

Open Day & Kelly Lecture Thursday 14th June 2001

10.30-11.15am	Tea & Coffee (Babbage Podium)
10.30-2.00pm	Poster Display (Babbage Podium)
10.30-11.30am	Registration (Babbage Podium)
11.30-12.30pm	Department Tours (leaving from Babbage Podium)
12.30-2.00pm	Free for lunch
2.00-3.30pm	The Gordon Seminars (Babbage Lecture Theatre)
3.30-4.00pm	Tea & Coffee (Babbage Podium)
4.00-5.00pm	The Gordon Seminars (Babbage Lecture Theatre)
5.00-5.30pm	Tea, Coffee & Biscuits (Babbage Podium)
5.30-6.30pm	The Kelly Lecture (Babbage Lecture Theatre)

The Gordon Seminars

2.00-2.30pm: Prof. Bill Bonfield

"Biomaterials and Tissue Engineering - Opportunities for Novel Composites"

Considerable progress has been made recently with custom-made biomaterials that mimic the biological template and combine favourable bioactivity in a skeletal site with mechanical compatibility (second generation biomaterials). Notable examples are synthetic hydroxyapatite, which resembles bone mineral, and hydroxyapatite reinforced polyethylene composite, which is a first approximation analogue of cortical bone. It has been demonstrated that such materials produce bone apposition at an implant surface, rather than the inevitable bone resorption produced by first generation biomaterials. As a consequence of providing favourable, and stable, sites for the recruitment of cells from the surrounding biological environment, the subsequent cellular processes lead to the expression of matrix new bone formation. Osteoconduction can be accelerated by precise control of surface chemistry, and specific ion substitution, the establishment of an interconnecting porosity and/or the incorporation of cells (tissue engineering) and biologics. These research developments are reviewed, and the prospects for refined tissue analogues are considered.

2.30-3.00pm: Prof. Derek Fray

"Electrodeoxidation - a new way of reducing metal oxides?"

Many metals, especially those in groups 4-6 of the periodic table, are prepared by the reduction of a compound of the metal by a more reactive element. Recently, a novel method has been developed where an oxide is made the cathode in a bath of molten calcium chloride. The favoured cathodic reaction is the ionisation of oxygen and not the deposition of calcium. The net result is that the oxygen ionises, dissolves in the salt, leaving pure metal behind. Examples of the reduction of titanium, zirconium, chromium niobium and other oxides will be given. If a mixture of oxides is made the cathode, the product is an alloy or an intermetallic compound. Overall, the method seems to offer the possibility of reducing the cost of production of many metals and their alloys.

3.00-3.30pm: Dr. Roger Reed

"The Development and Application of Process Models in the Rolls-Royce University Technology Centre "

Since the UTC was set up in the Department in 1994, a significant fraction of its work has been concerned with development of process models to describe the manufacturing processes, which are used to fabricate critical components for the gas turbine engine. A process model represents an attempt to relate the variables associated with a fabrication technique, to measurable outputs from the process by modelling the fields of interest. In this presentation, an overview will be given of the various activities which have been initiated. Work on welding, casting and forging operations will be described. I shall emphasise (i) the driving forces from industry which have provided the motivation and funding for the work (ii) details of the technical solutions which have been developed and (iii) the more fundamental work which has been completed and subsequently published in the learned journals. By doing this I hope to leave you with the impression that industry and academia are working closely together for mutual reward.

4.00-4.30pm: Dr. Kevin Knowles

"The Cambridge/TWI PTP Programme in Ceramics "

The Postgraduate Training Partnership (PTP) scheme between Cambridge University and TWI is now in its fifth year. The aims of the scheme are to stimulate innovation, to assist in the process of technology access through people movement between HEIs, RTOs and industry, to increase the industrial relevance of PhD training and to encourage commonality of purpose in the research effort of HEIs, RTOs and industry. In this talk, I will highlight the experience of three such projects in the area of joining of ceramic materials. I will conclude with an overview of the impact of the PTP scheme on research co-operation between TWI and Cambridge University and how this will continue to be fostered once the scheme comes to an end.

4.30-5.00pm: Prof. Alan Windle

"Adventures with Carbon Nanotubes"

An outline will be given of recent advances in the development, understanding and application of carbon nanotube structures.

The Kelly Lecture

5.30-6.30pm: Prof. Subra Suresh (R.P.Simmons Prof. & HoD, Mat.Sci. & Eng., MIT)

"Nano- and Micro-Scale Mechanical Properties for Miniature Technologies"

This presentation will provide a summary of our recent research into the effects of length scale, spanning the nanometer to macroscopic dimensions, on the mechanical properties of small-volume composite structures of interest in a variety of miniature technologies. Particular attention will be devoted to the effects of structural and geometrical length scales, confining environment, discrete deformation mechanisms, crystallographic texture as well as mechanical/non-mechanical coupling on the size-dependence of mechanical properties in small-volume composite structures and near-surface regions of materials. Different experimental, computational and analytical methods for characterizing the mechanical response at nano- and

micro-scales will also be examined along with some strategies for enhancing the resistance of surfaces to mechanical deformation and damage.