiology, Copenhagen (1953-54). Included in the folder is a letter dated 27 January 1954 from Weis-Fogh to T.H.C. Taylor of the Anti-Locust Research Centre in which he promises to send the first draft 'in a few days' for Taylor to read.
- Chapters 5 and 6 of this draft were later transferred to Part VII.
- B.80 Typescript of the above with corrections and alterations by Weis-Fogh.
- B.81 Folder labelled 'Figures for Principles of the flight system' (in Danish). Contents include rough and finished drawings, graphs and photographs numbered to correspond with the list of figures for each section in B.79 and B.80 above.
- B.82 Notes for a revised version of Part VI dated March 1956.
- B.83 'Old Ms. Cambridge'. Draft of second version of Part VI, entitled 'Wing movements and elastic deformations in flying locusts'. This is almost certainly the draft referred to by Weis-Fogh in a note to J.W.S. Pringle dated 20 April 1956 (see B.85).
- B.84 Typescript of the above with corrections and comments by Weis-Fogh in Danish and English, some dated 7 September 1956.

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- B.85 Folder labelled 'Elastik: for Discussion. Primary for discussion of model and comparisons with Hawk-moth and dragonfly and fly'. Contents include graphs, tables and calculations, and several ms. drafts of the Discussion which is missing from the version of Part VI at B.83 and B.84. The first item in the folder bears the date 20 April 1956, and a note in Weis-Fogh's hand: 'Dear John [Pringle], Here is a draft of part VI, plus the following disposition of the discussion ... Yours ever, Torkel'.

The model referred to in the title was exhibited at Royal Society Conversaciones in May and June 1956. See F.4, F.5.
- B.86 Set of notes headed 'Part VI. Wing movements and elastic deformations in flying locusts. (With a general discussion.) (Cambridge 18.11.57.)', outlining a third draft of Part VI. This outline does not correspond with the full ms. drafts which follow.
- B.87 Various ms. drafts of an introduction to Part VI. Three of these are dated 28 November 1957 (with a note 'not used but some details to be extracted'), 30 November 1957 and 6 December 1957 (headed 'Alternative Solution').
- B.88 3 ms. drafts of Chapter 2 of Part VI, dated 8, 23, 24 December 1957.
- B.89 Ms. draft of Chapter 3 'Movements and morphology: the basis of analysis' written between 28 December 1957 and 18 January 1958 (although the final date is given as 18 January 1957 this is clearly a slip of the pen). Contents of folder include a few other notes that were filed with this draft.
- B.90 Ms. draft of Chapter 4 'Wing inertia and work' and notes for tables related to this chapter.
- B.91 Ms. draft of Chapter 5 'Quantitative approach and methods' dated 2 February 1958. Folder also includes 3 sets of related notes, one of which is mostly in Danish.
- B.92 Ms. draft of Chapter 6 'Reactive components and elastic efficiency'. Notes for a table are also included.
- B.93 Several ms. drafts of Chapter 7 written between 21 February and 18 March 1958. The title varies but the subject is elasticity, mainly of the pterothorax. One of the drafts includes a set of notes on lateral stiffness, dated 31 May 1957.

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- B.94 Brief ms. outline of Chapter 8, dated 18 March 1958.
- B.95 Typescript of Chapters 1-6 of Part VI. Ms. versions of each chapter are filed above (B.87-B.92) but the whole typescript is included here as the final and most accessible version of this unfinished and unpublished paper.
- B.96 Miscellaneous notes re Part VI.
- B.97 Folder containing notes, graphs, tables, calculations, drawings, etc. for the figures for the 1957-58 version of Part VI, with a few brief notes dated 1961, 1962.
- B.98 Envelopes containing photographs and diagrams of layout for plates for Part VI. They are labelled as follows:
- 'Plate 1. Simple demonstrations'
 - 'Plate 2. Movements and morphology'
 - 'Plate 3. Types of elastic torques (mainly)'
- Each envelope was also briefly annotated in pencil in August 1961.

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B.99-B.123 Part VI - background material

- B.99 Folder containing notes, graphs and calculations re early experiments on elasticity, some dated May 1948.
- B.100 Folder labelled 'The elastic behaviour of the pterothorax of locusts (*Schistocerca gregaria* Forskål). Elastik: Oktober-November 1953. pp.1-31'. Contains records of experiments, graphs and notes on the results.
- B.101 Set of notes paginated 32-79 covering the period November 1953-March 1954, and continuing the record of experiments begun in the previous folder. The experiments are numbered from 5 to 11. 2 pp. of ms. notes in Danish dated 22 February 1954 were found with this material and are included in the folder.
- B.102 Contents of folder originally labelled 'Elastik - primary 1953-55 torque of thorax (no direct use)'. Results of experiments undertaken in May 1955, and some calculations.
- B.103 Folder labelled 'Elastik: general concepts 1957'. Contains:
3 pp. ms. notes in Danish dated May 1957 headed 'Altering and verifying of VI'
10 pp. ms. notes in Danish and English dated 13 September 1957 re principal ideas emerging from the work for Part VI
Notes for the Introduction to Part VI dated 16 November 1957
Notes on the literature.
- B.104 Folder labelled 'background for experiments 1957' containing material similar to that in B.103 above, mainly in Danish. In particular there is a set of notes dated May 1957 and headed 'What have we discovered?' (in Danish).
- B.105-B.107 Contents of a folder labelled 'Elastik: standard stroke' (in Danish). The original folder has been discarded because of its delapidated condition.
- B.105 Set of papers labelled (in Danish) 'Standard stroke. Hindwings'. Graphs and tables, mainly dated April-May 1957, though some are earlier (1953) and a few are later (1958).

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- B.106 Set of papers labelled (in Danish) 'Standard stroke. Forewings'. Contents similar to those of B.105 above.
- B.107 Set of papers labelled 'Kinematics'. Mainly notes and calculations, some dated 22 October 1954.
- B.108 Folder labelled 'Elastik: primary 1957 lateral stiffness'. Contains 3 pp. of notes in Danish dated 4 June 1952, a drawing, and data from experiments, May-June 1957.
- B.109-B.111 Contents of a folder labelled 'Elastik: primary. Damping. 1957'. The original folder remains at B.109, but it has been split into 3 parts because of its bulk. It contains records of experiments on damping in locust flight muscle, paginated 1-327. Pp.58-60 appear to be missing.
- B.109 Pp.1-57, experiments 1-3, June 1957. There are also a few unpaginated notes and calculations in English and Danish at the front of the folder.
- B.110 Pp.61a-193, experiments 4 and 5, June-July 1957.
- B.111 Pp.194a-327, experiments 6 and 7, July 1957.
- B.112 Folder labelled 'Elastik: primary 1957, effect of temperature', containing notes, graphs and data from experiments performed in July 1957. In Danish.
- B.113 Folder containing notes, tables and graphs summarising some of the results of experiments on damping, 1957. In Danish and English.
- B.114 Folder labelled 'Elastik: primary. Muscular torque: calculations'. Contains diagrams, calculations and notes in English and Danish, paginated 1-35. The first page is dated 4 September 1957. At the back of the folder is a group of unpaginated graphs and tables.
- B.115 Folder labelled 'Elastik: primary, finals, passive muscle elasticity, experimental'. Contains graphs and data from experiments, September-October 1957.

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- B.116 Folder labelled 'Elastik: various insects'. Contains records, in English and Danish, of experiments on Aeshna, Sphinx and Schistocerca, with graphs, calculations and notes on the results. Most of the experiments were carried out in October 1957, but there is one page of notes on Aeshna grandis dated 21 March 1971.
- B.117 Folder labelled 'Elastik: primary, finals. Coupled thoracic box'. Contains graphs and data from experiments, October-November 1957.
- B.118 Folder labelled 'mainly on wing inertia. May be of interest' containing a set of notes and calculations dated 22 January 1958, and another set, possibly earlier.
- B.119 Folder labelled 'Elastik: primary. Muscle-torque - imitation and lateral stiffness, experiment. March 1958'. Contains notes and data from experiments and a rough sketch of experimental apparatus headed 'Muscle-action-torque', all dated March 1958.
- B.120 Cards containing miscellaneous data, found with material relating to Part VI.
- B.121 Album of negatives labelled 'Cambridge I'. The first part of the album contains observations of locust flight muscle under a microscope; the rest is a record of a series of experiments with flying locusts and weights. One of these negatives is dated 4 July 1957.
- B.122 Album of negatives labelled 'Cambridge II'. The first part continues directly on from the previous book, after which there is a series of pictures of the elastic tendon in the dragonfly Aeshna Cyanea as seen under the polarizing microscope, dated 25 June 1958. (Approximately one third of the album is empty.)
- B.123 3 envelopes containing photographs of experiments on locust flight muscle.

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B.124-B.137 Part VII

- B.124 Various parts of the first typescript of Part VI which were extracted and re-ordered to form a basis for Part VII. They carry ms. corrections by Weis-Fogh and comments in another hand. They are accompanied by a letter to J.W.S. Pringle dated 19 April 1956 asking him to look at this early draft.
- B.125 Notes and diagrams for Part VII in the form of a letter, dated 7 September 1956, and probably intended for submission to Pringle. Also further notes outlining a scheme for Part VII dated April 1957.
- B.126 Letter from Anker Nielsen in Danish dated 23 May 1956 re the morphology of the wing systems of various insects.
- B.127 Various anatomical drawings of locusts, particularly of the wing hinge.
- B.128 2 sets of photomicrographs illustrating locust anatomy. The first set corresponds to negatives in B.47 which are dated 24 May 1952. The second set probably dates from 1957. The folder also includes various data re conditions, etc. for the photography, some of which are dated March 1957.
- B.129 1 page draft in Danish with references and notes headed 'The functional architecture of the pterothorax of *Schistocerca gregaria* in relation to flight'. The bibliography is dated 1952.
- B.130 2 envelopes containing data re wing area in male and female locusts. Undated, but probably c.1950.
- B.131 Notes in Danish and English headed 'Re-investigation of wing-mechanism', dated 27 June 1956.
- B.132 2 sets of notes on wings, in English and Danish, dated December 1956. Included here is brief correspondence from John Smart, 1956-57, and related reprints, one of which is heavily annotated by Weis-Fogh.
- B.133 Folder labelled 'Primary on wing and notal movement: may be of interest. Copenhagen'. Contains various data from experiments, January-March 1957.

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- B.134 Folder labelled 'Notal movements and wing folding spring: primary'. Contains notes and calculations, 1957-58.
- B.135 Folder labelled 'Locust thoracic mechanism in relation to the evolution of winged insects. Preliminary summary, February 1957'. Contains miscellaneous notes and a draft dated 27 February 1957.
- B.136 Folder labelled 'On evolution of winged insects'. Contains notes and drawings, and drafts for a paper delivered at the Fifteenth International Congress of Zoology, July 1958. This was probably the first announcement of the discovery of resilin which was not given the name until later. It is referred to here as 'a new rubberlike component of insect cuticle' and 'a protein, probably of a new type'.
See also F.11.
For further material on resilin see Section C.
- B.137 Miscellaneous notes relating to Part VII.

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B.138-B.142 Parts VIII and IX

- B.138 Background notes to Part VIII, 'Lift and metabolic rate of flying locusts', published in J. exp. Biol., 1964. Most of the notes in this folder were written in 1963 but there are also laboratory notes and graphs dated 1952, 1953.
- B.139 Notes on evaporation of water during flight. The notes are in Danish, paginated 1-23, undated but possibly c.1952. They are annotated in red 'For part VIII and ventilation papers'.
- B.140 'Studies on the energetics of locust flight'. Heavily-corrected typescript of a lecture given in Bristol, April 1954 (see E.34). This was in a folder marked 'IX' along with B.141 below.
- B.141 Miscellaneous material relating to Part IX. Folder includes an undated ms. draft in Danish on the energetics of flight, various notes, drawings and graphs, and 11 pp. of aerodynamic calculations in another hand.
- B.142 'The flight of locusts'. Original typescript of a paper by Weis-Fogh published in Scientific American (1956). The typescript differs considerably from the published version which was heavily edited (see letter from Weis-Fogh to J.W.S. Pringle, B.124). It is included here because it was originally filed with papers for Part IX above. Folder also includes brief correspondence about the article, 1954-56.
- B.143 2 sets of notes dated 8 and 12 August 1970 headed 'Revision of Parts VI, VII, IX'. Lists 6 or 7 possible papers to be derived from material already assembled for these 3 parts.

SECTION C RESEARCH IN COPENHAGEN 1957-66 C.1 - C.103

The material is presented as follows:

C.1	-	C.11	Early work on resilin, 1957-64
C.12	-	C.30	Other research (mainly on insect physiology), 1958-65
C.31	-	C.103	Research on the properties of resilin and elastomers in insects, 1964-66. (Includes correspondence to 1969.)

Section C roughly corresponds with the period during which Weis-Fogh was Professor of Zoophysiology at Copenhagen 1958-66, although there is some material that overlaps with Section B (see, e.g., C.1 - C.6, C.20).

Weis-Fogh's work on muscle and elasticity in Cambridge for Parts V - VII of the 'Biology and Physics of Locust Flight' led to the discovery in 1958 of a new rubberlike protein in insect cuticle which was later named resilin. Background material to this discovery may be found at C.1 - C.6 (see especially C.5 for material on nomenclature) and, more indirectly, in the latter part of Section B. Research during the years at Copenhagen was mainly devoted to an investigation of the physical and chemical properties of resilin, but Weis-Fogh also worked on several aspects of insect physiology including the tracheal system and muscle action potential in locusts (see C.12 - C.30).

A grant from the United States Air Force European Office of Aerospace Research in 1965 helped to support further investigations of resilin through different types of microscopy, and the results of some of this research appear at C.37 - C.103. The work was continued in Cambridge after Weis-Fogh's appointment to the Chair of Zoology in 1966 (see D.1 - D.26).

Further material on resilin is to be found at E.39-E.44, E.49, E.52, E.53, E.55, E.62, F.11, F.19, F.21, F.23, F.27, F.29, F.30, F.33, G.8, G.16, G.29, G.37, G.70, G.93, G.99, G.112, G.114, G.133.

Research in Copenhagen

C.1-C.11 EARLY WORK ON RESILIN 1957-64

- C.1 Folder labelled 'Rubberlike materials. Photographs. Histology. Water content. Morphology and function'. The photographs have been removed (see C.6 below) but the other contents remain, describing experiments, 1957-58, on the elastic tendon of various insects, including locusts. There are also some notes on the histology of Aeshna elastic tendon dated 5 January 1960.
- C.2 Folder labelled 'Elastic tendon. Primary material'. Contains notes on experiments with elastic tendon from Aeshna cyanea and Aeshna grandis, 1957-58.
- C.3 Folder labelled 'Experiments with prealar arm'. Contains laboratory notes and comments on experimental results, June 1958.
- C.4 Folder labelled 'Damping of prealar arm'. Contains laboratory notes, diagrams and calculations, July-September 1958.
- C.5 Folder labelled 'Elastic material: Chemistry and digestion'. Contains notes on experiments 1957-60. On the front of the folder, in Weis-Fogh's hand, is written 'Resilin. It. [Latin] resilio - to spring back, to rebound'. This refers to the naming of the new protein discovered by Weis-Fogh in 1958 (see B.136).

Also included is a Xerox copy of a paper on resilin by K. Bailey and Weis-Fogh published in Biochim. Biophys. Acta, 1961, in which it is stated that the name was suggested by Professor D.S. Robertson, Cambridge.
- C.6 Envelope containing photographs of prealar arm and elastic tendon and some data re conditions for photography, etc., 1958. This may originally have been filed with the other contents of C.1 above.
- C.7 Large notebook labelled 'Resilin. T. Weis-Fogh. Contains laboratory notes and drawings 1959-61 and many empty pages. Includes set of notes headed 'First successful "taming"/stabilization of resilin' 17 February 1961. There are several loose pages which were originally attached with sellotape.

Research in Copenhagen

- C.8 Material relating to paper 'A rubber-like protein in insect cuticle' (J. exp. Biol. 1960), referred to by Weis-Fogh as 'Resilin I'. Includes graphs, drawings, notes and a few photographs, 1959-60, with a copy of Weis-Fogh's letter submitting the paper for publication.
- C.9, C.10 Material relating to paper 'Thermodynamic properties of resilin, a rubber-like protein' (J. mol. Biol. 1961). This paper is referred to by Weis-Fogh as Resilin IV (later changed to III).
- C.9 Folder labelled (in Danish) 'Elastic tendon. Thermo-elasticity'. Contains notes, graphs, calculations and experimental data, 1958-60, collected together as a basis for the figures illustrating the paper.
- C.10 Folder containing similar material to the above, 1959-61, including parts of a ms. draft of the paper and correspondence with the Editor of the Journal of Molecular Biology, 1961.
- C.11 Material relating to paper 'On the structure of resilin' by G.F. Elliott, A.F. Huxley and T. Weis-Fogh (J. mol. Biol. 1965). Folder includes:
- Correspondence with G.F. Elliott and G.N. Ramachandran (Weis-Fogh's carbon only).
 - Ms. drafts in Weis-Fogh's hand including one dated 12 September 1964 with corrections by Elliott and himself.
 - Miscellaneous background notes and photographs.

Research in Copenhagen

C.12-C.30 OTHER RESEARCH (MAINLY ON INSECT PHYSIOLOGY) 1958-65

- C.12 Large notebook labelled 'Muscle and nerve. 19.1.61.-64. (Microscopy until 19.7.61). T. Weis-Fogh'.

Much of the book is empty, but there are some notes in English and Danish and diagrams of experimental apparatus at the front.

- C.13 Large notebook labelled 'Microscopy. Started 19.7.61. Torkel Weis-Fogh'.

The book is largely empty, but the first few pages contain notes on techniques for various types of microscopy in English and Danish, 1961, 1962, 1965, 1968-69.

- C.14 Notes, graphs, diagrams and calculations re muscle.

They are prefaced by a letter from Weis-Fogh in Danish dated 3 November 1960 beginning 'Dear E.G. [Erik Gettrup] Herewith the "data book" with the insertion "Experiment 15 removed for calculation"'. Folder also includes Weis-Fogh's 'Comments on Gettrup's calculations' 18 February 1961, 'Exp. 15' with corrections and a 'Scheme for revision' possibly in Gettrup's hand.

- C.15-C.19 Work with D.M. Wilson on locust muscle.

D.M. Wilson worked in Weis-Fogh's laboratory 1959-60 and Weis-Fogh spent 3 weeks with him at Berkeley, November-December 1961, in order to write up a joint paper (see C.19) which was published in 1962. Their collaborative work is well documented in the following items.

See also under Wilson in Index of Correspondents.

- C.15 Laboratory notes on muscle experiments, 1960. Folder contains:

Typescript description of experimental aims and techniques with additional notes by Wilson and Weis-Fogh.

'Muscle action potential recordings', 16 June-8 September 1960. Typescript laboratory notes.

'Post mortem dissections'. Laboratory notes in Wilson's hand.

'Miscellaneous flight recording situations'. Ms. notes by Wilson and Weis-Fogh.

Laboratory notes re filming of 'pronator-supinator action in mesothorax of Schistocerca gregaria'.

Research in Copenhagen

- C.16 Various notes on experimental results by Weis-Fogh and Wilson, August-September 1960, including records of a discussion 10 September 1960.
- C.17 'Summary of results to date on dorsal longitudinal flight muscle of metathorax of Schistocerca gregaria' by A.C. Neville, 6 October 1961. This summary was presumably written for Weis-Fogh's visit to Berkeley later in the year. Neville worked in Weis-Fogh's laboratory September-December 1959 and 1961-63. See C.20-C.22 and Index of Correspondents.
- C.18 Typescript of the above with annotations by Weis-Fogh and Wilson, and some photographs and drawings.
- C.19 'Patterned activity of co-ordinated motor units, studied in flying locusts. Berkeley 1.12.61.' Summary of experimental results, and outline for draft of the joint paper. Typescript with annotations by Weis-Fogh and Wilson and some additional ms. notes by Weis-Fogh dated 2 December 1961.
- C.20-C.22 Work with A.C. Neville 1959-65.
- C.20 Folder labelled 'Functional morphology. Odonata'. Includes:
- 'Statement on joint work concerning homologies in locust and dragonfly pterothorax by A.C. Neville and T. Weis-Fogh, 30th November 1959'. There is another copy of this, with figures, at G.82.
- Notes on dragonflies labelled 'A-E' 1957-58. Note E is headed 'TWF - Neville - discussion Cambridge 11.2.58'.
- Several pages of notes, November 1959, headed 'TWF - Neville - discussion'.
- See also under Neville in Index of Correspondents.
- C.21 Folder labelled 'Neville and Weis-Fogh. Tp. and flight muscle 1962'. Contains notes, graphs, calculations and two drafts of a joint paper 'The effect of temperature on locust flight muscle' (J. exp. Biol. 1963).

Research in Copenhagen

- C.22 Envelope containing typescript draft of a paper by A.C. Neville 'Circadian organization of chitin in some insect skeletons', with comments by Weis-Fogh and a letter from Neville to accompany the ms., 22 April 1965. A draft of Weis-Fogh's reply appears on both sides of the envelope. Also included is a set of photographs with typescript captions.
- C.23 Notes on 'Aeshna flight muscles. Tracheal supply'. Weis-Fogh paginated these notes but later put some of them out of sequence. They mostly date from 1962 but may incorporate some earlier material.
- C.24 'October 1962-December 1962. Diffusion'. Set of notes paginated 1-70.
- C.25 Further material on diffusion, December 1962. Includes calculations, notes, diagrams and a set of notes in Danish.
- C.26 'Functional design of the tracheal system of flying insects as compared with the avian lung'. Typescript with ms. corrections of paper published in J. exp. Biol. 1964. Included is correspondence with V.B. Wigglesworth, 1963-64.
- C.27 Folder marked 'Original material for Tracheal System' (in Danish). Notes, drawings, photographs, etc., 1949-62.
- C.28 Notes on insect flight, 1960, 1963. 4 sets of notes as follows:
- 6 pp. in Danish, but headed 'Current problems in research, etc. etc.', 3 April 1960.
 - Set of notes in English headed 'Flapping flight. Dimensional considerations', 8 January 1963.
 - Set of notes in English headed 'Lift and power', 13 May 1963.
 - 3 pp. notes, undated, headed 'Three limitations each with own set of rules'.

Also included here are some undated notes and calculations re airscrews.

Research in Copenhagen

- C.29 Folder containing miscellaneous notes and diagrams re equipment and techniques, mostly 1962-64, but some undated and probably earlier.
- C.30 Typescript in Danish 'Carbohydrate in haemolymph of Schistocerca gregaria' signed 'Svend Olav Andersen, 11 April 1962'.
- For further material re Andersen, see Index of Correspondents.

Research in Copenhagen

C.31-C.103 RESEARCH ON THE PROPERTIES OF RESILIN AND ELASTOMERS
IN INSECTS 1964-66 (includes correspondence to 1969)

C.31-C.36 United States Air Force European Office of Aerospace Research.
Grant to Weis-Fogh for research on 'Properties of resilin
and elastomers in insects', 1965-69. The work was begun
in Copenhagen and continued in Cambridge after Weis-Fogh's
appointment to the Chair of Zoology in 1966.

C.31 Correspondence 1964-65, mainly with officials of the
European Office of Aerospace Research. Includes Weis-
Fogh's application for the grant and a copy of the contract.

C.32 Correspondence 1966, mainly re conditions for transferring
research work to Cambridge in Autumn 1966, and routine
administrative matters.

C.33 Correspondence 1967-69.

C.34 Invoices, Accounts, etc. 1965-69.

C.35 Notes re equipment, quotations, catalogues, etc.

C.36 Progress reports on research, submitted by Weis-Fogh to
European Office of Aerospace Research, 1965-69, with
some background material.

C.31-C.103

Research in Copenhagen

C.37-C.103

The following items contain the results of a comprehensive survey of resilin using different types of microscopy and comparing the results obtained. All the work was done in Copenhagen 1965-66.

Items C.37 - C.96 consist of photographs of the locust prealar arm and wing hinge viewed under the electron microscope. The photographs are grouped in envelopes bearing their numbers, the date, and notes in Danish (not in Weis-Fogh's hand) re type and provenance of section, magnification, and any points of interest in the photographs. Other data re photographic conditions, etc. are included inside the envelope.

The photographs are presented as received but it will be seen that the sequence of numbers is not complete. The reason for this is not known.

C.37	379-398	28.6.65.
C.38	410-429	14.7.65.
C.39	433-452	28.8.65.
C.40	455-466	3.9.65.
C.41	469-480	3.9.65.
C.42	495-514	24.9.65.
C.43	516-533	24.9.65.
C.44	536-555	24.9.65.
C.45	Parts of 512-533, at greater magnification	8.10.65.
C.46	587-606	21.10.65.
C.47	608-627	21.10.65.
C.48	629-648	21.10.65.
C.49	650-669	21.10.65.
C.50	677-682	8.11.65.
C.51	688-707	11.11.65.
C.52	713-732	23.11.65.
C.53	734-742	23.11.65.
C.54	743-762	24.11.65.
C.55	764-783	24.11.65.
C.56	786-797	25.11.65.

Research in Copenhagen

C.57	829-847	4.1.66.
C.58	23-30	25.1.66.
C.59	31-50	26.1.66.
C.60	51-63	27.1.66.
C.61	68-87	2.2.66.
C.62	89-107	2.2.66.
C.63	130-149	17.2.66.
C.64	151-170	17.2.66.
C.65	172-190	18.2.66.
C.66	191-207	18.2.66.
C.67	208-227	21.2.66.
C.68	305-311	8.3.66.
C.69	318-327	25.3.66.
C.70	330 (000-011)	29.3.66.
C.71	334-350	5.4.66.
C.72	352-358	5.4.66.
C.73	359-378	6.4.66.
C.74	401-414	19.4.66.
C.75	415-426	20.4.66.
C.76	427-446	22.4.66.
C.77	501-520	17.5.66.
C.78	522-541	17.5.66.
C.79	543-549	n.d.
C.80	560-579	2.6.66.
C.81	229-240	22.6.66.
C.82	757-792	5/6.9.66.

These were not in an envelope and were accompanied by a letter from W. Rasmussen and Weis-Fogh's reply, October 1966.

Correspondence with Rasmussen dated March 1967 is also included here.

C.83	25-44	25.10.66.
C.84	47-57	26.10.66.

Research in Copenhagen

C.85	58-62	26.10.66.
C.86	63-75	26.10.66.
C.87	76-84	26.10.66.
C.88	85-96	26/27.10.66.
C.89	200-212	9.11.66.
C.90	213-224	n.d.
C.91	225-236	10.11.66.
C.92	225-236	(but containing 237-245) 10.11.66.
C.93	450-469	9.12.66.
C.94	506-515	13.12.66.
C.95	516-535	13.12.66.
C.96	536-556	14.12.66.

C.97 'Journal' 1964-66. Laboratory notes in Danish and English
re individual specimens, aims, techniques, results, etc.,
in various hands.

C.98, C.99 2 folders containing photographs of locust prealar arm viewed
with a phase-contrast microscope.

C.100-C.103 4 boxes of colour transparencies of locust prealar arm
viewed with fluorescence and interference microscopes.

SECTION D RESEARCH IN CAMBRIDGE 1966-75 D.1 - D.62

The material is presented as follows:

D.1 - D.34	Research on resilin and elastin
D.35	Material relating to the Biological Microprobe Laboratory, Department of Zoology, Cambridge
D.36 - D.39	Research on 'Intracellular and extra-cellular matrix proteins'.
D.40 - D.57	Research on animal flight
D.58 - D.62	Project for research on 'Fluid dynamics in biology'

Each sub-section is preceded by a brief introductory note.

The record of Weis-Fogh's research work in this Section is far less complete than in Sections B and C because material relating to research projects continuing after his death in 1975 was retained by the Department of Zoology, Cambridge.

This period marks the growth and diversification of Weis-Fogh's research interests: he supervised two major research teams (see D.35, D.36 - D.38) as well as continuing research on insect flight on which he published a major paper in 1973 (see D.48 - D.53).

The Section ends with Weis-Fogh's plans for an ambitious project to study biological fluid dynamics in collaboration with Sir James Lighthill, Lucasian Professor of Mathematics in the University of Cambridge. The application to the Science Research Council for a grant to support this research, drafted in October 1975, was never presented, following Weis-Fogh's death on 13 November.

Research in Cambridge

D.1-D.34 RESEARCH ON RESILIN AND ELASTIN

The material in the first part of this Section (D.1 - D.24) continues the investigation into the properties of resilin and elastomers in insects begun in Copenhagen in 1964 (see C.31 - C.103), and financed by a grant from the USAF European Office of Aerospace Research. After the expiry of the grant in 1969, work on elastin continued in collaboration with J.M. Gosline as part of a project to study intracellular and extracellular matrix proteins (see also D.36 - D.39).

For further material on elastin, see E.59 - E.63, F.29, G.28, G.93, G.148.

- D.1-D.8 'Chitin'. The following material, consisting of laboratory notes and photographs 1967-68, was kept together under the above heading. Although some notes were written by Weis-Fogh, most are in an assistant's hand.
- D.1 'Photography of Autoradiography sections'. Notes and negatives April-November 1967.
- D.2 Preliminary work. Notes on specimens, preparation techniques, equipment, etc. May-July 1967. pp.1-58a.
- D.3 'Tendon no.1', pp.59-76. July 1967.
- D.4 'Tendon no.3', and a note re discarded specimens, pp.76a-163. September 1967.
- D.5 Notes mainly re photometer and polarising microscope, pp.164-238a (p.237 missing). September-October 1967.
- D.6 'Tendon no.4', pp.238a (sic.)- 338c, with some unpaginated sheets. October-November 1967.
- D.7 'Tendon no.7', pp.339-374. December 1967-May 1968. Includes a letter from Weis-Fogh in Denmark to G. Mewis, 13 December 1967, with comments on the conduct of the experiments.
- D.8 'Chitin Vol.2. Observations made with Polarising microscope of Locust Tendon'. Notes, photographs and charts, November 1967, February, March 1968.

Research in Cambridge

- D.9-D.11 'Locust Development'. Material filed under the above heading, as follows.
- D.9 Pp.1-18 (with several additional unpaginated sheets. See below). Includes:
- Records monitoring growth of locust batch 1, April 1968
 - Records for batch 2, September 1968
 - Notes headed 'Shadow method for measurement of distance d from cuticle surface to hypodermal cell in Schistocerca', 14 September 1968, with photographs, charts and negatives. The photographs, etc. are unpaginated.
- D.10 Pp.19-89. Records for batches 3 and 4, September-October 1968, and notes by Weis-Fogh headed 'Locust Development', June 1970.
- D.11 'Locust culture records', batches 7-14, 1969-70. Unpaginated. Includes copy of a letter from Weis-Fogh, 7 June 1968, setting out the conditions under which the locusts were bred.
- D.12-D.21 'Cuticle development'. Material filed under the above heading, as follows.
- D.12 Pp.1-18. Weis-Fogh's notes on aims and methods, and records of preliminary experiments, October 1968.
- D.13 Pp.19-65. 'Locust development: Fixation scheme'. Record of experiments, 1968-69, followed by summary of techniques.
- D.14 Pp.66-88. 'Cuticle Development. Microscopy and calibrations'. Notes and photographs, February 1969.
- D.15 Set of unpaginated notes on 'Glycerol-Gelatine solutions', July-September 1969. Includes correspondence with G. Mewis re problem of gelatine frothing.
- D.16 Pp.89-103 headed '17.5.70. Resumed work on Cuticle Development'.
- D.17 Notes on silk, April 1968.
- D.18 Climate cabinet records, September-November 1968.

Research in Cambridge

- D.19 Records re preparation of frozen sections for microscopy, 1968-69.
- D.20 Micrographs of cuticle development observed with an interference microscope, 1969.
- D.21 Set of notes headed 'Epicuticle formation, summer 1970'.
- D.22 Folder containing 3 panoramic micrographs of locust cuticle, 1969.
- D.23 Folder containing negatives of micrographs of locust cuticle with some notes, September 1969.
- D.24 Micrographs illustrating locust cuticle development. 1 box. For background material to these, see D.12-D.21, especially D.13, D.14, D.16.
- D.25 Ms. draft headed 'Chitin and cuticle', 23 March 1969, with related notes including a 3 pp. typescript memorandum from W.D. Biggs.
- D.26 Material relating to paper 'Elasticity and thermodynamics of elastin' by T. Weis-Fogh and S.O. Andersen, published in Chemistry and Biology of the Intercellular Matrix, Vol. I, ed. E.A. Balazs, Academic Press, 1970. Laboratory notes 1968-69, not in Weis-Fogh's hand, preceded by 5 pp. summary of aims, etc. by Weis-Fogh.
- D.27 'A new molecular model for the long-range elasticity of elastin, by Torkel Weis-Fogh and S.O. Andersen'. Typescript of paper published in Nature, 1970.
- D.28-D.30 Correspondence re elastin 1973-75. Some of the folders include related drafts or reprints.
- D.28 'Elastin. Correspondence'. Contains letters from:
- | | |
|---------------|---------|
| S.O. Andersen | 1974 |
| H.Y. Elder | 1973 |
| H. Fröhlich | 1973 |
| P.J. Manning | 1970-72 |
| N.G. McCrum | 1973-74 |
- D.29 Correspondence 1972-73 re grant application by K.J. Packer for 'Nuclear magnetic relaxation studies of elastin'.

Research in Cambridge

- D.30 Correspondence with J.M. Gosline, 1973-75, mainly re joint papers on elastin (see D.31-D.34). Includes drafts of an unpublished letter to Nature, 1974.
- D.31 Untitled typescript draft for a paper on elastin with ms. annotations by J.M. Gosline. n.d. but probably 1973.
- D.32 'Hydrophobic interaction and a model for the elasticity of elastin'. Typescript drafts of a paper by J.M. Gosline with extensive ms. corrections and additions by Weis-Fogh. Includes photographs of apparatus, used for drawing figures, and 2 sets of notes and calculations by Weis-Fogh, August 1974. This paper is often referred to in correspondence, etc. as 'Elastin I.' It was published in Biopolymers, 1978, and is therefore not included in the list of publications on pp.100-107.
- D.33 'Thermodynamics and elasticity of elastin in relation to temperature and swelling agent', by J.M. Gosline and Weis-Fogh. Typescript drafts with ms. corrections by Gosline and Weis-Fogh, and 9 pp. notes by Weis-Fogh 28 August 1974. This paper is referred to as 'Elastin II'.
- D.34 'Reversible structural changes in a hydrophobic protein, elastin, as indicated by fluorescence probe analysis' (Elastin III). Typescript drafts with ms. corrections by Gosline and Weis-Fogh. Folder includes photocopies of referees' comments on the paper, 1973. It was published in Biopolymers, 1975, but is not included in the list of publications on pp.100-107.

Research in Cambridge

D.35

BIOLOGICAL MICROPROBE LABORATORY

In 1971 the Science Research Council awarded a joint research grant to Weis-Fogh and four collaborators (P. Echlin, B.L. Gupta, T.A. Hall and R.B. Moreton) to enable a series of morphological and analytical studies to be carried out on frozen-hydrated soft biological material. This resulted in the setting up of the Biological Microprobe Laboratory in the Department of Zoology, Cambridge. The technique of X-ray microanalysis in the scanning electron microscope normally used dehydrated tissues which retained their structure intact but suffered from loss or redistribution of electrolytes; the team's first major achievement was to perfect a technique for the preparation of quick-frozen hydrated tissues.

Only the grant applications and a few related papers are included in the collection, since the laboratory continued to function after Weis-Fogh's death.

See also F.42.

Contents of the folder include:

Copy of Weis-Fogh's application to the Science Research Council for a grant for 'Electron microprobe studies on soft biological tissues', September 1970.

Appendix to the above application, 9 November 1970.

Copy of letter from the S.R.C. announcing support for the project, 28 January 1971.

Progress report and supplement, 1973.

3 pp. typescript headed 'Biological Microprobe Laboratory', dated 12 December 1974, describing procedures for the running of the laboratory.

Miscellaneous related material.

Research in Cambridge

D.36-D.39 RESEARCH ON 'INTRACELLULAR AND EXTRACELLULAR
MATRIX PROTEINS'

This investigation grew out of Weis-Fogh's study of the formation of insect cuticle (see D.12 - D.24) and work by W.B. Amos, one of Weis-Fogh's research students, on the contractile mechanism of the spasmonemes in Protozoa (see F.39). Weis-Fogh wrote informally to the Science Research Council about the possibility of applying for a grant to study the subject in April 1971 (see D.36); the car accident a few days later in which his wife was killed and he himself seriously injured delayed the presentation of a formal grant application until April 1972.

As with the previous item, the collection contains very little material relating to this project because the work continued after Weis-Fogh's death in 1975. See, however, D.28 - D.34 for work with J.M. Gosline on thermodynamic and mechanical properties of elastin, which was also funded by this research grant.

See also F.43, F.44, F.56, F.71.

D.36 Application for a grant to study 'Intracellular and extracellular matrix proteins'. Contents of folder include:

Ms. draft of a letter from Weis-Fogh introducing the project to the S.R.C., 12 April 1971.

Typescript of same as sent and a related offprint.

Ms. draft of application for grant, April 1972. It is prefaced by an apology for the delay caused by the car accident in April 1971 in which Hanne Weis-Fogh was killed and Weis-Fogh himself seriously injured.

Typescript of application as sent.

Miscellaneous background information.

D.37 Notes for progress report and outline of future plans by Weis-Fogh, L. Routledge, W.B. Amos, F.F. Yew, 1975.

Research in Cambridge

- D.38 Application for a grant to study 'Organisation and properties of new contractile and structural proteins'. Contents of folder include:
- Ms. draft of application to S.R.C., March 1975.
 This project was to follow directly on from the previous one.
 Copy of application as sent.
 Miscellaneous correspondence and other related material.
- D.39 Folder labelled 'Spasmoneme', containing 2 brief typescripts and correspondence with H.G. Müldner and O.V.S. Heath, 1973-74.

Research in Cambridge

D.40-D.57 RESEARCH ON ANIMAL FLIGHT

A major feature of this period was Weis-Fogh's renewed interest in the problems of flight, now widened to include some birds (especially the hummingbird) as well as insects. In 1973 he published a paper in J. exp. Biol. entitled 'Quick estimates of flight fitness in hovering animals, including novel mechanisms for lift production', which contained a new aerodynamic theory for the generation of lift in small insects which had previously defied explanation in mathematical terms (see D.48 - D.53).

Interest in flight extended to other forms of locomotion especially to comparative studies and 'scaling problems' as will be seen from correspondence at F.53 - F.54, F.58 - F.59, F.66 - F.70, and finally led to the formulation of a project to study biological fluid dynamics in collaboration with Sir James Lighthill (see D.58 - D.62).

Most of the material dates from c.1970, but some early work on the subject is included (see D.40 - D.42).

D.40-D.42 Material related to paper 'Respiration and tracheal ventilation in locusts and other flying insects' (J. exp. Biol. 1967).

D.40 Folder containing laboratory notes on respiration and ventilation, mainly 1950-53, with some additions and revisions, 1966. Includes graphs and drawings used as basis for figures in the published article.

See B.1, B.7, B.35-B.42.

D.41 Ms. draft found filed with the above, 'Rate and mechanism of the tracheal ventilation in flying insects'. n.d. but internal evidence suggests 1952-53.

D.42 Correspondence with R.C. Rainey and J.B. Tyson re sighting of Schistocerca gregaria at high altitude in the Himalayas, 1967. Includes reprint of paper by Tyson.

See also G.135.

Research in Cambridge

- D.43-D.47 Material relating to paper 'Energetics of hovering flight in hummingbirds and in drosophila' (J. exp. Biol. 1972)
- D.43 Notes on hummingbirds dated August 1970. Calculations and reflections and a first rough outline of the content of a projected paper.
- D.44 Set of notes headed 'Amazilia', pp.1-86, August-December 1970. Study based on a recently dead hummingbird received from Copenhagen Zoo, 28 August 1970. Includes 2 letters from C.W. Benson identifying the bird as Amazilia fimbriata fluvialis.
- D.45 Various notes on inertia, October 1970, comparing hummingbirds and insects. Mainly aerodynamic calculations.
- D.46 Set of notes headed 'Drosophila', pp.1-102a, November-December 1970.
- D.47 Background to the figures for the published paper. Notes, graphs, drawings, etc. Includes material removed from D.44 and D.46 above. Brief correspondence re the paper, 1970, 1975, is also included here.
- D.48-D.53 Material relating to paper 'Quick estimates of flight fitness in hovering animals, including novel mechanisms for lift production' (J. exp. Biol. 1973).
- D.48 Mathematical calculations and brief notes, mainly February and April 1971, paginated by Weis-Fogh 1-82. All were later annotated in red by Weis-Fogh and the heading 'Quick estimates' added. Folder also includes an envelope labelled 'Beetle flight - Pringle' containing measurements, drawings and calculations.
- D.49 Folder containing material re hovering flight of Syrphidae. Includes notes, negatives of sound tracings, photographs and traces of wings, etc., August-September 1972.
- D.50 Folder labelled 'Encarsia flight and Syrphinae'. Contains calculations and notes including analysis of a film of a flying Encarsia. Material was divided by Weis-Fogh into sections A-F, and includes 2 letters, one from W.D. Biggs, 27 November 1972 (among notes labelled 'E') and one from M.J. Lighthill in the last section (F), 10 December 1972, beginning 'My dear Weis-Fogh, I must congratulate you on the original and brilliant concept of your new lift-generation mechanism'. Weis-Fogh's reply is also included here.

Research in Cambridge

- D.51 Folder labelled 'Quick Estimates. Material for writing results'. Notes and calculations, with corrections and annotations in red by Weis-Fogh. Includes notes in another hand on equipment and procedure used for high speed filming of Manduca sexta and Encarsia formosa, July 1972.
- D.52 'Quick Estimates. First handwritten draft', June-December 1972, with additions and corrections in red.
- D.53 Material re figures, tables, etc. for the above.
- D.54 Notes and calculations re insect flight, November 1973. Annotated in red by Weis-Fogh on the first page 'Good example of how one can go wrong if only part of story is considered'.
- D.55 'Experimental flight animals'. Notes and correspondence re suitability of various insects for experiments on flight, 1972-74.
- D.56, D.57 Material relating to paper 'Unusual mechanisms for the generation of lift in flying animals' (Sci. Amer. 1975).
- D.56 Correspondence with the editor of Scientific American, 1974-75.
- D.57 Original typescript with figures as sent, May 1975, and proof with ms. corrections by Weis-Fogh, September 1975.

Research in Cambridge

D.58-D.62 PROJECT FOR RESEARCH ON 'FLUID DYNAMICS IN BIOLOGY'

An application to the Science Research Council for a grant for research in this subject in collaboration with Sir James Lighthill was completed in October 1975 shortly before Weis-Fogh's death. It was to have been the culmination of a collaboration which had begun in 1972 (see D.50).

Weis-Fogh's growing interest in this subject is well documented in Section F (see correspondence in F.53 - F.54, F.58 - F.59) and led him to organise with Lighthill a small symposium in Cambridge on the 'Biodynamics of Animal Locomotion', 1-5 September 1975 (see F.66 - F.70).

The material in this Section consists of drafts and correspondence re the grant application, which was not submitted due to Weis-Fogh's death on 13 November 1975.

- D.58 Early notes for proposals for research in biological fluid dynamics, July 1975. Includes some later notes re equipment, salaries, etc.
- D.59 First draft of Weis-Fogh's part of the application dated 26 September 1975. Ms. and typescript.
- D.60 Drafts of M. J. Lighthill's part of the application with some annotations by Weis-Fogh.
- D.61 Various drafts of the final application, October 1975.
- D.62 Correspondence with G.K. Batchelor, J. Fendley and D.A. Parry, 1975. Folder also includes miscellaneous unindexed correspondence with suppliers of scientific equipment, etc. and related information.

SECTION E LECTURES, ADDRESSES, PUBLICATIONS 1948-76 E.1 - E.75

The material is presented as follows:

E.1 - E.20	University lectures and courses delivered or attended by Weis-Fogh, 1955-75
E.21 - E.74	Lectures and addresses, 1948-75
E.75	Reprints of published papers, 1949-76

Much of the material in the first part is in typescript and was designed for distribution to students rather than as a basis for lectures delivered by Weis-Fogh (though see E.6, E.12, E.15, E.19). Papers have survived from both Copenhagen (1958-65) and Cambridge (1968-75). Occasionally brief correspondence is included with the lectures.

Weis-Fogh kept notes for talks he had given in rough chronological groups, thus enabling approximate dates to be suggested for the few undated mss. Related correspondence was occasionally filed with the text of the talk.

Weis-Fogh seems to have been much in demand as a speaker (see letter in E.57), although during the last years of his life he found it increasingly difficult to spare the time for giving talks. The subjects chosen reflect his main research interests at a given time and it is notable that talks on insect flight recur throughout the period covered, demonstrating his continuing enthusiasm for the subject. He continued to give talks in Denmark after his move to Cambridge in 1966 and much of the material in this Section is in Danish.

Inevitably there is some overlap with Section F, as some of these talks and papers, especially in the earlier years, were delivered at conferences. These are itemised in the introduction to Section F.

Titles and descriptions in inverted commas are those which appear on Weis-Fogh's folders or notes. Translations are given of headings originally in Danish. All items are in manuscript unless otherwise indicated.

Lectures, addresses and publications

E.1-E.20	<u>UNIVERSITY LECTURES AND COURSES DELIVERED OR ATTENDED BY WEIS-FOGH 1955-75</u>	
E.1	15 pp. typescript with some annotations by Weis-Fogh headed 'Physiology Course 1955. Muscle Biochemistry. Szent-Györgyi'. On the first page is a note 'copy from Pringle's copy'. [J.W.S. Pringle].	1955
E.2	Set of typescript lecture notes on comparative physiology, in German, with scattered annotations by Weis-Fogh, including a note on the first page 'Hoffman and Langer. München. May 1962'. It is not clear whether Weis-Fogh attended these lectures.	1962
E.3-E.11	<u>Copenhagen University 1958-65</u>	
E.3	Ms. notes (in Danish) in Weis-Fogh's hand re seminars, 1958, 1961-62. Includes letters from Weis-Fogh to individual students suggesting background reading for seminar papers they were to give.	1958
E.4	'Muscle seminars. Spring 1959'. Lecture notes and notes on papers given by students (in Danish).	1959
E.5	'Lectures and seminars on general physiology. Autumn 1959'. Folder includes typescript bibliography, lists of students attending and ms. and typescript lecture notes (all in Danish).	1959
E.6	Ms. lecture notes (in Danish) 1959, 1962, with accompanying typescript bibliography headed 'The genetic code'.	1962
E.7	Set of typescript notes for practical classes (in Danish), Autumn 1961, with annotations by Weis-Fogh commenting on the success or otherwise of the experiments performed.	1961
E.8	Folder labelled 'Practicals. Spring 1963' containing typescript notes on animal physiology with annotations by Weis-Fogh and a list of students attending (all in Danish).	1963
E.9	Folder containing typescript notes for practical classes in animal physiology, Autumn 1963 and 1964 (in Danish).	1964
E.10	Folder containing typescript notes for practical classes, Autumn 1965. Similar to E.9 (in Danish).	1965

Lectures, addresses and publications

E.11	Contents of a folder labelled 'Seminars TWF'. Ms. and typescript notes on lectures and papers by other members of Copenhagen University 1964-65 (in Danish).	1964-65
E.12-E.20	<u>Cambridge University 1968-75</u>	
E.12	Ms. notes for lecture 'The origin of life' delivered 1968-74 at Cambridge. Includes Xerox copy of a set of lecture notes in another hand.	1968-74
E.13	'Guide to Comparative and General Physiology, Part IB, 1969/70'. 80 pp. typescript.	1969-70
E.14	'Guide to Lectures on Specialized Cells'. Lent Term 1970. 31 pp. typescript.	1970
E.15	Ms. notes for set of lectures on 'Active flapping flight of birds and insects', 1971, with typescript bibliography.	1971
E.16	Typescript guide to '7 lectures on specialised cells', Lent Term 1972. Includes letter from Weis-Fogh to J.A. Ramsey re revision of lecture notes and guides.	1972
E.17	'Notes, Illustrations and Tables for 12 lectures in Zoo- physiology', Lent Term 1974. 85 pp. typescript.	1974
E.18	Typescript guide to '7 lectures on specialised cells', Lent Term 1974. Includes brief correspondence.	1974
E.19	Ms. notes for 3 lectures on 'Animal Flight', February 1975, with typescript bibliography.	1975
E.20	Miscellaneous bibliographies, lists of lectures, etc.	

Lectures, addresses and publications

E.21-E.74 PAPERS AND INFORMAL TALKS 1948-75

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| E.21 | Untitled set of notes and drawings annotated by Weis-Fogh 'I think this is the first talk given by me on Insect Flight: tea-talk in Dept. Zool. [Cambridge?] in late autumn 1948?'. Contains an interesting summary of Weis-Fogh's experimental work to date. | 1948 |
| E.22 | Notes in Danish for a talk on insect flight. Undated but c.1948-49. | n.d. |
| E.23 | 'An aerodynamic sense organ in locusts' (in Danish). n.d. but c.1948-50. | n.d. |
| E.24 | 'The Work which Occupied August Krogh as a Professor Emeritus'. 6 pp. typescript. | 1949 |

For further material on Krogh see Index of Correspondents.

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| E.25 | Another copy of the above with annotations by Weis-Fogh. | 1949 |
| E.26 | 'How do insects fly?' (in Danish), 17 October 1949. | 1949 |
| E.27 | Notes in Danish for a talk on respiration of flying insects delivered 27 November 1950. | 1950 |
| E.28 | Drawings and photographs to illustrate a lecture. They are in an envelope marked (in Danish) 'Biol. Assoc. 1950? or 1952?'.

 | 1950-52 |
| E.29 | 'Weight economy of flying insects'. n.d. but Weis-Fogh delivered a paper with this title at the IX International Congress of Entomology, 1952 (see list of publications, pp.100-107 and E.75). | 1952 |
| E.30 | 'Metabolism and ventilation during flight in insects (locusts)'. Typescript. | n.d. |
| E.31 | Notes for a talk on abdominal and thoracic ventilation, 7 August 1953. | 1953 |
| E.32 | 'How locusts fly' (in Danish). 10 October 1953. | 1953 |
| E.33 | Notes for a talk on insect wing muscle (in Danish). 26 October 1953. | 1953 |
| E.34 | 'Studies on the energetics of locust flight'. Ms. and typescript both headed 'Lecture in Bristol, April 1954'. See also B.140. | 1954 |

Lectures, addresses and publications

E.35	'On the energetics of the flight of locusts and other insects'. 2 sets of notes, both undated.	n.d.
E.36	Undated notes in Danish for a talk on the energetics of locust flight, accompanied by several drawings, etc.	n.d.
E.37	'Dynamics of insect flight'. Lecture delivered 19 November 1956.	1956
E.38	Talk on wing movements and elasticity in insects, with a note 'London Meeting, July 1958'.	1958
E.39	'Animal rubber. Tea-Talk. 24 October 1958'.	1958
E.40	'Flight and Animal Rubber'. Talk delivered at King's College, London, 6 November 1958. Folder includes brief correspondence <u>re</u> arrangements.	1958
E.41	'A new rubber-like protein, resilin' (in Danish) delivered to the Physiological Society, Lund, Sweden, 4 March 1960.	1960
E.42	'A new type of rubber-like structural protein' (in Danish). Paper delivered at a conference in Lund, Sweden, 9 June 1960. 1 p. notes in Danish with brief administrative correspondence including an English synopsis.	1960
E.43	'Physical and chemical properties of a new type of rubber-like cuticle, resilin', delivered at the Carlsberg Laboratory, Copenhagen, 13 February 1961.	1961
E.44	Brief notes in Danish for a talk on flight muscle, Aarhus, 2 March 1961. Includes correspondence <u>re</u> arrangements.	1961
E.45	Brief notes in Danish for a talk on locusts, 17 March 1961.	1961
E.46	'Locusts and men. What can we learn from the study of other animals?'. Brief notes in Danish for a talk delivered at the Academy of Technical Sciences, Copenhagen, 15 November 1962.	1962
E.47	Correspondence in Swedish and Danish <u>re</u> talk on animal flight delivered in Lund, Sweden, 20 November 1962.	1962
E.48	'Flapping flight of animals', Royal Aeronautical Society, London, 11 January 1963. Folder includes correspondence 1962-63 and a typescript summary of the talk.	1963

Lectures, addresses and publications

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| E.49 | 'General problems concerning resilin and similar structural proteins' (in Danish), delivered to the Biochemical Society, Copenhagen, 28 February 1963. | 1963 |
| E.50 | 'Nervous coordination of wing movements in insects' (in Danish). 2 sets of notes dated 13 December 1963. | 1963 |
| E.51 | Brief notes in Danish for a talk on insect flight, 14 December 1963. | 1963 |
| E.52 | Brief notes in Danish for talk on '3-dimensional protein-networks', 16 January 1964. | 1964 |
| E.53 | Brief notes in Danish for a talk on resilin to the Royal Danish Academy, 7 May 1965. | 1965 |
| E.54 | Notes for an after-dinner speech in Danish, 4 December 1965. | 1965 |
| E.55 | 'Resilin compared with other structural proteins' (in Danish). Talk delivered at Aarhus, 10 February 1966. | 1966 |
| E.56 | 'The nervous coordination of the movement of wings and other limbs' (in Danish), delivered to the Biological Society, Copenhagen, 13 April 1966. | 1966 |
| E.57 | 'Insect flight'. Talk delivered to the Entomology Section of the Cambridge Natural History Society, 16 February 1967. Folder includes 2 letters <u>re</u> talks to the same group, 1955 and 1974. | 1967 |
| E.58 | Correspondence <u>re</u> an interview for Cologne Radio. | 1967 |
| E.59 | 'Does elastin represent a new type of elastomer?' Tea-talk in Department of Zoology, Cambridge, 22 October 1969. | 1969 |
| E.60 | 'Proteins and Rubber. (Does elastin represent a new type of elastomer?)' Talk delivered at Aberystwyth, 23 April 1970. Folder includes correspondence with Secretaries of the Biological Society at Aberystwyth, 1968-69.

See also G.61. | 1970 |
| E.61 | Notes in Danish for a talk on elastin, delivered at the Royal Danish Academy 1 May 1970. Includes brief correspondence. | 1970 |

Lectures, addresses and publications

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| E.62 | 'Crosslinks and Elasticity in two elastomeric proteins'.
Talk delivered 11 May 1970. | 1970 |
| E.63 | 'Elasticity in structural proteins: a new model for elastin',
delivered at Glasgow University 19 October 1970, and
subsequently at Edinburgh and Birmingham. Folder includes
correspondence re Weis-Fogh's visits to Glasgow and
Edinburgh 19-21 October 1970. | 1970 |
| E.64 | Correspondence 1969-70 re talk delivered at Birmingham
University 3 November 1970. For ms. see E.63 above. | 1970 |
| E.65 | 'Dimensions in flying animals'. Tea-talk in the Depart-
ment of Zoology, Cambridge, 13 October 1971. Includes
brief correspondence and background notes. | 1971 |
| E.66 | Brief notes and printed summary in Danish for a talk on
insect flight given at the Royal Danish Academy
10 December 1971. | 1971 |
| E.67 | 'Hovering flight in animals and novel mechanisms for lift
production'. Typescript summary in English and corres-
pondence in English and Danish re talk delivered to the
Biological Society, Copenhagen, 28 March 1973. | 1973 |
| E.68 | Summary in Danish of talk on new mechanisms for lift
production, delivered at the Royal Danish Academy,
30 March 1973. | 1973 |
| E.69 | Correspondence re a talk on animal flight delivered at
Exeter University 9 October 1973. | 1973 |
| E.70 | Script of radio interview with Weis-Fogh about his work on
insect flight, recorded for BBC External Services,
6 November 1973. | 1973 |
| E.71 | Correspondence re a talk on animal flight delivered to the
H.G. Wells Society of Imperial College, London,
19 November 1973. | 1973 |
| E.72 | 'Notes from tape of talk 26.11.73.' The notes are about
animal flight, and are in Weis-Fogh's hand but it is not
clear who gave the talk. | 1973 |

Lectures, addresses and publications

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| E.73 | Correspondence <u>re</u> talk on insect flight to be delivered at the Royal Institution, 21 November 1975. Includes a typescript synopsis. | 1975 |
| E.74 | Shorter correspondence with universities and societies <u>re</u> arrangements for talks to be given by Weis-Fogh, 1955-75. | 1955-75 |
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| E.75 | <p>1 box containing numbered reprints of publications by Weis-Fogh and colleagues assembled from the Department of Zoology, Cambridge. The set is not complete, some early papers and publications in Danish being omitted. See pp.100-107 for a bibliography of Weis-Fogh's scientific publications.</p> <p>An earlier version of the bibliography is included in the box, with publications after no.79 added in manuscript. The numbers assigned to some of the most recent publications in this list do not always correspond with those in the later typed version, but they are the ones which appear on the reprints themselves.</p> | |
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SECTION F CONFERENCES, VISITS, LECTURE TOURS 1955-76 F.1 - F.76

Weis-Fogh attached considerable importance to conferences and symposia because of the opportunities they presented for exchanging ideas with people working in the same field in different parts of the world. In particular, he attended the regular meetings of the Society for Experimental Biology whenever possible, and frequently read papers there (see below, passim). In 1975 he organised, with Sir James Lighthill, a small but influential symposium on 'Biodynamics of Animal Locomotion' (see F.66 - F.70).

The material below mainly consists of correspondence about arrangements for conferences, etc., but there are also some drafts of papers presented by Weis-Fogh, and these are itemised in the catalogue.

See also B.43, B.136, E.29, E.38, E.42, G.27.

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| F.1 | 100th meeting of the Society for Experimental Biology, Cambridge, July 1955. | 1955 |
| | Notes for paper by Weis-Fogh on 'A problem in locomotion: the elastic design of the wing system in insects'. | |
| | Notes and drawings <u>re</u> model of locust thorax exhibited at the meeting. | |
| | Miscellaneous related material. | |
| F.2 | British Association for the Advancement of Science, Bristol, September 1955. | 1955 |
| | Brief correspondence with organisers, etc. | |
| | Several sets of notes for paper by Weis-Fogh on 'Flapping flight of insects'. | |
| F.3 | Xth International Congress of Entomology, Montreal, 17-25 April 1956. (Weis-Fogh was unable to attend.) | 1956 |
| | Correspondence with organisers, 1955-56. | |

Conferences, visits, lecture tours

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| F.4 | Royal Society Conversazione, London, 10 May 1956. | 1956 |
| | Correspondence <u>re</u> Weis-Fogh's exhibit illustrating the 'Elastic properties of the insect thorax', and a copy of the programme.
See also B.85. | |
| F.5 | Royal Society Canversazione, London, 21 June 1956. | 1956 |
| | Correspondence and programme. | |
| F.6-F.8 | Society for Experimental Biology, Liverpool, 17-19 July 1956. Weis-Fogh was unable to attend the meeting and his paper was read by J.W.L. Beament. | 1956 |
| F.6 | Ms. and typescript of paper 'Factors in the thermal balance of flying locusts' by T. Weis-Fogh and Bent Muus. Folder includes correspondence <u>re</u> arrangements. | |
| F.7 | Laboratory notes used in preparing the above paper. See also B.33. | |
| F.8 | Correspondence with R.C. Rainey and Z. Waloff 1952-56, including 2 drafts of a paper by Rainey 'The thermal balance of settled and flying locusts' which was delivered immediately after Weis-Fogh's at the conference. | |
| F.9 | Society for Experimental Biology, London, 2 January 1957. | 1957 |
| | Revised version of paper by Weis-Fogh and Muus (see F.6), and brief correspondence. | |
| F.10 | Society for Experimental Biology, Cambridge, 8 April 1957. | 1957 |
| | Set of brief notes and a full draft for talk on locust flight muscle. Both are annotated by Weis-Fogh '100 SEB 1955', but this is clearly a mistake. Folder includes brief administrative correspondence. | |
| F.11 | XVth International Congress of Zoology, 1958. | 1958 |
| | Abstract of paper 'Elasticity in arthropod locomotion: a neglected subject, illustrated by the wing system of insects'. This was probably the first announcement of the discovery of 'a new rubberlike compound of cuticle', later named resilin.
See also B.136, and Section C. | |

Conferences, visits, lecture tours

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| F.12-F.19 | Prather Lectures, Harvard University. | 1961 |
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- Weis-Fogh was invited to deliver these in Autumn 1961, and he prolonged his stay in the US for over two months in order to visit other universities and laboratories.
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| F.12 | Correspondence 1960-61. Includes:

Letter from A.M. Pappenheimer inviting Weis-Fogh to deliver the lectures and Weis-Fogh's letter of acceptance.

Subsequent correspondence with Pappenheimer and C.M. Williams <u>re</u> arrangements for the visit to Harvard.

Correspondence with members of other universities and laboratories in the US <u>re</u> visits by Weis-Fogh. | |
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| F.13 | 'Principles of flapping flight and the call for power'.
Drafts and notes for first Prather Lecture, 17 October 1961.
Folder includes poster advertising the lectures and list of previous Prather Lecturers. | |
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| F.14 | 'The wing muscles and the chemical machinery for flight'.
Second Prather Lecture, 18 October 1961. | |
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| F.15 | 'Elastic materials, power economy, and nervous control of flight'. Draft and notes for Third Prather Lecture, 19 October 1961. | |
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| F.16 | Notes in Danish, February-March 1962, which were filed with the Prather Lectures. Includes 2 small water-colours of a flying dragonfly. | |
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| F.17 | Correspondence with Harvard University Press, 1964-75 <u>re</u> possibility of publishing a book based on the Prather Lectures. Weis-Fogh was unable to find time to write it. | |
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| F.18 | Brief notes for talks and lectures delivered at Harvard, Yale, Berkeley and the National Institutes of Health, Bethesda, October-November 1961.

See F.12 for related correspondence. | |
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| F.19 | 'Resilin or animal rubber, a new type of structural protein and its significance'. Talk delivered at the University of California, Los Angeles, the University of Texas and Texas Agricultural Experiment Station, December 1961.

See F.12 for related correspondence. | |
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Conferences, visits, lecture tours

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| F.20 | Conference on Comparative Neurophysiology, Leyden, 5-7 September 1962.

Brief correspondence <u>re</u> arrangements. | 1962 |
| F.21 | Symposium in Göttingen, September 1962.

Correspondence in English and German; abstract of paper on resilin by S. O. Andersen. | 1962 |
| F.22 | International Symposium on Protein Structure and Crystallography, Madras, 14-18 January 1963.

Correspondence 1962-63 (Weis-Fogh was unable to attend but a letter from him was read at the symposium). | 1963 |
| F.23, F.24 | Gordon Research Conference on Elastomers, New Hampshire, 15-19 July 1963. | 1963 |
| F.23 | Folder labelled 'Gordon Research 1963 and Brecksville (Goodrich)'. Contains notes for Weis-Fogh's conference paper (on resilin) and for 2 lectures delivered at the Rockefeller Institute, New York, and the B.F. Goodrich Research Center, Brecksville, Ohio. | |
| F.24 | Correspondence with organisers <u>re</u> arrangements for the above. | |
| F.25 | Society for Experimental Biology Symposium on 'Homeostasis and feedback mechanisms', Cambridge, September 1963.

Correspondence 1962-63 (Weis-Fogh gave a paper on 'Control of basic movements in flying insects'). | 1963 |
| F.26 | Correspondence and notes <u>re</u> a visit to England in January 1964. References to this visit will be found scattered throughout the general correspondence (Section G). Weis-Fogh was asked to go to England as a representative of the Royal Danish Academy (see his letter to Sir Lindor Brown, 2 January 1964).

The folder contains a brief journal in Danish describing the people he saw during the six day visit and the topics discussed, and his subsequent report to the Royal Danish Academy, also in Danish. | 1964 |

Conferences, visits, lecture tours

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| F.27 | Folder labelled in Danish 'Visit to Detroit-Boston, January 1964'. It contains:

A brief journal of the visit, in Danish.

Notes for talks on resilin delivered at Wayne State University, and the U.S. Rubber Company.

Ms. draft 'Future research related to the elucidation of the property and structure of the newly discovered rubberlike protein, resilin'.

Typescript <u>re</u> elastin by A.J. Boyle, January 1964.

3 pp. notes headed 'London: Flight' (on discussions with colleagues, etc.). | 1964 |
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| F.28-F.30 | Conference on 'The Structure and Function of Connective and Skeletal Tissues', St. Andrews, 15-25 June 1964. | 1964 |
| F.28 | Correspondence 1963-64 including conference programme and list of participants. | |
| F.29 | 'Resilin as compared with elastin' and 'Mechanical properties of insect cuticle'. Typescripts of papers given by Weis-Fogh with some background notes. | |
| F.30 | Notes on papers delivered by others, a set of abstracts, and typescript of a paper by S.O. Andersen 'Structure and biogenesis of the cross-links in resilin, a rubber-like protein'. | |
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| F.31 | XIIIth International Congress of Entomology, London, July 1964.

Correspondence 1961-64.

Drafts and notes, July 1964, for paper delivered by Weis-Fogh on 'Elasticity and wing movements in insects'.

Typescript synopsis of paper with annotation in red by Weis-Fogh '9.8.70. Tibirke. Important'. | 1964 |

Conferences, visits, lecture tours

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| F.32, F.33 | Conference on the 'Biology and Chemistry of Extracellular Matrices', Arden House, Columbia University, 1-4 November 1964. Weis-Fogh took the opportunity to visit Chicago, Cleveland, Charlottesville, Boston and New York. | 1964 |
| F.32 | Correspondence <u>re</u> conference including list of participants, abstracts of papers, and Weis-Fogh's notes on papers which he attended. | |
| F.33 | Correspondence <u>re</u> arrangements for visits. Includes notes for a talk on resilin delivered at Chicago University, 5 November 1964, and 2 pp. notes headed 'Albert Einstein College. Advanced protein chemistry course'. | |
| F.34 | Opening of the Ramsay Wright Zoological Laboratories, Toronto University. Inaugural lecture by Weis-Fogh 17 September 1965.

Correspondence <u>re</u> arrangements, including printed programme and photographs of architect's model.

Draft and background notes for lecture 'Insects as tools in general biology. Some examples'. | 1965 |
| F.35, F.36 | Symposium on Nutrition and Physical Activity, Työlösand, Sweden, 15-16 August 1966. | 1966 |
| F.35 | Correspondence 1965-66 in Swedish and Danish <u>re</u> arrangements for the symposium. Includes list of participants and abstracts of papers. | |
| F.36 | Typescript of paper by Weis-Fogh on 'Metabolism and Weight Economy in Migrating Animals, Particularly Birds and Insects', with correspondence <u>re</u> publication 1966-68. See list of publications, pp.100-107, and E.75. | |
| F.37 | Symposium on Gravity and the Organism, Tuxedo, New York, 18-21 September 1967.

Correspondence with organisers 1966-70 <u>re</u> arrangements for the symposium and publication of papers. Weis-Fogh did not deliver a paper but was asked to open discussion of a paper by D.M. Wilson. There is also correspondence with K. Schmidt-Nielsen whom Weis-Fogh took the opportunity to visit in order to meet colleagues and exchange ideas. | 1967 |

Conferences, visits, lecture tours

- F.38 International Study Conference on the Current and Future Problems of Acridology, Anti-Locust Research Centre, London, July 1970. (Weis-Fogh gave a talk in place of a paper to have been delivered by Donald M. Wilson who was drowned shortly before the conference. See G.63, G.84). 1970
- Correspondence re possibility of republishing Wilson's paper from the Symposium on Gravity and the Organism (see F.36 above) in the Proceedings of this conference. Includes a memorial note on Wilson by Weis-Fogh for inclusion in the conference proceedings.
- This is not included in the list of publications on pp.100-107.
- F.39 Folder labelled 'Trip to Denmark. Amos. TWF'. 1970
- Correspondence in English and Danish re arrangements for visit to collect specimens of Zoothamnium, August 1970, as part of a study of the contractile mechanism in Protozoa.
- See also D.36-D.39.
- F.40 Symposium on Physiological and Biological Adaptations, University of Indiana, 30 August 1970. (Weis-Fogh originally accepted the invitation to attend but later had to decline owing to ill health.) 1970
- Correspondence, including an invitation to lecture at Woods Hole, Mass.; preliminary programme.
- F.41 Colloquium on 'Structural Macromolecules in Arthropods', London, 4-5 January 1971. 1971
- Letter accepting invitation to conference; programme and list of participants; Weis-Fogh's notes on papers delivered.
- F.42 Visit to Copenhagen, April 1971. 1971
- Correspondence re visit by T.A. Hall and B.L. Gupta to study a Hitachi Microprobe in connection with research for the Biological Microprobe Laboratory in Cambridge (see D.35).

Conferences, visits, lecture tours

- F.43 Society for Experimental Biology, Göteborg, 20-23 1971
 July 1971.

 Brief correspondence, programme and typescript
 of joint paper by Weis-Fogh and W.B. Amos
 'Contraction in the Myonemes of Protozoa'.
 Weis-Fogh was badly injured in a car accident
 in April 1971 in which his wife was killed. He
 had not thought he would be able to attend this
 meeting, but decided at the last moment that he
 was sufficiently recovered to do so.
- F.44 Society for Experimental Biology, London, 4-7 January 1972. 1972

 Correspondence and programme. (Weis-Fogh gave
 2 papers: 'A new mechanism of contraction' (with
 W.B. Amos) and 'Dimensions in flying animals'.)
- F.45 Symposium on 'The Biophysics and Biochemistry of Insect 1972
 Flight', XIVth International Congress of Entomology,
 Canberra, August 1972.

 Correspondence with organisers, 1971. Weis-Fogh
 hoped to go, but he was still not fully recovered
 from the accident and had finally to decline the
 invitation.
- F.46 International Congress on Comparative Physiology, Aquasparta, 1972
 Italy, 18-22 September 1972.

 Correspondence with organisers including programme
 and list of participants. (Weis-Fogh gave a 'Summary
 and Integration' of papers in the session on Comparative
 Physiology of Locomotion.)
- F.47 West Coast Connective Tissue Society, Annual Meeting, Los 1972
 Angeles, November 1972. (Weis-Fogh hoped to go in order
 to give a talk on myonemes, but he had finally to decline
 the invitation.)

 Correspondence.

Conferences, visits, lecture tours

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| F.48 | Quatrième Conférence Internationale 'De la Physique Théorique à la Biologie', Versailles, 28 May-2 June 1973. | 1973 |
| | Correspondence <u>re</u> arrangements 1972-74; programme, list of participants and abstracts of papers; corrected transcript of Weis-Fogh's contribution to discussions; invitation to participate in a conference on 'Méthodes pour déceler les agents tératogènes physiques et chimiques' (declined). | |
| F.49 | International Centre of Insect Physiology and Ecology (ICIPE). International Committee Meeting, Copenhagen, 7-8 September 1973. | 1973 |
| | Correspondence 1972-73 (in English and Danish). Includes list of people who attended the meeting. | |
| | Weis-Fogh was Research Director of ICIPE and a member of the International Committee, but he resigned after this meeting due to pressure of work and personal circumstances. (see his letter to R. Adams, 29 June 1973.) | |
| | For further material on ICIPE see G.59. | |
| F.50-F.52 | Symposium on Insect Flight, Royal Entomological Society, London, 20-21 September 1973. | 1973 |
| F.50 | Correspondence 1971-74 <u>re</u> content and organisation of symposium, publication of proceedings, etc. | |
| F.51 | Corrected typescript of paper 'Energetics and aerodynamics of flapping flight, a synthesis'. | |
| F.52 | Notes and calculations, August 1973, filed with the above. | |
| F.53, F.54 | Conference on Scaling, Duke University, 24-27 September 1973. | 1973 |
| F.53 | Correspondence 1972-75, mainly with K. Schmidt-Nielsen, the originator and organiser of this small informal conference. (9 participants). The later correspondence is about arrangements for publishing the conference papers, but this proved to be impractical. | |
| F.54 | Background notes and calculations for Weis-Fogh's paper on 'Scaling problems in a dynamic process: flapping flight in insects and birds'. | |

Conferences, visits, lecture tours

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| F.55 | Society for Experimental Biology, Leeds, January 1974.

Correspondence with organisers, and programme. (Weis-Fogh gave a paper on 'What can we learn from dimensional analyses? Scale effects in flying animals'). | 1974 |
| F.56 | Second International Conference on Comparative Physiology, 'Functional aspects of structural materials', Ascona, Switzerland, 16-21 June 1974.

Correspondence <u>re</u> arrangements 1973-74. (Weis-Fogh gave a paper on 'Principles of contraction in the spasmoneme of vorticellids'). | 1974 |
| F.57 | Ciba Foundation Symposium on Energy Transformation in Biological Systems, London, 2-4 July 1974.

Correspondence 1973-74, including programme with list of participants; corrected transcript of Weis-Fogh's contribution to discussions. | 1974 |
| F.58, F.59 | Symposium on Swimming and Flying in Nature, California Institute of Technology, 8-12 July 1974. | 1974 |
| F.58 | Correspondence 1974-75 including programme with list of participants, etc., and Weis-Fogh's notes on papers delivered. | |
| F.59 | Typescript of paper on flapping flight, originally delivered at Royal Entomological Society Symposium 1973 (see F.50-F.52), with revisions and amendments for reading at present meeting. | |
| F.60 | Society for Experimental Biology, Cambridge, 16-19 July 1974.

Correspondence 1971-72, 1974, mainly <u>re</u> arrangements for holding the meeting in Cambridge. | 1974 |
| F.61 | Symposium of the Society of General Physiologists, on 'Molecules and Cell Movement', Asilomar, California, 7-10 September 1974. (Weis-Fogh originally accepted the invitation to attend, but later had to decline due to pressure of work and ill health.)

Correspondence 1972-74 <u>re</u> arrangements for conference and possible visits to other colleagues in the US. | 1974 |

Conferences, visits, lecture tours

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| F.62-F.64 | August Krogh's Centenary Symposium, Copenhagen, 14-20 November 1974.

For further material on Krogh, see Index of Correspondents. | 1974 |
| F.62 | Folder labelled 'Benzon Symposium'. Correspondence in English and Danish <u>re</u> possibility of applying to the Benzon Foundation to sponsor a symposium in honour of Krogh.

See also G.115. | |
| F.63 | 'Visit to Copenhagen - August Krogh - 14-20 Nov.' Correspondence in English and Danish <u>re</u> Weis-Fogh's visit to deliver 2 lectures and open the August Krogh Institute. Also included is an article about Krogh by C. Barker Jørgensen from <u>Naturens Verden</u> , 1971. | |
| F.64 | 'Modern insect physiology in the light of the pioneer work of August Krogh'. Typescript of Weis-Fogh's talk (in Danish) delivered at the August Krogh Institute 19 November 1974. Folder also includes brief ms. notes for this and for a talk on similar lines 15 November 1974. | |
| F.65 | Symposium on 'New Directions in Comparative Physiology and Biochemistry', Tucson, Arizona, 27-29 December 1974. (Weis-Fogh planned to attend but was prevented by ill health.)

Correspondence <u>re</u> arrangements 1973-74. | 1974 |
| F.66-F.70 | Symposium on 'Biodynamics of Animal Locomotion', Cambridge, 1-5 September 1975.

This symposium, plans for which were originally formulated during the Scaling Conference at Duke University (F.53, F.54), was organised by Weis-Fogh and Sir James Lighthill, and was to have been the prelude to further cooperation in a joint research project on biological fluid dynamics (see D.58-D.62). | 1975 |
| F.66 | Correspondence, 1973-74, <u>re</u> date and financing of the symposium. | |

Conferences, visits, lecture tours

- F.67 Correspondence, 1974-75, with and between members of the Scientific Committee for the symposium:
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| M. J. Lighthill | T. Y. Wu |
| R. D. Keynes | S. S. Grigoryan (Lighthill's carbon only) |
| R. McNeill Alexander | N. V. Kokshaysky |
| K. Schmidt-Nielsen | T. J. Pedley |
- F.68 Correspondence with others re the symposium, mainly requests or invitations to participate.
- F.69 Programme of meeting, list of participants. Included here is a photocopy of greetings sent to Sir James Gray, 'the Doyen of Animal Locomotion', signed by all the participants in the symposium. The pleasure given to Gray by the receipt of this document is mentioned by H. W. Lissman in his Memoir of Gray (Biographical Memoirs of Fellows of the Royal Society, 24, 1978, p.67).
- F.70 Notes taken by Weis-Fogh on papers given at the symposium.
- F.71 Society for Experimental Biology Symposium on 'Calcium in Biological Systems', Royal Holloway College, London, 8-12 September 1975. 1975
- Correspondence 1974-75, including programme. (Weis-Fogh gave a paper on 'The spasmoneme and the calcium dependent contraction in connection with the specific calcium binding proteins').
- F.72 Zoological Society of London Symposium on 'Comparative Biology of Skin', London, 30 October 1975. 1975
- Correspondence with organisers re arrangements, including programme.
- Notes taken by Weis-Fogh during the symposium.
- Typescript of paper by S. O. Andersen on 'Arthropod cuticles: their composition, properties and functions'.

F.73-F.76

Shorter correspondence. Invitations to most of the conferences listed below were declined by Weis-Fogh.

Conferences, visits, lecture tours

F.73-F.76	Shorter correspondence. Invitations to most of the conferences listed below were declined by Weis-Fogh.	
F.73	Undated letter <u>re</u> unnamed symposium	n.d.
	International Conference of Biophysics, Cambridge (?)	1959
	Society for Experimental Biology, Copenhagen	1959
	Society for Experimental Biology, Amsterdam	1961
	Conference Against the Spread of Nuclear Weapons, Oslo	1961
	International Biochemical Congress, Moscow	1961
	10th Pugwash Conference, London	1962
	Second Meeting on an International Laboratory of Molecular Biology, Geneva (?)	1963
F.74	British Association for the Advancement of Science, Southampton	1964
	XIth International Congress of Cell Biology, Providence, Rhode Island	1964
	Gordon Research Conference on Proteins, New Hampshire	1964
	Society for Experimental Biology, Copenhagen	1965
	Corneal Biophysics Conference, Wiesbaden	1965
	23rd International Congress of Physiology, Tokyo	1965
	Symposium on Comparative Neurophysiology, Tokyo	1965
	Symposium on Functional Organisation of the Compound Eye, Stockholm	1965
F.75	Society for Experimental Biology. Brief correspondence <u>re</u> meetings, 1967, 1969.	1967, 1969
	2nd Symposium of the Underwater Association, London	1967
	Informal discussion on muscle, Cambridge	Dec. 1967
	'Science and Mathematics in Secondary Education', Hockerill College of Education	1968
	Conference on 'The Chemistry and Molecular Biology of the Intercellular Matrix', Italy	1969
	Conference on 'Water pollution and its effects considered as a world problem', Aberystwyth	1970
	Symposium on 'Approaches to Quaternary Plant Ecology', Cambridge	1972
	Two-day symposium, Museum of Comparative Zoology, Harvard	1973
	Society for Experimental Biology, Reading	1973

Conferences, visits, lecture tours

F.76	Workshop on 'Receptors and Control of Respiration in Birds', Göttingen	1974
	Conference on 'Chance, necessity and human values', Sussex University	1974
	Gordon Conference on Structural Macromolecules, New Hampshire	1974
	Vth International Congress of Biophysics, Copenhagen	1975
	Cold Spring Harbor Motility Meeting (see list of publications, p.107)	1975
	Society for Experimental Biology, Nottingham	1976
	Symposium on 'The Changing Scene in Natural Science', Philadelphia	1976
	XVth International Congress of Entomology, Washington	1976

The material is presented as follows:

- | | | | |
|-------|---|-------|--|
| G.1 | - | G.149 | Correspondence with individuals, organisations and societies |
| G.150 | - | G.174 | Correspondence with editors and publishers |
| G.175 | - | G.181 | References and appointments |
| G.182 | - | G.197 | Miscellaneous shorter correspondence (not indexed) |

This Section is made up of material from more than one source. Most of the correspondence up to 1966 was kept by Weis-Fogh in loose-leaf binders in alphabetical order of correspondent. Later correspondence was not in any order when it arrived, and has been incorporated with the above.

The material in the main sequence (G.1 - G.149) is presented alphabetically, dated, and with an indication of the language(s) in which it is conducted. An indication of the content is sometimes given, but this has not always been possible, especially in the case of a heterogeneous exchange extending over a period of several years (see, e.g., A.C. Neville, G.80 - G.84, J.W.S. Pringle, G.101 - G.104, V.B. Wigglesworth, G.144 - G.145). The bulk of the correspondence is scientific in content, but it contains many personal and friendly references.

The names of all correspondents listed in the main sequence appear in the Index of Correspondents on pp. 108-120. Correspondence relating to lectures, conferences, specific research projects, etc., kept by Weis-Fogh with working notes and records, will be found in the relevant sections of the collection. (See especially Section F.) The Index of Correspondents should be consulted in order to trace correspondence by specific individuals in other parts of the collection.

Not all the material in this Section is necessarily available for immediate consultation. Enquiries should be made in the first instance to the Head of the Manuscripts Department, University Library, Cambridge.

Correspondence

G.1	Adrian, R. H. Agricultural Research Council	1972 1968-69, 1973, 1975
G.2	Alexander, R. McNeill Correspondence September-November 1975 is re plans for a joint paper, interrupted by Weis- Fogh's death in November.	1966-75
G.3	Alexandrowicz, J. S. on locust muscle	1956-58
	Andersen, S. O. (in English and Danish)	1974
G.4	Anti-Locust Research Centre (see also Centre for Overseas Pest Research)	1960-70
G.5	Archer, R. D.	1974
G.6	Arup Associates Includes correspondence repossibility of establishing a 'Carlsberg pub' in Cambridge as part of the Lion Yard development, 1972.	1967-68, 1971- 74
G.7	Atyeo, W. T. on identification of soil mites	1958, 1961
	Aziz, S. A. on locusts	1955
G.8	Bailey, K. on resilin	1958-61
G.9	Re Barro Colorado Island (Marine Laboratory, Smithsonian Tropical Research Institute)	1968
G.10	Bayronoglu, S. on locusts	1963

Correspondence

G.11	Beament, J. W. L.	1959-61
	Mainly re arrangements for a paper by Niels Bohr to be read at the Society for Experimental Biology Symposium on 'Models in Biology', Bristol, September 1959. Includes 2 typescript drafts of the paper.	
G.12	Bech, K. (in Danish)	1956
	Beenackers, A. M. Th.	1965
	Bellamy, D.	1958
	on the biochemistry of insect flight	
G.13	Berger, M.	1970-73
	Bernays, E.	1969
	on locust muscle	
	Biggs, W. D. (Weis-Fogh's carbons only)	1970, 1972
G.14	Boettiger, E. G.	1952, 1957, 1964-65
G.15	Bone, Q.	1967
	Bramwell, C. D.	1970-71
G.16	Bredsdorff, A. and Bredsdorff E. (in Danish and English)	1960-64, 1974
	Brian, P. W.	1971
	on resilin	
	Brink, P. (in Danish)	1946
G.17	British Broadcasting Corporation	1974-75
	on filming flying locusts and <u>Manduca sexta</u>	
	British Universities Film Council	1975
G.18	Brodsky, A. K.	1973
	on insect flight	
	Brunet, P. D. J.	1965, 1968-69

Correspondence

G.19	Brunori, M. on fish hemoglobins	1972-73
	Buchthal, F. (in Danish)	1957, 1960-63
G.20	Buck, J.	1956, 1961-63
G.21	Buckner, J. M.	1972
	Buddenbrock, W. v. (in German and English)	1952, 1957
	Bullock, T. H. (Weis-Fogh's carbons only)	1958, 1960, 1962
G.22	Burton, A. J. on locust flight	1956, 1961-62
G.23	Cadwell, S. M.	1964-65, 1968
G.24	Callan, H. G. Cambridge Evening News and Cambridge Independent Press (includes newscuttings)	1975 1971
G.25	Canning, E.	1955
	Caro, C. G.	1972
G.26	Centre for Overseas Pest Research (see also Anti-Locust Research Centre)	1971
G.27	Chadwick, L. E. Includes a letter from Weis-Fogh and Martin Jensen, August 1953, to accompany a copy of their film 'How Locusts Fly' which was to be shown at an informal symposium on flight physiology at Woods Hole, Massachusetts, Summer 1953. For further material <u>re</u> the film see B.49.	1952-53, 1956, 1966
G.28	Chance, B. on insect flight muscle	1955
	Chapman, D. on elastin	1971-72

Correspondence

G.29	Chari, N.	1966
	on insect cuticle and resilin	
	Clements, A. N.	1955-59
	1957 correspondence on locust saline	
	See also B.52	
	Cloudsley-Thompson, J. L.	1971-72
G.30	Coles, G. C.	1965-72
G.31	Collett, T.	1973
	on hover-flies	
	Cone, C. D.	1974
	on birdflight aerodynamics	
G.32	Crone, C. (in English and Danish)	1960, 1968-75
G.33	Cumber, R. A.	1958
	<u>re Uropetala carovei</u>	
	Currey, J. D.	1961-63
	on bone and insect cuticle	
G.34	Danish Embassy (in Danish and English)	1970-71
	Danmarks Teknisk-Videnskabelige Forskningsraad (in Danish and English)	1959-66
G.35	Danzer, A. (in German and English)	1956
	on <u>Deilephila</u>	
	Davis, R. B.	1966
	Dixon, K.	1974
G.36	Edney, E. B.	1954, 1968
	Einarson, L. (in Danish)	1955, 1960-61
	Eliassen, E. (in Danish)	1959-60, 1964
G.37	Elliott, G. F.	1958-65, 1969
	includes correspondence on resilin	
G.38	Elliott, J.	1963-66
	on man-powered ornithopters	

Correspondence

G.39	European Molecular Biology Organization	1964-74
G.40	Fänge, R. (in Swedish and Danish)	1960-61
	Fatt, P.	1971
	Feinsinger, P.	1975
	on calculating power output of hummingbirds	
G.41	Fitzpatrick, J. L. G. (Weis-Fogh's carbon only)	1953
	Forer, A.	1973
	Fraenkel, G. S.	1953
G.42	Friend, W. G.	1966-67, 1970
	Frisch, K. v. (in German and English)	1957, 1960
G.43	G ---, J.	1952
	on U-type thermistors	
	Gettrup, E.	1970
	(includes brief correspondence <u>re</u> Gettrup, 1967)	
G.44	Gibbons, I. R.	1973
	Gibbs-Smith, C. H.	1973
	on insect aerodynamics	
	Glen, R.	1952
G.45	<u>Re</u> Gombe Stream Research Centre	1972
	see also G.59	
G.46	Gotte, L.	1972-74
	Grace, T.	1964
G.47	Gray, Sir James	1954-59
G.48	Greenewalt, C. H.	1961, 1976
	Greenhalgh, S.	1975
G.49	Gustavson, K. H. (in Swedish and Danish)	1961-63, 1965

Correspondence

G.50	Haarlov, N. (in Danish and English)	1959-60, 1964
	Hackman, R. H.	1962, 1971, 1974
G.51	Hanson, E. J.	1957, 1965, 1973
	(1973 correspondence is from G. Offer <u>re</u> her death)	
	Hargrove, J.	1972-73
G.52	Haskell, P. T.	1961-74
G.53	Hatch, G.	1965
	on insect flight	
	Heinrich, B.	1974
	Heran, H. (in German and English)	1958-61
G.54	Hinton, H. E.	1954, 1958-61
G.55	Hocking, B.	1950-63
	on insect flight	
G.56	Holdgate, M. W.	1967-68
	re provision of teaching and research facilities at National Environment Research Council research stations.	
G.57	Hoyle, G.	1955-57, 1974
	Huber, F. (in German and English)	1958, 1960, 1966
G.58	Huntingdon Research Centre	1972-74
	Huxley, A. F.	1963-65
G.59	International Centre of Insect Physiology and Ecology (ICIPE) (some correspondence in Danish and Swedish).	1970-75

See also F.49, G.45

Correspondence

G.60	Jensen, M. and Jensen I. (in Danish and English) Includes much material <u>re</u> the 'Biology and Physics of Locust Flight' (see also B.67-B.142).	1954-61, 1968- 72
G.61	Jönasson, P. M. Jones, B.	1972 1958, 1967-70
G.62	Kalckar, H. M. (in Danish) Karlson, P. (in German and English)	1959, 1962, 1964 1959, 1962, 1964
G.63	Kendrew, J. C. Kennedy, D. correspondence <u>re</u> D.M. Wilson	1962-63, 1976 1962, 1970
G.64	Kristensen, B. (in Danish and English) Krogh, A. (in Danish)	1967-68 1947, 1948
G.65	Kubista, V. <u>re</u> study of zoology in Czechoslovakia, Cambridge and Denmark	1958
G.66	Lall, S. B. Lane, F. W.	1966-68 1953, 1963
G.67	Lefkowitz, I. on locust flight Levenbook, L. on locust muscle	1956 1953
G.68	Lighthill, Sir James	1972-74
G.69	Lindhard, P. (in Danish) Lissmann, H. W. 1975 correspondence <u>re</u> Weis-Fogh's plans for his sabbatical (Weis-Fogh's carbon only)	1962 1961-63, 1975

Correspondence

G.70	Locke, M. on resilin	1961-63
	Long, D. P. on insect flight energetics	1958
G.71	Loveridge, J. P. on locusts	1964-67
	Lowy, J.	1957-63
G.72	McCutchen, C. W. McKenzie, D. McMahon, T. A.	1975 1970 1973, 1975
G.73	McMullen, A. I. Masud, R. on Lamarckism	1972 1968
G.74	Medical Research Council	1973
G.75	Mewis, G. E. (Weis-Fogh's carbons only) Michelson, A. (in Danish and English)	1965 1973
G.76	Miller, P. L. Includes correspondence re work on the 'Biology and Physics of Locust Flight' (see B.67-B.142).	1959-72
G.77	Møller, K. M. (in Danish and English) Muus, B. (in Danish)	1968, 1971 1954, 1956
G.78	Nachtigall, W. (in German and English) on insect flight	1960, 1964, 1967, 1972-73
G.79	National Science Foundation	1971, 1974-75
G.80	Natural Environment Research Council see also G.56	1970-72

Correspondence

G.81-G.84	Neville, A. C.	1958-60, 1962-66, 1970, 1973
G.81	1958-59	
G.82	1959	
G.83	1960, 1962	
G.84	1963-66, 1970, 1973	
G.85	Niedenfuhr, F. W. on insect flight	1956
	Nielsen, C. O. (in Danish and English)	1960-63, 1973
G.86	Nielsen, E. T. (in Danish)	1949-61, 1964
G.87	Nielsen, J. (in Danish)	1953, 1956
	Nielsen, L. E. (in Danish and English)	1967-71, 1975
G.88	Norberg, R. A.	1972-74
G.89	Norberg, U.	1970, 1975
G.90	Nuffield Foundation	1974
G.91	Oouchi, H. on insect respiration	1975
	Osborne, M. F. M. on insect flight	1951, 1956-57
	Owen, G.	1962
G.92	Pantin, C. F. A. Includes typescript of obituary of Pantin by Weis-Fogh for <u>Christ's College Magazine</u> , 1967. This is not in the list of publications on pp. 100-107.	1961-62
	Pantin, Amy M. (Weis-Fogh's carbon only)	1968
G.93	Partridge, S. M. on resilin and elastin	1963-64, 1970-73
	Pearson, M.	1975

Correspondence

G.94, G.95	Pennycuick, C. J.	1972, 1974-75
	(includes typescript of paper by Pennycuick and ms. notes by Weis-Fogh headed 'Attempt to re-consider maximum power output of skeletal muscle in the light of Pennycuick's draft ms.' 17 August 1975).	
G.94	1972, 1974	
G.95	1975	
G.96	Re Percy Sladen Memorial Fund, The Linnaean Society of London (Weis-Fogh was a Trustee)	1972-74
G.97	Petersen, J. includes correspondence on insect cuticle.	1958-61
G.98	Phillips, D. C. Phillips, D. M.	1967 1974
G.99	Picken, L. (Weis-Fogh's carbons only) Pierson, R. M. on resilin	1958-59 1963
	Piez, K. A.	1964-65, 1972
G.100	Prange, H. D.	1974-75
G.101-G.104	Pringle, J. W. S.	1959-64, 1967-72
G.101	1959-60	
G.102	1961-62	
G.103	1963-64, 1967	
G.104	1968-72	
G.105	Prosser, C. L.	1963-65
G.106	Ramsay, J. A. (includes some correspondence in Danish) <u>re</u> effects of pornography on society	1964

Correspondence

G.107	Rasmussen, L.	(in Danish and English)	1974
	Rasmussen, S.	(in Danish)	1957
	Rees, C. J. C.		1973-75
	on insect flight		
G.108	Richard, G.		1953, 1956
	includes correspondence <u>re</u> the film 'How Locusts Fly' (see also B.49)		
	Richards, A. G.		1958-59, 1965
G.109	Roeder, K. D.		1951
	Rothschild, M.		1967, 1973, 1975
G.110, G.111	The Royal Society		1959-63, 1970-75
	includes correspondence <u>re</u> Leverhulme Student-ship Committee of which Weis-Fogh was a member		
G.110	1959-63, 1970-71		
G.111	1972-75		
G.112	Rudall, K. M.		1961, 1971
	includes correspondence on resilin		
	Russell, F. S.		1955-56
G.113	Russell, F. E.		1970-71
G.114	Sannasi, A.		1966, 1968
	on resilin		
	Satchell, J.		1975
	on cockroach chitin		
	Schmidt-Nielsen, B.	(in Danish and English)	1963-65
G.115	Schmidt-Nielsen, K.	(in Danish and English)	1965-66, 1972-75
G.116	Schneider, D.	(in German and English)	1962, 1972

Correspondence

G.117	Schwartzkopff, J. on locusts	(in German and English)	1961-63
G.118-G.123	Science Research Council		1968-75
G.118	1968-70		
G.119	1971		
G.120	1972		
G.121	1972		
G.122	1972-73		
G.123	1974-75		
G.124	Seifter, S.		1959, 1964-65
	Shapiro, D. G.		1965, 1973
G.125	Shepherd, A.		1971
	Sibulkin, M.		1956
G.126	Siddorn, J. W.		1957
	Simesen, M. G.	(in Danish and English)	1964-65
	Includes a typescript 'The case history of an empty floor' re his attempts to set up an 'institute for experimental transplantation and immunology' in Copenhagen.		
G.127	Slijper, E. J.		1951, 1956
	Smart, J.		1957
G.128	Smith, J. M.		n.d.
	Smith, S.		1954, 1960, 1963
	'Søgaard'	(in Danish)	1957
G.129	Sotavolta, O.		1950-54, 1958
	includes correspondence on insect flight		

Correspondence

G.130	Stegwee, D. on <u>Hydrophilus</u> beetles	1951-53, 1956-57
G.131	Taub, E. Taylor, B.	1965 1956
G.132	Thamdrup, H. M. (in Danish and English) Thorson, J. W.	1959, 1961, 1965, 1969 1962-63
G.133	Thurm, U. (in German and English) Treloar, L. R. G. on resilin	1962-64 1961-62
G.134	Tucker, V. A. Turner, B. M.	1966, 1973 1957
G.135	Tuxen, S. L. (in Danish) Tyson, J. B. on high flying locusts. See also D.42	1949, 1961, 1964-66 1969
G.136	Ussing, H. H. Uvarov, Sir Boris	1958, 1961 1961-62, 1965, 1967
G.137	Vague, J. Vincent, J. F. V. on locust cuticle	1966 1972
G.138	Vogel, S. on insect flight Von Brand, T. on respiration of flying insects	1963-65 1952
G.139	Wainwright, S. A.	1963-65, 1973-75
G.140	Wajc, E. on locusts Wald, G.	1968-69 1975

Correspondence

G.141	Waterhouse, D. F.	1956-57, 1973
G.142	Waterman, T. H.	1960-65, 1969, 1971
G.143	The Wellcome Trust	1962, 1964
	Westergaard, M. (in Danish)	1959-61, 1969
	Wiersma, C. A. G. (Weis-Fogh's carbons only)	1953, 1956, 1960-61
G.144, G.145	Wigglesworth, Sir Vincent	1953-56, 1959-63, 1967
G.144	1953-56, 1959-60	
G.145	1961-63, 1967	
G.146	Wilkie, D. R.	1972
	Wilkin, P. J.	1968-70, 1972- 74
G.147	Wingstrand, Karl G. (in Danish)	1958, 1964
	Wootten, Robin J.	1973
	Work, T. S.	1969
G.148	Yannas, John B.	1961-62
	on elastin	
	Yurkiewicz, William J.	1964
	on insect flight	
G.149	Zebe, E. C.	1957

Correspondence

G.150-G.174 Correspondence with publishers and editors, mostly re books, articles and reviews by Weis-Fogh or submitted to him for comment.

The material is arranged alphabetically by name of publisher or publication.

G.150	Academic Press	1964, 1972-75
G.151	<u>Advances in Insect Physiology</u>	1962-64, 1974-75
G.152	<u>The American Naturalist</u>	1972-74
G.153	<u>Annual Review of Entomology</u>	1957-58, 1966-69
G.154	<u>Biological Reviews</u>	1956-57, 1972-74
G.155	Blackwell Scientific Publications	1966-73
G.156	Cambridge University Press	1967-75
G.157	Central Office of Information	1973-74
	Includes an article written by Weis-Fogh for the <u>Overseas Press Services</u> entitled 'Aerodynamic lift discovery in wasp study', 1973. This is not in the list of publications on pp. 100-107.	
G.158	Chapman and Hall	1973-75
G.159	Chatto and Windus	1975
	Includes correspondence with G.W. Trevelyan <u>re</u> arrangements for filming swifts from the top of the cathedral tower at St. Albans.	
G.160	<u>Ergebnisse der Biologie</u> (in German and English)	1957-63
G.161	<u>Journal of Comparative Physiology</u>	1967-68, 1974-75
G.162	<u>Journal of Experimental Biology</u>	1961, 1964, 1973-75
G.163	<u>Journal of Mechanochemistry and Cell Motility</u>	1970-73
G.164	<u>Journal of Theoretical Biology</u>	1961, 1972

Correspondence

G.165	McGraw-Hill	1967-68
G.166	<u>Nature</u>	1969-75
G.167	<u>New Scientist</u>	1972, 1974
G.168	Oliver and Boyd Limited	1965-72
G.169	<u>Oxford Biology Readers</u>	1969-71
G.170	<u>Polymer</u>	1974
G.171, G.172	Miscellaneous shorter correspondence. Not indexed.	1956-76
G.171	A - E	
G.172	F - T	
G.173	Invitations to Weis-Fogh from colleagues to write books/ articles, serve on editorial boards, etc.	
G.174	Brief unindexed correspondence re 2 articles by Weis- Fogh published in <u>Politiken</u> , March 1965. In Danish	

Correspondence

G.175-G.181 References and appointments.

1960-75

7 folders in alphabetical order.

G.175 A - G

G.176 H

G.177 M - P

G.178-G.180 S

G.181 W

Correspondence

G.182-G.197	Shorter scientific correspondence. The contents of each folder are in alphabetical order. Not indexed.	
G.182-G.184	Arrangements for visits to and from colleagues; requests to work in Weis-Fogh's laboratory.	1954-75
G.182	A - C	
G.182	D - L	
G.183	M - Z	
G.185-G.187	Reprint requests and exchanges. Some letters contain very brief personal references.	1948-75
G.185	A - G	
G.186	H - O	
G.187	P - Z	
G.188	Postcards requesting reprints from Weis-Fogh. Unsorted	
G.189	Requests for permission to quote or reproduce material in Weis-Fogh's publications.	1962-65
G.190	Requests for information or advice on research methods, specimens, etc.	1950-75
G.191	Requests for advice on academic appointments.	1962-75
G.192	Correspondence <u>re</u> external examining of theses.	1954-71
G.193	Brief exchanges of correspondence with colleagues.	1949-73
G.194	Correspondence with firms and individuals <u>re</u> supply of laboratory equipment, etc.	1959-70
G.195	Correspondence with societies <u>re</u> subscriptions, dates of meetings, etc. In English and Danish.	1956-74
G.196	Miscellaneous Danish correspondence. Mainly Weis-Fogh's carbons only.	1953-66
G.197	Letters from members of the public.	1968-75

LIST OF PUBLICATIONS

This list is essentially the one produced by the Department of Zoology, University of Cambridge, with a few editorial alterations in the interests of consistency, and some additional bibliographical indications in the case of the more recent publications. A copy of the original on which this list is based is included in A.4.

Papers in brackets refer to work carried out in association with Weis-Fogh and of particular relevance to his research, but of which he was not co-author.

A collection of reprints of most of Weis-Fogh's publications can be found in E.75.

Note: For other publications by Weis-Fogh, not included in this list, see A.12, D.32, D.34, F.38, G.92, G.157.

1. Weis-Fogh, T. (1948). Ecological investigations on mites and collembolus in the soil. Nat.Jutland 1, 135-270.
2. Weis-Fogh, T. (1949). An aerodynamic sense organ stimulating and regulating flight in locusts. Nature, Lond. 164, 873.
3. Weis-Fogh, T. (1950). Vandregårdshoppernes flugtfysiologi. Nat.Verd.Kbh. 34, 19-26.
4. Weis-Fogh, T. (1950). An aerodynamic sense organ in locusts. Proc. VIII Int.Congr.Ent. 1948, 584-588.
5. Weis-Fogh, T. (1951). August Krogh. Ent.Medd. 25, 435-445.
6. Krogh, A. & Weis-Fogh, T. (1951). The respiratory exchange of the desert locust (*Schistocerca gregaria*) before, during and after flight. J.exp.Biol. 28, 344-357.
7. Krogh, A. & Weis-Fogh, T. (1952). A roundabout for studying sustained flight of locusts. J.exp.Biol. 29, 211-219.
8. Weis-Fogh, T. (1952). Fat combustion and metabolic rate of flying locusts (*Schistocerca gregaria* Forskaal). Phil.Trans. B. 237, 1-36.

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