



## THE UNIVERSITY OF MELBOURNE ARCHIVES

<b>NAME OF COLLECTION</b>	<b>HARGREAVES, MAXWELL EDGAR</b>
<b>ACCESSION NO</b>	A.1987.0003
<b>CATEGORY ACTIVITY</b>	University, individuals Academics - Metallurgy
<b>DATE RANGE</b>	1923 - 1980
<b>SIZE OF COLLECTION</b>	.65 m. (5 Archives boxes and some oversize materials), Poster, Photograph, Thesis, Publication
<b>HISTORICAL NOTE</b>	Hargreaves was the first Professor of Physical Metallurgy, appointed in 1964. He occupied the Chair until his death in 1976.
<b>DATE OF TRANSFER</b>	
<b>ACCESS CONDITIONS</b>	Access: Open
<b>LISTED BY DATE</b>	GAVAN McCARTHY

AUSTRALIAN SCIENCE ARCHIVES PROJECT

The Papers of  
MAXWELL EDGAR HARGREAVES  
(1923 - 1976)

Listed by : Gavan McCarthy

Deposited with the  
University of Melbourne Archives  
Barry Street, Carlton

The Australian Science Archives Project was established in March 1985  
to locate, sort, list and index the archival papers of selected  
Australian scientists and scientific institutions.

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## AUSTRALIAN SCIENCE ARCHIVES PROJECT

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INTRODUCTION:

Registration No. : ASAP 2/2/85  
Registration Date: 14 March 1985  
Collection Size : 0.65m (5 (12cm) Archive Boxes and some oversize materials)  
Collection Dates : 1926 - 1980

Professor Max Hargreaves was the inaugural appointment to the chair of Physical Metallurgy, University of Melbourne, in 1964. A small collection of personal papers including correspondence, publications and photographs was assembled from materials held by his widow, his former secretary and the CSIRO Archives. Unfortunately most of his papers were destroyed shortly after his premature death in 1976.

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CAREER SUMMARY: Maxwell Edgar Hargreaves

1923 : born 31 March, Wedderburn, Victoria  
 - : Educated Melbourne High School  
 - : Queen's College, University of Melbourne  
 1944 : University of Melbourne (Bachelor of Metallurgical  
 Engineering, Final Honours Exhibition)  
 1944-1946 : C.S.I.R. Lubricants and Bearings Section (Assistant  
 Research Officer)  
 1947 : married 19 July, Arlie Boyd Vance  
 1947-1949 : C.S.I.R. Overseas Studentship, seconded to  
 Cambridge University to do research in the  
 Cavendish Laboratory on the structure of  
 permanent magnet alloys  
 : Clare College, Cambridge University  
 1949 : Cambridge University (Doctor of Philosophy)  
 1949-1963 : C.S.I.R.O. Division of Tribophysics, research on  
 plastic deformation of metals and alloys and  
 short range order in alloys (Senior Principal  
 Research Scientist 1961)  
 1950-1972 : Australian Institute of Metals (Member of Federal  
 Council 1950-1972, Melbourne Branch Chairman  
 1963-1964, Federal President 1970)  
 1957 : Royal Society Discussion on Fatigue, London  
 (Invited speaker)  
 1961 : David Syme Research Prize (conjointly with L.M.  
 Clarebrough and M.H. Lorreta)  
 1963-1976 : Queen's College Council (Member, President  
 1968-1970, Fellow of Queen's College)  
 1964-1976 : University of Melbourne (Professor of Physical  
 Metallurgy; Faculty of Engineering Dean  
 1967-1970; Member of Council 1967-1973;  
 Pro-Vice-Chancellor 1969-1973; Professorial  
 Board Vice-Chairman 1970, Chairman 1972-1973;  
 also was a member of the Appointments Board and  
 the Board of Management of the University Press  
 and served on the following Faculties:  
 Engineering, Science, Applied Science, Dental  
 Science, Architecture and the Board of Studies  
 for Physical Education, Dean of Graduate Studies  
 May 1973 - January 1974)  
 - : Victorian Universities Admissions Committee  
 (Chairman 1969-? ; Chairman of Executive  
 Committee 1968-?)  
 - : Victorian Universities and Schools Examinations  
 Board (Member, Executive Committee)  
 - : Committee on Arrangements for Secondary Curriculum  
 (Courses) and Assessment (Member of the working  
 group to draw up the terms of reference and  
 establish membership)  
 1976 : died 2 September, Melbourne, Australia

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HANDLIST:**Series 1 Personal / Biographical 1923, 1942-1976**

File Size in mm.	File Number	File Title and Dates	Box 1
1	1/1	Curriculum Vitae [Including a list of publications, 1948-1964] 1974	
1	1/2	Biographical Material [Obituaries, references from Queens College and the University of Melbourne] 1963, 1976	
1	1/3	Certificates [Cradle Roll Certificate, 1923 and Dwight's Prize in Chemistry I, University of Melbourne, 1942]	
1	1/4	Memorial Service, 9 September 1986 [Correspondence, Order of Service, tribute, notes and lists made by Mrs. Arlie Hargreaves] 1976-1977	
	1/5	Max Hargreaves Scholarship, Queen's College [Correspondence, notes, biographical statement] 1976-1980	

**Series 2 Scientific Publications 1948 - 1963**

32	2/1	'Pre-Precipitation Effects in Copper, Nickel, Iron Alloys' by M.E. Hargreaves [A dissertation submitted to the University of Cambridge for the degree of Ph.D.] September 1949	
30	2/2	Publications by M.E. Hargreaves and Others [List of contents, publications:	
		1. A Sensitive Differential Wattmeter, with L.M. Clareborough, D. Michell and G.W. West, <u>Journal of Scientific Instruments</u> Vol. 30, No.8, August 1953	
		2. Bearing Metals, <u>Transactions of The Australian Institute of Metals</u> , 1952	
		3. Density Changes during the Annealing of Deformed Nickel, with L.M. Clarebrough and G.W. West, <u>The Philosophical Magazine</u> , June 1956	

4. Discussion of Williams' comments on "The influence of grain size on the stored energy and mechanical properties of copper", with L.M. Clarebrough and M.H. Loretto, Acta Metallurgica Vol. 8, 1960
5. Electrical Resistivity of Dislocations in Face centred Cubic Metals, with L.M. Clarebrough and M.H. Loretto, The Philosophical Magazine, Vol. 7 No.73, January 1962
6. Energy Stored During Fatigue in Copper, with L.M. Clarebrough, A.K. Head and G.W. West, Transactions AIME, Journal of Metals, January 1955
7. Failure of a Set of Roller Bearings, with C.G. McDonald, A.L. Temby and A.J.W. Moore, WEAR Vol. 1 No. 1, August 1957
8. Inhomogeneities of Deformation as they Affect Recrystallization in Zinc, with G. Brinson, Journal of the Institute of Metals, Vol. 87 1958-1959
9. Modulated Structures in Some Copper-Nickel-Iron Alloys, Acta Crystallographica Vol. 4, Part 4, July 1951
10. On the Inhomogeneity of Plastic Deformation in the Crystals of an Aggregate, with W. Boas, Proceedings from the Royal Society, A, Vol. 193, 1948
11. Order and Solute Segregation in Copper-Zinc, Silver-Zinc and Copper-Aluminium Alloys, with L.M. Clarebrough and M.H. Loretto, Journal of the Australian Institute of Metals, Vol. 8, No. 3, August 1963
12. Order-Disorder phenomena in Alpha-Brass (Parts I, II, III and IV), with L.M. Clarebrough and M.H. Loretto, Proceedings of the Royal Society, A, Vol. 257, 1960
13. Order in Alpha-Brass, with L.M. Clarebrough and M.H. Loretto, Journal of the Australian Institute of Metals, Vol. 6, No. 2, May 1961
14. Preliminary results of a further X-ray investigation of Cu-Fe-Ni alloys, Acta Crystallographica, Vol. 2, Part 4, August 1949

15. Stored Energy and Electrical Resistivity in Deformed Metals, with L.M. Clarebrough and M.H. Loretto, The Philosophical Magazine, Vol. 6, No. 66, June 1961

16. Stored Energy and Flow Stress in Deformed Metals, with L.M. Clarebrough, A.K. Head and M.H. Loretto, The Philosophical Magazine, Vol. 6, No. 66, June 1961

17. The Annealing Stages in Copper Deformed at  $-196^{\circ}\text{C}$ , with L.M. Clarebrough and M.H. Loretto, Journal of the Australian Institute of Metals Vol. 8, No. 2, May 1963

18. The Deformation of Polycrystalline Aggregates, Journal of the Australian Institute of Metals, Vol. 1, No. 2, October 1956

19. The Density of Dislocations in Compressed Copper, with L.M. Clarebrough and G.W. West, Acta Metallurgica, Vol. 5, No. 12, December 1957.

20. The Determination of the Energy Stored in a Metal during Plastic Deformation, with L.M. Clarebrough, D. Michell and G.W. West, Proceedings of the Royal Society, A, Vol. 215, 1952

21. The Energy Stored in Deformed Metals, with L.M. Clarebrough, Journal of the Australian Institute of Metals, Vol. 3, No. 1, May 1958

22. The Influence of Grain Size on the Stored Energy and Mechanical Properties of Copper, with L.M. Clarebrough and M.H. Loretto, Acta Metallurgica Vol. 6, No. 12, December 1958

23. The Influence of Impurities on the Annealing of Nickel after Cold Work, with L.M. Loretto and G.W. West, Acta Metallurgica Vol. 8, No. 11, 1960

24. The Orientation Dependence of Work-Hardening in Crystals of Face-centred Cubic Metals, with L.M. Clarebrough, Australian Journal of Physics Vol. 13, No. 2A, 1960

25. The Release of Energy during Annealing of Deformed Metals, with L.M. Clarebrough and G.W. West, Proceedings of the Royal Society, A, Vol. 232, 1955



26. The Release of the Energy Stored in Deformed Nickel, with L.M. Clarebrough and G.W. West, The Philosophical Magazine Ser. 7, Vol. 44, No. 355, August 1953

27. Work Hardening of Metals, with L.M. Clarebrough, Progress in Metal Physics, Vol. 8, 1959  
[Four copies]  
1948 - 1963

- . Changes in Internal Energy Associated with Recovery and Recrystallization, by L.M. Clarebrough, M.E. Hargreaves and M.H. Loretto, pp 63 - 130  
[Source not given]  
n.d.

- 1            2/3        Masson Lecture, The Pathology of Crystals and the Strength of Materials, by Walter Boas, The Australian Journal of Science, Vol. 25, No. 7 January 1963  
The Development of Solid State Physics, by Walter Boas, The Australian Journal of Science, Vol. 18, No. 6 June 1956

Box 2

- 3            2/4        Hume-Rothery, William, The Structure of Metals and Alloys. The Institute of Metals Monograph and Report Series No.1, March 1936.

**Series 3    Subject Files    1942 - 1976**

Note: For further subject files see Series 8 Subject Files [Later accession] 1944 - 1963

- 5            3/1        Family Correspondence  
[including letters home while at the Cambridge University]  
1942-1949
- 2            3/2        David Syme Research Prize, 1961  
[Correspondence, press cutting, photograph showing M.E. Hargreaves, L.M. Clarebrough and M.H. Loretto, Conferring of Degrees programme, 1 August 1962]  
1961-1962
- 1            3/3        Address to Graduands, 7.30 p.m., 18 August 1968  
[Lecture typescript, press cutting]  
1968
- 2            3/4        The Institute of Metals  
[Publication 'The Metals Society' 1972, circulars, receipts]  
1970-1974

- 1 3/5 Metallurgy Courses, University of Melbourne  
[Prospectus, circular]  
1975 and no date
- 1 3/6 Professorial Board, University of Melbourne, Joint  
Meeting of Academic Committee and Selection  
Procedures Committee, Meeting No. 1  
[Meeting Papers, M.E. Hargreaves was chairman]  
24 February 1976
- 5 3/7 Date, Appointments Diary  
1976

## Box 3

- 1 3/8 Committee of Deans, Sub-Committee of H.S.C.  
Subjects  
[Correspondence, tables of enrolments]  
1976
- 4 3/9 University House  
[Agenda, Annual Reports, notes, correspondence,  
Handbook 1971]  
1971, 1976
- 7 3/10 Victorian Universities Admissions Committee  
[Meeting papers, reports, notes, correspondence]  
1976
- 1 3/11 Material from John Richards, Canberra 23 April 1985  
[Letter from M.E.Hargreaves 20 May 1964 and  
'Some Observations on Push Penny' by M.E.H., The  
Wyvern October 1944]  
1944, 1964
- 3 3/12 Crossword, Vacation Special No. 1  
[devised by M.E.Hargreaves]  
[n.d.]

## Series 4 Photographs 1926 - 1976

- 3 4/1 Portrait Photographs  
[Five B.W. photographs, Two Colour photographs]  
1945, [1970s]
- 2 4/2 Photocopies of a family photograph album still held  
by Mrs. Arlie Hargreaves  
[1926]-1976
- 4 4/3 Family, Friends and Sporting Photographs  
[including one B.W. of Robert Honeycombe; one  
B.W. of the wedding of Mac and Mary Vance  
October 1946; one mounted and labelled B.W. of  
the Queen's College Athletics Team, 1941; one  
mounted and signed B.W. of the Melbourne  
University Rugby Team, August 1946 with  
programme for the Intervarsity Rugby Carnival,  
Adelaide, August 1946; B.W. Print Max with son  
Tony, April 1956; B.W. print Max bowling at a  
cricket match no date; B.W. print, Anthony  
McMahon (Maree's ex-husband) 1970; B.W. print,  
M.E. Hargreaves singing, n.d.; B.W. print, Ian



## Series 5 Other Publications 1967 - 1973

- 7 5/1 Wyvern, Queen's College, University of Melbourne  
[M.E. Hargreaves was a member of the Queen's  
College Council]  
1954, 1960, 1969-1973
- 21 5/2 Conferring of Degrees, University of Melbourne  
[Programmes; 15 March 1967, 1 April 1967, 13  
March 1968, 23 March 1968, 6 April 1968, 17  
August 1968, 29 March 1969, 19 December 1970, 18  
December 1971, 12 August 1972, 16 December 1972,  
24 March 1973, 14 April 1973, 15 December 1973,  
24 August 1974]  
1967 - 1974
- 10 5/3 University of Melbourne - General  
['The Cloisters' 1855 - 1955; Gazette, 21  
December 1959; Appointments Board, Annual Report  
1969, M.E. Hargreaves was a member; University  
of Melbourne pamphlet, n.d.; The Victorian  
Universities Guide for Prospective 1971  
Students; The University of Melbourne, Lists of  
Members 1973]  
1969-1973

## Series 6 Graphic Materials (Oversize)

Housed separately

- 6/1 'Fig. 41. Curves of constant relative resolved  
shear stress for the ten likely secondary slip  
systems. The numbering of the systems is as  
Fig. 1 and the relative resolved shear stress is  
calculated as a fraction of the resolved shear  
stress on the system BIV, i.e. the primary  
system, for orientations in the standard  
triangle' from "Work Hardening of Metals" by  
L.M. Clarebrough and M.E. Hargreaves, Progress  
in Metal Physics Vol. 8, p.66  
[10 poster charts]  
[1959]
- 6/2 Same as above  
[10 charts 350mm x 300mm prepared for  
photographic reproduction]  
[1959]
- 6/3 Same as above  
[10 charts, drafts 350mm x 300mm]  
[1959]
- 6/4 [Schematic section of Calorimeter used for  
measuring energy stored in a metal during  
plastic deformation. from "The Determination of  
the Energy Stored in a Metal during Plastic  
Deformation" by L.M. Clarebrough, M.E.  
Hargreaves, D. Michell and G.W. West. (Figure 1)  
Proceedings of the Royal Society, A, 215, 1952,  
pp 507-524]

- 6/5 [Schematic diagram of the electrical circuits of the apparatus used for measuring the stored energy in a deformed metal. from "The Determination of the Energy Stored in a Metal during Plastic Deformation" by L.M. Clarebrough, M.E. Hargreaves, D. Michell and G.W. West. (Figure 4) Proceedings of the Royal Society, A, 215, 1952, pp 507-524]
- 6/6 [Power difference (vertical axis) as a function of time (horizontal axis) for specimens (of copper) deformed various amounts in torsion. The curves from left to right are for values of  $nd/l$  decreasing from 3.03 to 0.47, from "The Determination of the Energy Stored in a Metal during Plastic Deformation" by L.M. Clarebrough, M.E. Hargreaves, D. Michell and G.W. West. (Figure 8) Proceedings of the Royal Society, A, 215, 1952, pp 507-524]
- 6/7 [Diagram showing stored energy (vertical axis) versus work done in twisting (horizontal axis) and recrystallization temperature (vertical axis) versus work done in twisting for several copper specimens, from "The Determination of the Energy Stored in a Metal during Plastic Deformation" by L.M. Clarebrough, M.E. Hargreaves, D. Michell and G.W. West. (Figure 5) Proceedings of the Royal Society, A, 215, 1952, pp 507-524]

Note: The following six posters are probably related to War work done in the Department of Metallurgy concerning the failures of the cooling systems in Spitfire aircraft operating in the Darwin area during World War II.

- 6/8 Oil Circulation Diagram - Hercules VI, XVI & XVII  
Air Diagram 2585, Sheet No. 1 [of 4]  
September 1943
- 6/9 Oil Circulation Diagram - Hercules VI, XVI & XVII  
Air Diagram 2585, Sheet No. 3 [of 4]  
September 1943
- 6/10 Oil Circulation Diagram - Hercules VI, XVI & XVII  
Air Diagram 2585, Sheet No. 4 [of 4]  
September 1943
- 6/11 Merlin Aero-Engine, Two piece block, single stage,  
two speed supercharger type  
Air Diagram 2632, Sheet No. 1 [of 1]  
October 1943
- 6/12 Merlin Aero-Engines, Two stage, Two speed,  
Supercharger and Intercooler  
Air Diagram 2577, Sheet No. 1 [of 1]  
June 1943
- 6/13 Merlin Aero-Engines, Two stage, Two speed,  
Supercharger and Intercooler, Float chamber  
carburettor  
Air Diagram 4157, Sheet No. 1 [of 1]  
June 1944

## Box 4 (Cont.)

## Series 7 Related Material Held at the CSIRO Archives, Canberra

- 4        7/1        CSIRO Staff File, M.E. Hargreaves  
                  [Photocopied extracts of correspondence,  
                  promotion recommendations and research summaries  
                  including documents from S.H. Bastow and W.  
                  Boas]  
                  1944 - 1951, 1986
- 3        7/2        List of CSIRO Archives holdings relevant to M.E.  
                  Hargreaves  
                  [The section of the C.S.I.R.O. Archives Series 9  
                  register (Series 202) which lists Tribophysics  
                  files; a list of Tribophysics research  
                  scientists, 1939 - 1965]  
                  1939 - 1965, 1986

## Box 5

## Series 8 Chronological Subject Files [later accession] 1944 - 1963

- 3        8/1        Final Honour Examination in Metallurgical  
                  Engineering, 1944, Essay on Subject Numbered 1,  
                  Concerning an Ancient Axehead submitted by M.E.  
                  Hargreaves  
                  25 November 1944
- 5        8/2        CSIR[O], Division of Lubricants and Bearings  
                  [Tribophysics] - Reports  
                  [-CSIR, Serial No. A.123, Lubrication and  
                  Friction Report No. 44, A Method of Taper  
                  Sectioning for the Examination of Surface  
                  Contours. April 6, 1945;  
                  -CSIR, Serial No. A.138, Lubrication and  
                  Friction Report No. 52, The Hardened Layer  
                  Produced in a 2 PDR Gun Barrel during Firing.  
                  The Effect of Slow Forcing of Shells. October  
                  23rd, 1945;  
                  -CSIRO, Serial No. A.161, Physical Metallurgy  
                  Report No.8, The Hazards of Perchloric Acid  
                  Solutions in Electropolishing and Suggested  
                  Alternative Electrolytes. by D.S. Kemsley  
                  March 7th, 1949, Revised December 13th, 1949  
                  -Radiant Heating of an Insulated Wall. By J.K.  
                  Mackenzie, n.d.  
                  -A Note on Radiant Shields. by J.K. Mackenzie,  
                  n.d.]  
                  1945 - 1949
- 3        8/3        Miscellaneous Notes etc.  
                  [Notes on X-Ray diffraction and crystallography  
                  from Cambridge; The Institute of Physics ?-Ray  
                  Analysis Group, Midland Branch Autumn Conference  
                  1947, Abstracts; photographs; University of  
                  Melbourne, Metallurgy School, Lecture Notes  
                  No.8, Qualitative Metallurgical Analysis;  
                  Report on the "Minox" Miniature Camera. By M.E.  
                  Hargreaves and T.V. Krok]  
                  [1947 - 1948]

- 1           8/4       X-Ray Crystallography  
                   [Publication and overhead transparencies:  
                   Weisz, Olga, and W.F. Cole, An Improved  
                   Technique for Setting Crystals from Zero  
                   Layer-line Photographs. Journal of Scientific  
                   Instruments Vol.25, No.6 June 1948]  
                   1948
- 10          8/5       CSIRO Division of Tribophysics  
                   Annual Reports  
                   1948 - 1958
- 20          8/6       Miscellaneous Local  
                   [Correspondence, reports, photographs: dealing  
                   with inquiries made to CSIRO Division of  
                   Tribophysics concerning lubrication and metal  
                   bearing failures]  
                   1950 - 1959
- 2           8/7       Micro Hardness Tester 4 Applications B Internal  
                   [Tabulated numerical data]  
                   11 September 1951
- 5           8/8       Reprints Miscellaneous and other Miscellaneous  
                   Publications  
                   [Lectures, reports:  
                   -Wear and Surface of Sliding Metals, 18 June  
                   1952, typescript;  
                   -Lecture 1, Elementary Crystallography, Physics  
                   of Metals, Metallurgy II Course 1954,  
                   manuscript;  
                   -Failure of a Main Bearing from a Large Diesel  
                   Engine. 23 December 1957, typescript;  
                   Some Trends in Physical Metallurgy. n.d.  
                   typescript, photographs]  
                   1952 - 1957 [1964]
- 2           8/9       Publication Copies  
                   [Junge, Charles H., Wear in Bearings. A.S.T.M.  
                   Bulletin, May 1954, pp64-69;  
                   Cree, J.C. and J.C. Withers, All-Season High  
                   Performance Oil. Automobile Engineer, January  
                   1955]  
                   1954 - 1955
- 2           8/10      Australian Institute of Metals  
                   [Agenda with annotations, correspondence,  
                   reports]  
                   1958
- 2           8/11      Friction, Bearing Metals, Lubrication  
                   [Annotated typescripts for a course of lectures  
                   including a bibliography]  
                   n.d. [1960]
- 2           8/12      Bearings and Bearing Metals  
                   [Annotated typescript and manuscript for a talk  
                   or lecture]  
                   1 November 1962
- 1           8/13      Recovery in Copper, Australian Institute of Metals  
                   [Annotated manuscript for talk or lecture]  
                   11 April 1963

4	8/14	Lectures on Friction, Bearing Metals, Lubrication etc. [Annotated manuscripts: -Effect of Friction in Rolling; -Wire Drawing, Extrusion etc; Annotated typescript: Friction and Lubrication of Metal Surfaces] n.d.
3	8/15	Unlabelled but includes a reference to Zinc [Tabulated numerical data, notes] n.d.

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