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Editorial

This special issue on biosensors and protein electrochemistry is dedicated to Professor Frieder W. Scheller on occasion of his 80th birthday in August 2022.

Frieder Scheller's contributions to the field of bioelectrochemistry and bioanalysis, which covers the areas of protein electrochemistry, biosensors, molecular technology, and biomimetics have been influential for countless ongoing research activities. With the present collection of original articles we present a selection of current research related to Frieder's fields of expertise spanning from the early work on bioelectrochemistry of P450 enzymes, biosensors with different recognition elements and schemes for transducer coupling and their application to his more recent activities on biomimetic biosensors for protein recognition.

As a pioneer of protein electrochemistry Frieder Scheller realised and described as one of the first the direct electrical communication between enzymes and electrodes. In his early work he found out that even complicated oxidoreductases such as cytochrome P450 can communicate with electrodes. These fundamental investigations led not only to a deeper understanding of the mechanism of such enzymes, but are also the basis of reagentless biosensors and bioelectrosynthesis using peroxidases, cytochromes P450 and peroxygenases. Today, these developments are used to measure small signal molecules, to create arrays for personalized medicine and direct electron transfer based biofuel cell devices.

While continuing his researches on protein electrochemistry, he was among the first scientists in Germany investigating enzyme electrodes. Already back in the late seventies he and his team developed enzyme electrodes for various metabolites and enzyme inhibitors. In 1982 Frieder's group developed the first commercial enzyme-electrode based glucose analyser in Europe. He founded the companies BioSensor Technology GmbH, EKF diagnostics Magdeburg and FILT Berlin. His developments are the basis of several generations of bioanalyzers which were distributed on the world-wide market.

To overcome limitations in biosensor performance Frieder and his group proposed a combination of enzymes in various coupling schemes. Among the research highlights are also simulated logic operations (amplifier and switches) in enzyme sensors by means of coupled enzymatic reactions. These investigations made it possible to greatly enhance sensor sensitivity, for example to detect nanomolar concentrations of neurotransmitters and phenols. The technique could be advanced towards ultrasensitive immunoassays by the additional amplification step of the label signal.

Since the late 1990s Frieder's group became very much interested in

novel recognition elements with successful research achievements in the analytical applications of nucleic acid -based aptamers and the development of a new generation of molecularly imprinted polymers (MIPs) by integration of enzymes and enzyme models in the signal generation.

In recent years Frieder W. Scheller established novel ways of electrochemical protein imprinting as a tool to develop biomimetic sensors for biomarkers such as proteins and enzymes that have great potential as novel separation and recognition materials. In his 80s year of life he is still active, curious to understand and eager to advance biomolecular sensing techniques what can be read in his most recently published work on new generation of epitope-imprinted polymer-based microarrays for protein recognition. Several monographs, textbooks and many book chapters, review articles, numerous patents and more than 500 research publications illustrate his outstanding research activities.

Born in Dresden (Germany) in August 1942, Frieder Wolfram Scheller studied chemistry at the Merseburg College of Technology and received his PhD in the field of electrochemistry from the Humboldt University in Berlin in 1969. He then joined the Department of Enzymology of the Central Institute of Molecular Biology of the Academy of Sciences of the GDR in Berlin-Buch, where he established protein electrochemistry, a rather niche research area at that time. Shortly later Frieder created his own Department of Bioelectrochemistry/Biosensors which he headed for many years. Since 1993 he was appointed Professor and he has held the Chair of Analytical Biochemistry of the University of Potsdam until his retirement. In 2001 and 2002 he was Vice-President of the German Society of Biochemistry and Molecular Biology. He was Vice-President of the University of Potsdam from 2004 to 2007. Since his retirement he is honorary Professor at the University of Potsdam. Without any administrative duties he can now fully enjoy the freedom of research.

During Frieder's professional career, which has spanned more than 50 years, he has educated scores of aspiring biochemists and chemists and collaborated with colleagues from all over the globe, making him one of the major figures in biosensor research.

A friendly atmosphere among the people in his group, honesty and integrity have always been major concerns of Frieder as a boss. Those who have worked with him will not forget the enthusiasm inspiring his team. We are proud to have had the chance to work with him and thank him for sharing his knowledge, trust, support and friendship.

Happy birthday, Frieder,

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