

## 2004 ACTA MATERIALIA, INC. GOLD MEDAL



The 2004 *Acta Materialia* Gold Medal has been awarded to Professor Ray Smallman, currently Emeritus Professor of Metallurgy and Materials Science, in the University of Birmingham and Honorary Senior Research Fellow in the Department of Metallurgy and Materials in the School

of Engineering, Birmingham England. Over a career spanning more than 50 years, Professor Smallman has made many outstanding contributions to the field of Metallurgy and Materials Science as a Researcher, as a Teacher and as an Administrator in the National and European Sphere.

Professor Smallman graduated with 1<sup>st</sup> Class Honours B.Sc. in Theoretical and Structural Metallurgy at the University of Birmingham in 1950, and went on to carry out research mainly on the Structure of Deformed Metals using X-ray diffraction, under the supervision of Dr. G.K. Williamson, but also on mechanical behaviour under the general guidance of Professor (later Sir) Alan Cottrell. His early papers on crystal growth and yield point behaviour were published in the first edition of *Acta Metallurgica* in 1953, and he is still publishing original work.

After gaining his Ph.D in 1953, Professor Smallman took up an appointment as a Scientific Officer at the Atomic Energy Research Establishment, Harwell. There he carried out research initially on the structure of liquid metals and then on textures in F.C.C. metals and alloys, publishing a seminal paper on the texture transition in 1955. It is an area of study he has returned to on several occasions over the years, publishing work in the 1960's on the dependence on stacking fault energy and in the 1990's on the role of deformation banding in deformation textures and recrystallisation texture formation. As a Senior Scientific Officer he moved on to study

the structure of irradiated metals and of quenched metals initially using small-angle X-ray scattering but introduced transmission electron microscopy to Harwell when clustered point defects, 10-100 nm in size, were indicated. A fruitful collaboration with Professor (late Sir) Peter Hirsch produced the first direct observation of dislocations loops in metals and the subsequent published paper (Hirsch, Silcox, Smallman and Westmacott) became an ISI Citation classic.

Always interested in teaching (he first taught part-time at Wednesbury Technical College later to become part of Wolverhampton University, and Oxford college of Technology later to become Oxford Brooks University) and developing his own Research Team, he accepted a Lectureship back at Birmingham in October 1958. There he acquired and Electron Microscope for the University and introduced TEM studies to the undergraduate curriculum and into research. The Group he initially built-up concentrated mainly on the observation and behaviour of 2- and 3-dimensional defects and on climb controlled phenomena in general, developing quantitative measurements of stacking fault energy. These studies laid the foundation for climb-controlled annealing (radiation damage, recrystallisation, etc.) and demonstrated the important phenomena of oxidation-vacancy injection.

In 1970-71, Birmingham became a National Centre for Electron Microscopy with the introduction of an AEI, EM7 1 MV microscope (one of three funded by the Government to further structural research in the UK). This allowed the observation of *in-situ* studies of deformation, annealing and recrystallisation, transformations at low temperature (martensite in low S.F.E. steel) and irradiation damage in different structural materials. The Centre acquired the first intermediate voltage (400KV) analytic electron microscope (IVAEM) in 1985 and was used, with students and colleagues, to research a wide variety of applied microstructural areas. These included titanium and aluminium alloys, mechanically-alloyed nickel alloys, and austempered ductile iron

(ADI) where a knowledge of both micro-chemistry and structure was important.

A continued interest over more than 40 years has been in the microstructure and mechanical properties of intermetallic compounds, initially with NiAl (showing that the brittleness was due to a lack of available slip systems) to yield points in  $A_3B$  compounds, ductility and grain boundary effects in  $Ni_3Al$  to inverse creep and high temperature behaviour. Much of this work has been published in *Acta* and Professor Smallman is still active in this field.

Professor Smallman has guided many students over the 50 years, supervising about 100 Ph.D students, 25 of them now professors and others occupying senior technical positions world-wide. With his students and colleagues he has published more than 300 research papers and several books including "Modern Physical Metallurgy" (which has run to 5 editions); "Modern Metallography" (jointly); "Structure of Metals and Alloys" (jointly); "Defect Analysis in Electron Microscopy" (jointly); "Metals and Materials: Science, Processes and Applications" (jointly); "Modern Physical Metallurgy and Materials Engineering" (jointly). His academic career at Birmingham has spanned the spectrum from Lecturer, Senior Lecturer, Personal Professor (1964), Feeney Professor and Head of the Department of Physical Metallurgy (1969) to Head of the combined new Department of Metallurgy and Materials incorporating the departments of Physical Metallurgy, Industrial Metallurgy and Science of Materials (1980). He served as Deana of the Faculty of Science and Engineering (1982-1985), first Dean of the new created Faculty of Engineering (1985-1987) and then as Vice-Principal of the University (1987-1992).

Apart from his contributions to, research and teaching, Professor Smallman has played a prominent role in the development of Materials Science as a profession. He was President of the Birmingham Metallurgical Association (1972), a long-serving member of the Councils and Vice-President of The Institute of Metals, The Metals Society and The Institute of Materials. He was

Chairman of the Editorial Committee of the Metals Science Journal, the forerunner of *Materials Science and Technology*, of which he is still Associate Editor. He was prominent in the development and growth of the Federation of European Materials Societies and President of F.E.M.S (1994-1996). He has served on many National Committees, promoted Industry-Education partnerships and was a Council Member of the former Science and Engineering Research Council. Professor Smallman has lectured extensively all over the world and held visiting appointments in the Universities of Pennsylvania, Stanford, Berkeley and Case Western Reserve, U.S.A; Cape Town, South Africa; New South Wales, Australia; Hong Kong and Novi Sad, Yugoslavia.

In recognition of his many achievements, Professor Smallman has received numerous honours and awards. He was elected a Fellow of The Royal Society (F.R.S.) in 1985, a Fellow of The Royal Academy of Engineering (FREng) in 1991, and a Commander of The British Empire (C.B.E.) in 1992. He has Honorary Doctorates from the University of Wales (1990), Novi Sad, Yugoslavia (1990) and Cranfield University (2001), and Honorary Fellowships from the China Ordinance Society and the Czech Society for Metal Science. He has been awarded the Sir George Beilby Gold Medal of The Royal Institute of Chemistry and The Institute of Metals (1969), the Rosenhain Medal (The Metals Society, 1972), the Van Horn Distinguished Lecture Award (1978), the Elegant Work Prize (The Metals Society, 1979) and the Platinum Medal of The Institute of Materials (1989).

Since his retirement in 1993 he has held an Honorary Research appointment at the University of Birmingham, a Visiting Professorship in the University of Hong Kong, and has acted as external academic adviser and assessor both in the UK and overseas.

The Acta Materialia, Inc. 2004 Gold Medal will be presented to Prof. Smallman at the IOM<sup>3</sup> Materials Congress 2004 (30 March to 1 April 2004) in London.