

## **Sir Alan Howard Cottrell ScD, FRS, FEng, LLD (Hon)**

(17 July 1919 – 15 February 2012)

With the death of Sir Alan we have lost a scientific 'Colossus' in the field of materials science and metallurgy.

Entering Birmingham University from Moseley Grammar School to read Metallurgy, Alan graduated in 1939 and obtained a PhD in 1942 for research in the field of steel welding, of significance in relation to tank armour. He was greatly influenced by the Head of Department, Professor David Hanson. Recognising Cottrell's outstanding scientific ability, Hanson took him onto his staff with the remit of developing modern science concepts in both the teaching and research in the Birmingham Department, aided by Raynor from Oxford where the atomic theory of metals was being developed by Hume Rothery. Cottrell had then to teach himself the level of advanced physics unknown to a conventional metallurgist, which was necessary for the task that he had been set. This enabled him in his own research to take dislocation theory forward, to make it more quantitative, and to explain, for example, the phenomenon of the yield point and strain ageing in steel. At the early age of 30 he was appointed Professor of Physical Metallurgy, always showing an ability to present difficult subjects in a new and understandable way. Recognising a rising star, he was made Deputy Head of the Metallurgy Division at the AERE Harwell Laboratory in 1955 where it was becoming clear that a structural atomistic approach was necessary to understand and predict the behaviour of materials in modern reactors.

In January 1958 he was approached by Lord Adrian, Vice Chancellor of Cambridge University, to take the Goldsmiths' Chair of Metallurgy, vacant following the retirement of G P Wesley Austin. He greatly welcomed the appointment to what was already a growing Department, with access to good students. By the end of 1958 he had made his assessment of the situation in the Department. Although very capable, the staff were few and were heavily overloaded as the requirements of the expanding subject increased. He determined to raise the profile of the Department, both in teaching and research by carefully selected appointments, who, in their turn were to flourish under his inspiration. Amongst them were A Kelly (metal physics and non-metallic materials) R B Nicholson (electron microscopy) and J A Charles (process metallurgy). Cottrell encouraged the introduction of real science into areas that had been before largely phenomenological. For example, he insisted on taking over the teaching of extraction metallurgy in the second year course based using physical chemistry concepts that had been first introduced at the Royal School of Mines by Dannatt and Ellingham. As well as increasing staff levels, Cottrell used his contacts from his association with AERE Harwell to obtain equipment grants from both the Atomic Energy Authority and the Central Electricity Generating Board and support from the Science Research Council. This enabled purchase of a top-flight electron microscope in 1959.

Apart from his general influence on staff, Cottrell set up two new research teams, one on field-ion microscopy (D Brandon, P Bowden, M J Southon and M Wald) and the other on the metallurgy of high-field superconducting alloys (D Dew Hughes, J E Evetts, and A Campbell). He did, of course, continue his own research, focusing on three main topics, the

theory of elastic-plastic deformation at crack tips, and the fracture of brittle materials, the former in collaboration with J F Knott and J Griffiths, and fibre strengthened composites with A Kelly, where the significant mechanical strength of single crystal whiskers could be utilised in a composite. Substantial research has followed in all of these fields.

In 1965 Cottrell left Cambridge to become Deputy Chief Scientific Adviser to the MOD, much to the disappointment of the Metallurgy Department staff. This was to be followed by roles as Chief Scientific Advisor to the MOD in 1967, Deputy Chief Scientific Adviser to HM Government in 1968 and Chief Scientific Advisor to HM Government, Cabinet Office, in 1971, all these posts in succession to Professor Sir Solly (later Lord) Zuckerman. It is clear from past conversations with Cottrell and some comments in Solly's autobiography and a subsequent biography, that although the two were not always in agreement and were very different characters, Zuckerman supported Cottrell as his successor. In hindsight the interruption of a scientific career at its highest point for Government service may have been a waste of his innovative brilliance, certainly judged by the extent and quality of work that he was able to do as a Distinguished Research Associate in the Metallurgy Department in later years after final retirement.

In 1974 he left the Cabinet Office to become Master of Jesus College, Cambridge, having been knighted in 1971. This included the Vice-Chancellorship of the University in 1977-79. Retiring from the post of Master in 1986 he returned to the Department, continuing to work on theoretical aspects of materials science, usually without collaboration, until over 90. His contribution to learning through books and papers, that have stood the test of time, was massive. In 1999 his beloved wife Jean died after a distressing illness where Alan supported her diligently and patiently. They had been a great team.

He was a great, kind man, and I shall very much miss our weekly meetings for coffee in the Department's Common Room.

Dr J A Charles FREng  
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### **The Cottrell Appeal Fund**

The Department of Materials Science & Metallurgy and the School of Physical Sciences of the University of Cambridge are in the process of formally establishing a professorship in memory of Sir Alan Cottrell. The Sir Alan Cottrell Professorship of Materials Science will be a lasting celebration of Sir Alan's supremely distinguished scientific contributions. Donations at this time, in additions to the sums already raised, will greatly assist the University in establishing this new chair.

## **Links**

The Cottrell Appeal Fund

<http://www.msm.cam.ac.uk/alumni/cottrell.php>

Oral history of British science: Alan Cottrell

[http://sounds.bl.uk/Oral-history/Eminent-scientists/021M-C1379X0046XX-0001V0#\\_](http://sounds.bl.uk/Oral-history/Eminent-scientists/021M-C1379X0046XX-0001V0#_)