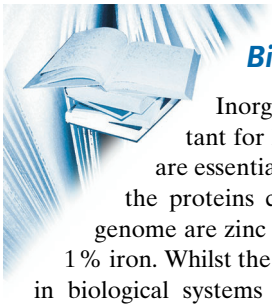

Inorganic Chemical Biology

Inorganic chemistry is important for life. At least 20 elements are essential for man. About 10% of the proteins coded for by the human genome are zinc proteins, 1% copper and 1% iron. Whilst the speciation of C, N, and P in biological systems is well understood, the same is not true for many other elements, mainly because it is difficult to study. The 12 chapters of this multi-authored book provide a readable and well-illustrated account of some aspects of the state of the field, whilst highlighting advances that are still needed.

Importantly inorganic chemistry is also useful for investigating the organic components of biology. For example, immobilized metal ion affinity chromatography (IMAC) can not only be used for purification of recombinant proteins, but also for low-molecular weight compounds which have an affinity for the immobilized metal ions (e.g. Ni^{II}). There are also chapters on metal-specific analytical methods (atomic absorption spectroscopy, X-ray fluorescence spectroscopy, mass spectrometry, including inductively coupled plasma–MS, laser ablation–MS, and MALDI imaging), as well as metal complexes as tools for structural biology—phasing in X-ray crystallography, paramagnetic NMR, EPR spin labels, and FRET.

Complexes of the d^6 metal ions Re^{I}, Ru^{II}, and Ir^{III}, as well as some lanthanide ions are readily detectable by their luminescence in cells by confocal laser scanning microscopy, fluorescence lifetime imaging microscopy and flow cytometry (including two-photon absorption and upconversion of near infrared into visible light), and metal carbonyl complexes can be imaged with infrared and Raman microscopy. CARS and SRS microscopy based on light scattering are promising for resolution of organelles and membranes.

Photochemical and photophysical studies feature prominently in this book. There is an informative chapter explaining why some Ru^{II} complexes are more successful as optical probes for DNA in vitro and in cells. Both metal ions, e.g. Ca^{2+}, Zn^{2+}, and signalling molecules such as NO and CO, can readily be photoreleased. The application of As^{III} compounds conjugated to fluorophores (or radiolabels) which target dithiol centers for visualizing proteins and cells is described. Chapter 11 on enzymes inhibitors and catalysts in living cells raises intriguing possibilities for the design of novel drugs.

Overall this is an excellent book for researchers seeking to do cutting-edge bioinorganic research, for assessing the state of the field in selected areas.

This is a field of many challenges where we can expect major advances in the years to come. The current atmosphere is captured on page 90: understanding the biology of inorganic substances needs "novel methodology, creative approaches, and development of even more sophisticated instrumentation." Inorganic chemical biology is definitely an exciting field to get into.

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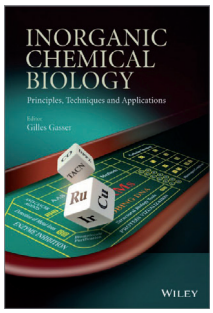

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