Electrochemical biosensing, special issue ChemElectroChem

The ability to measure biological molecules in complex biological matrices in a simple, rapid and reliable manner enables biosensors to bring many benefits to society. Foremost amongst the successful examples of biosensors is the determination of blood glucose concentration for the management of diabetes. From the first integration of the enzymatic reactions of glucose oxidase with oxygen electrodes by Leland Clarke to mediated bioelectrochemistry and the wireless biosensing devices nowadays available, the impact on the healthcare and its management is well documented. Despite the success of this area, continuing research on basic and applied biosensing continues apace as researchers identify solutions to on-going challenges and explore new applications. Electrochemical biosensors are complex systems. As defined by the International Union of Pure and Applied Chemistry, an electrochemical biosensor is *"a self-contained integrated device, which is capable of providing specific quantitative or semi-quantitative analytical information using a biological recognition element (biochemical receptor) which is retained in direct spatial contact with an electrochemical transduction element."*[1]

The biological recognition elements may be enzymes, antibodies, nucleic acids, organelles, cells, or even tissues. Nowadays, semi-synthetic materials such as aptamers and synthetic recognition species such as molecularly imprinted materials are increasingly used to overcome problems with natural materials. The smart combination of appropriate selective biorecognition processes with the sensitivity of electrochemical transducers enables sensitive and selective detection of a variety of target species. While the transducer technology and signal processing have significantly matured in recent decades, reliable and versatile biorecognition interfaces remain a major research topic, for both in vivo and ex vivo applications. Accordingly, electrochemical biosensing encompasses a broad scope of research activity aimed at overcoming these challenges in biosensor technology.

The advancement of electrochemical biosensing via exploration of novel biorecognition materials, target analytes and matrices, transduction strategies and application areas demands an interdisciplinary approach involving researchers from various science and engineering disciplines. Notable application areas that occupy the minds of the global biosensing community include healthcare, wearable technologies, life sciences, agriculture, environment, safety and security.

This Special Issue of ChemElectroChem devoted to electrochemical biosensing aims to give a flavour of on-going research in this area, ranging from discovery and characterisation of bioelectrochemical reactions through to applications of novel devices which transition these concepts from a laboratory environment into real world scenarios. We hope that readers of these articles will be enthused to delve deeper into electrochemical biosensing research.

[1] D.R. Thévenot, K. Toth, R.A. Durst, G.S. Wilson, Pure Appl. Chem., 1999, 71, 2333-2348.