



Professor Emeritus Anthony Kelly, CBE, FRS

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<http://www.msm.cam.ac.uk/mmc/index.php/component/content/article/50/251>

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Department of Materials Science and Metallurgy
Composites and Coatings Group
University of Cambridge

Biography:

Professor Anthony Kelly is an Emeritus Professor and Distinguished Research Fellow at Cambridge.

He is a Fellow of the Royal Society, a Fellow of the Royal Academy of Engineering and a Foreign Associate of the US National Academy of Engineering. He is a Fellow of the Institute of Physics, a Fellow of the Institution

of Materials Mining and Metallurgy (and past President) as well as being a founding Fellow of Churchill College Cambridge. He holds Honorary Degrees from Universities in Europe, the USA and Korea.

He is an Honorary Fellow of the Institute of Linguists, of the Institution of Civil Engineers and of the Institution of Structural Engineers.

He has been employed in Universities, in Government Science (National Physical Laboratory) and in industry (ICI). He was Vice-Chancellor of the University of Surrey from 1975 until 1994. While there he established the Surrey Research Park and was the first chairman of Surrey Satellite Technology Ltd.

His early scientific work related x-ray and electron microscope studies of precipitation and dispersion hardened alloys and in 1963 with Robin Nicholson (now Sir Robin) produced the first synthesis, which has stood the test of 50 years, relating type of dispersion and work hardening characteristics of metals. This has become an SCI citation classic.

He pointed out clearly the nature of the criterion for metals to show polycrystalline ductility by glide and applied this to important ceramic and other inorganic materials which were becoming available in the 60s and 70s. He applied the same ideas to the climb of dislocations. This led to a criterion for distinguishing fundamentally between brittle and ductile crystals and to detailed calculations of the ideal strength of crystals.

He set down the principles of the materials science of metallic composite materials, particularly the strength, toughness and creep of short fibre composites, and led the way to relating fibre reinforcement and conventional strengthening methods of metals. This was followed by the experimental analysis of fibre bundle failure. His group explored for the first time the phenomenon of multiple fracture of a fibrous composite in detail which explained the properties of fibre reinforced cements and concretes and which has led to the whole development of ceramic composite materials as well as to an understanding of the modes of toughness of laminated composite structures with resin matrices. For this work and for his books and editing of a number of treatises on composites he has been called 'The Father of Composite Materials'.

In the 1990s he established the fundamental limits to the attainable packing density of assemblies of long straight fibres and supported this with experiment in order to establish the most possible dense packing of random fibre arrangements and of those regular fibre arrangements which can produce elastic isotropy.

Since 2000 his principal interest is in using composite principles to control and to modify the thermal expansion coefficients of materials so as to obtain hitherto unattained values and to obtain these with a desirable combination of other properties. He has lately turned his interests to understanding the science of climate.

Kelly has worked for periods in the USA, Germany and in Switzerland. He has an interest in the linguistic aspects of science and is an Honorary Fellow of the Institute of Linguists.

From 1988 until 1997 he was Chairman of the Standing Committee on Structural Safety of the Institutions of Civil and of Structural Engineers, which was reconstituted under his Chairmanship to include the Health and safety Executive.

Education:

1949 Gained BSc (General) - First Class, University of Reading

1950 Gained BSc (Special) - Physics, First Class, University of Reading
1953 Gained PhD, Trinity College, Cambridge
1968 Awarded ScD of University of Cambridge

EMPLOYMENTS HELD:

1953-55 Research associate, University of Illinois
1955 ICI Fellow, University of Birmingham
1956-59 Assistant, later Associate Professor, The Technological Institute Northwestern University, Chicago
1959-67 University Lecturer, University of Cambridge
1960 Founding Fellow of Churchill College, Cambridge & Director of Studies in Natural Sciences.
Extraordinary Fellow (1985-1996). Pensioner Fellow for life (1996)
1967-69 Superintendent, Division of Inorganic and Metallic Structure at the National Physical Laboratory, Teddington, Middlesex
1969-75 Deputy Director , National Physical Laboratory- in charge of Materials Group
1973-75 Seconded to ICIplc as part of Government/Industry/Academia Task Force
1975-1994 Vice-Chancellor and Chief Executive, University of Surrey
1979 Founded Surrey Research Research Park
1994- Distinguished Research Fellow Department of Materials Science and Metallurgy, University of Cambridge
1973- Consultant to many international Companies

OTHER APPOINTMENTS HELD:

1960 Visiting Scientist, Deutsche Akademische Austausch Dienst, University of Gottingen
1967 Visiting Professor, Carnegie Institute of Technology
1967-72 Science Research Council Member of Committee
1969-74 Member of Council, Institute of Metals
1970-73 Member of Council, later Director, British Non-Ferrous Metals Research Association
1973-75 Member of the Advisory Committee, Community Reference Bureau EEC
1973-80 Member (1973-75), later Chairman (1976-80) Engineering Materials Requirements Board, Department of Trade & Industry
1977 Professeur invité, Ecole Polytechnique Fédérale de Lausanne
1984 Founder Member and later President, European Association of Composite Materials
1998 President of Honour European Society for Composite Materials
1989 -1998 Chairman, Standing Committee on Structural Safety (independent body established by Institutions of Civil and Structural Engineers)
1989 –1998 Vice-President, Royal National Institute for the Deaf
1989 –1998 Member of Management Committee and Chairman, Awards Committee, Canada Memorial Foundation
1995 Senior Vice-President Institute of Materials
1996-1997 President Institute of Materials
1999 Lee Kuan Yew Distinguished Visitor to the Commonwealth of Singapore

DIRECTORSHIPS:

1981-1996 Director, Johnson Wax UK Ltd
1984-2000 Director, QUO-TEC Ltd
1984-1994 Vice-chairman, Surrey Research Park Executive

1985-1994 Chairman Surrey Satellite Technology
1995-2001 Director, NPL Management Ltd

AWARDS AND HONOURS:

1967 Awarded William Hopkins Prize, Cambridge Philosophical Society
1967 Awarded Beilby Medal, Royal Institution of Chemistry
1973 Elected Fellow of the Royal Society
1974 Awarded A A Griffith Medal
1979 Elected Fellow of the Royal Academy of Engineering
1984 First co-recipient of Medal of Excellence in Composite Materials of the University of Delaware
1985 Elected Extraordinary Fellow, Churchill College, Cambridge
1986 Elected Foreign Associate of the US Academy of Engineering
1987 Elected University Professor, University of Surrey
1988 Awarded CBE in Queen's Birthday Honours
1988 Elected Honorary Fellow, Roehampton Institute
1988 Elected Honorary Fellow of the Institute of Linguists
1990 Elected to the Academia Europaea
1991 Awarded International Gold Medal of American Society of Materials
1992 Awarded Platinum Medal of Institute of Materials
1992 Appointed a Knight of St Gregory
1993 Appointed a Deputy Lieutenant for the County of Surrey
1994 D. Univ University of Surrey
1996 Elected Honorary Fellow Institution of Structural Engineers
1997 Hon. DSc. University of Birmingham
1997 Elected Honorary Fellow Institution of Civil Engineers
2000 Awarded Acta Metallurgica Gold Medal
2001 Honorary D.Eng. Hanyang University Korea
2002 Honorary Doctor of Science, University of Reading
2003 Doctor Honoris Causa of Engineering University of Navarra
2004 Awarded Alfred Ewing medal by Institution of Civil Engineers
2011 Awarded President's medal of the Royal Academy of Engineering

PUBLICATIONS:

Over 200 papers in the scientific and technical journals

BOOKS

Precipitation Hardening, A Kelly and R B Nicholson, Progress in Materials Science, 10, (3), 149-391
Principles of the Fibre Reinforcement of Metals, A Kelly and G J Davies, Metallurgical Review, 10, 1-77
Strong Solids, A Kelly, Clarendon Press, pp 1-212 and i-xv
Composite Materials, A Kelly, G C Smith, P J E Forsyth and A J Kennedy, Liffie Books, London, pp 1-154
Crystallography and Crystal Defects, A Kelly and G W Groves, Longman London and Addison Wesley New York
Strengthening Mechanisms in Crystals, Edits A Kelly and R B Nicholson, Elsevier, London, pp 1-627
Strong Solids, 2nd Edition, A Kelly, Clarendon Press

Fabrication of Composites, Edits A Kelly and S T Mileiko, Vol.4 of Handbook of Composites, pp 0-574, North Holland, New York Amsterdam

Composite Materials, A Directory of European Research, Editors A R Bunsell and A Kelly FRS, (170 pages ISBN O 408 221658) £60

Strong Solids 3rd Edition, A Kelly and N H Macmillan, Clarendon Press Oxford, pp.xiv + 423

Concise Encyclopedia of Composite Materials, Edited by Anthony Kelly CBE FRS, Pergamon Press, 1989

Concise Encyclopedia of Composite Materials, revised edition, Pergamon Press, A Kelly Edit, 1994 + 5 articles therein by A Kelly

Crystallography and Crystal Defects, revised Edition, A Kelly, G W Groves and P Kidd, J Wiley and Sons Ltd, pp 470

Comprehensive Composite Materials, A 6-volume work of 5161 pages, Editors in Chief A Kelly and C Zweben

Vol.1: Fiber Reinforcements and General Theory of Composites - 824 Pages

Vol.2: Polymer Matrix Composites - 1129 pages

Vol.3: Metal Matrix Composites - 866 pages

Vol 4: Carbon/Carbon Cement and Ceramic Matrix Composites - 715 pages

Vol.5 Test Methods Non Destructive Evaluation and Smart Materials - 653 pages

Vol.6 Design and Applications - 974 pages

Crystallography and Crystal Defects, 2nd Edition, A Kelly and K M Knowles, J Wiley and Sons Ltd. pp540

MAJOR LECTURES

1986 - Royal Society of Arts: 'Composite Materials: Industrial Innovation via New Materials'

1986 - Royal Society: Lectures to the Public: 'New Materials'

1988 - Institution of Linguistics, Threlford Memorial Lecture 'Science, Technology and Language'

1992 - 'The Future of Metals', The Third CMMI Distinguished Lecture on the occasion of the Fourteenth Congress of the Council of Mining and Metallurgical Institutions. Pub. Minerals Industry International Bulletin of the Institute of Mining and Metallurgy, No. 996, September 1990, pp 5-15

1994 - Institution of Materials Finnieston Memorial Lecture: 'The Changing Cycle of Engineering Materials'

1995 - Royal Society, The Bakerian Lecture: 'Composite Materials'

1995 - Travers Morgan Safety Lecture, 'The Price of Safety is Eternal Communal Vigilance'

1995 - Institut de France Academie des Sciences: 'La Fissuration Empecherait - elle la Rupture?'

1996 - Institution of Engineers, Australia Eminent Speaker Programme

1997 - Lee Kuan Yew Distinguished Visitor to the republic of Singapore

(1) Materials Engineering and the Global Technological Societies

(2) How the Science of Materials Controls Engineering Advance

1999 - The first Kelly Lecture - University of Cambridge; 'Fibre Composites: the Weave of History'

2003 - UK-Canada Rutherford Lecturer - Royal Society of Canada and Royal Society of London. Lectures on:

(1) Composite Materials and can they compete with metals at elevated temperature

(2) Poisson's ratio and Controlling thermal expansion by use of composite materials

2008 - Eminent speaker tour of Australia organised by Engineer's Australia and the Royal Aeronautical Society: 'Fibre Composites; woven in to Australia's Engineering Future'