Institut Català d'Investigació Química

2011 Seminar Program

Av. Països Catalans, 16, Campus Sescelades (St. Pere i St. Pau), Tarragona. Tel. 977920200

"Electrocatalytic Cycling of Hydrogen and Carbon Dioxide: The importance of understanding how enzymes work so well"

Prof. Dr. Fraser Armstrong

University of Oxford (United Kingdom)

Friday 25th February, 2011. ICIQ Auditorium, 12 p.m.

Professional Career: Fraser Armstrong is a Professor of Chemistry at Oxford University and a Fellow of St John's College, Oxford. He obtained his PhD at the University of Leeds with Geoff Sykes then carried out postdoctoral research (1978-1983) with Peter Kroneck (Konstanz), Ralph Wilkins (New Mexico), Helmut Beinert (Madison) and Allen Hill (Oxford). In 1983 he was awarded a Royal Society University Research Fellowship which he held in Oxford until 1989 when he joined the Chemistry Faculty at the University of California, Irvine. He moved to his present position in 1993. His interests are in biological redox chemistry (in particular the properties of FeS centres in enzymes) and in the application and inspiration afforded by enzymes in many types of future energy technologies. He has developed new applications of dynamic electrochemical techniques for studies of complex electron transfer and catalytic reactions in proteins, and most recently he has focused on the mechanisms and exploitation of biological hydrogen and oxygen cycling. These efforts are directed to applications in niche fuel cells and hydrogen production. He is also co-author of a leading international textbook for Inorganic Chemistry - 'Shriver & Atkins' and has recently organized two conferences on future energy on at Oxford (Energy...beyond Oil), the other at the Royal Society in London (Energy for the Future).

Research: Biological chemistry; and in particular, understanding the nature and mechanism of complex biological electron-transfer reactions. The development and application of a concept and suite of electrochemical methods called 'Protein Film Electrochemistry' to study active sites in proteins; labile and vacillatory Fe-S clusters; chemical coupling and gating of electron transfer; proton transfer; mechanisms and regulation of catalytic electron transport in multi-centred metalloenzymes; studies and exploitation of electrocatalysis by hydrogenases. Recent efforts have focused on the role of enzymes in future energy technologies, either directly or through the inspiration they provide for catalyst performance. Established examples include enzyme active sites as real and inspirational electrocatalysts in fuel cells, the mechanistic basis of microbial energy capture from trace H_2, hydrogen production and molecular basis for hydrogen farms, tackling the challenges for achieving efficient H_2 production by microorganisms. A new program of research – understanding enzymes as optimal catalysts attached to conducting and photoactive nanoparticles – is now being established in the Armstrong group. This includes research collaboration with Dr Ragsdale, on CO_2 activation.