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Foreword to the 39th International Conference on Coordination Chemistry Bioinorganic Research Front

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This Research Front features papers selected from the 39th International Conference on Coordination Chemistry held in Adelaide (24–30 July 2010). This meeting, the premier inorganic coordination chemistry conference worldwide, had not been held in Australia since 1989. In 2010 it coincided with the RACI Inorganic Chemistry Divisional (IC'10) conference. This international meeting featured excellent contributions across the various themes of the conference including materials chemistry, metals in synthesis, solar energy conversion, metals in catalysis, supramolecular chemistry, and metals in biological systems.

It is from this last theme that papers have been chosen for this Research Front, and these span a wide range of topics within the 'bioinorganic' area. Inorganic chemistry taken literally in its original meaning from the days of 'Vital Force Theory', excludes the chemistry of life. Nearly 200 years after Friedrich Wöhler rescued inorganic chemistry from biological irrelevance the roles of metals in biological systems are now, more than ever, the focus of intense research in biological chemistry.

Within this Research Front we have two reviews. One a personal perspective by David Parker[1] (Durham) on the development of fluorescent complexes for bio-imaging. The long fluorescent lifetimes of lanthanoid excited states enable time resolution to be used in fluorescence imaging with essentially zero background interference from any other fluorescent molecules in the sample. A second review is from Zhiguang Xiao and Tony Wedd (Melbourne)[2] on the topic of metallo-oxidases, a fascinating family of enzymes that catalyze the oxidation of important low valent metals such as Cu(I), Fe(II), and Mn(II) by molecular oxygen. These reactions are critical to maintaining balanced levels of redox active metals within cells and to their transport and uptake by other metalloproteins.

The full papers in this Research Front are equally comprehensive in their coverage of contemporary biological inorganic chemistry. The emergence of organometallic complexes in medicinal chemistry has challenged traditional views on metal-based drugs and their interactions with biomolecules (see also the Research Front published in *Aust. J. Chem.* 2010, *63*, issue 11). In this vein, a paper by Gilles Gasser (Zürich), Nils Metzler-Nolte (Bochum), and coworkers[3] report new peptide nucleic acid containing ligands and their Re and ^{99m}Tc carbonyl complexes, the latter being of great interest in radio-imaging. The stability of these complexes and ease of formation is investigated and discussed. Water solubility can be challenge in developing ligands and complexes that exhibit suitable pharmacological properties. Paul Donnelly (Melbourne) and coworkers[4] have developed new water soluble bis-thiosemicarbazone ligands that strongly bind ^{64}Cu, a suitable isotope for positron emission tomography diagnostic imaging. The effects on cellular uptake and the redox properties of their Cu(II) complexes are discussed. The use of synchrotron radiation as a tool for imaging metals within cells is covered in two different papers using distinct techniques. Trevor Hambley (Sydney) and coworkers,[5] using X-ray absorption near-edge spectroscopy, have developed a way of extracting information about the relative proportions of Pt(II) and Pt(IV) within cells. Pt(II) complexes comprise the most thoroughly investigated metal-based anticancer drugs to date but their side effects, linked to reactions with other biomolecules, have led to new approaches including the use of more chemically inert Pt(IV) analogues. The present paper shows how the relative proportions of the Pt(II) and Pt(IV) forms of some complexes change over time within cells. Lou Rendina (Sydney), Hugh Harris (Adelaide), and colleagues[6] have used synchrotron X-ray fluorescence (XRF) spectroscopy to identify the cellular location of a DNA-intercalating Pt-terpyridyl complex bearing a carborane thiolate ligand; a potential target in boron neutron capture therapy. Rather than localising within the nucleus, the bifunctional complex is found to be distributed throughout the cell both within and outside the nucleus. Addition of the Pt complex also has significant effects on the concentrations of other elements within the cell (also measured with XRF) with an increase in Cl, K, and Cu being found while Fe levels decreased. The purple acid phosphatase (PAP) family are an interesting group of enzymes that require two metal ions in proximity, one in a trivalent and the other in a divalent oxidation state for activity. Lawrie Gahan and coworkers[7] report a new binucleating ligand and its Fe(III)/Zn(II) complex that mimics the PAP active site found in the plant enzyme in structure and in function. This ligand also bears an olefinic substituent for future copolymerization of the complex.

Only a relatively small selection of the work presented at ICCC39 was able to be included in this Research Front but the quality of these contributions, and the contributors, herein is representative of the meeting. I was fortunate to be a PhD student in 1989 when ICCC last came to Australia. It was a long wait of 21 years to see the conference return to Australia and then from a different perspective as one of the organizing committee. If this pattern is to be repeated I will have retired

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before the conference is once again held in this country! All associated with the meeting are pleased that the 39th ICCC at Adelaide was a great success.

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