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EDITORIAL

Chemical Sensors, Biosensors, and Bioarrays

One of the catchier titles in the program of the 1991 Pittsburgh Conference was: *'Biosensors: Philosopher's Stone or Fool's Gold?'* Under this title, statistical data and forecasts regarding the market of chemical sensors and biosensors were presented. Looking through the annual reports of the Centre Suisse d'Electronique et de Microtechnique (CSEM), of the Institut de Microtechnique (IMT), Neuchâtel, and of the *Paul Scherrer* Institut (PSI), Villigen, and of many of the university institutes involved in analytical chemistry, one has the impression that real 'gold', and not fool's gold, is supposed to be associated with the sensor market in future. Various forecasts agree that market shares will rise explosively after the 'cleaning' processes from 1988 to 1994 arising from unsuccessful developments.

The development of chemical sensors is partly driven by the need for dedicated analytical devices which can be easily operated even in a space laboratory. The sensors have to be suitable for on-site analysis, for screening and continuous monitoring, and thus, for running chemical analyses with improved efficacy. The design of such a device typically combines a chemical recognition process and a physical transducer element in one probe which is selective for a typical analyte or a chemical class of analytes. This probe is in contact with the specimen on one side, and a data processor on the other side.

Biosensors are frequently used in dedicated analytical systems even if the host-guest interaction is not truly reversible. They are attractive due to their natural selectivity. Biosensors can be described as a class of chemical sensors which make use of biochemical host compounds, such as antibodies and antibody fragments, oligonucleotides, peptides, and of biochemical processes involving enzymes. In the production of biological or biochemical array sensors, or *bioarrays*, a multiplexing and miniaturization step is involved. This means that bioarray projects are more likely to be developed and run in an industrial, than in an academic environment. Bioarrays are very useful in tracing ligand-receptor interactions in the widest sense. They can perform complex multiple assays as well as high-throughput biochemical assays in general.

Amperometric oxygen sensors and pH electrodes represent the interface between chemical and physical sensors. It is an open question whether such sensors can be classified as chemical sensors, but this did not prevent papers about them from being accepted. The objective of this special issue is rather to provide a representative survey of research and development in the field of chemical sensors, biosensors and bioarrays. The articles in this special issue show how complex the development of sensors and bioarrays tends to be and how time-consuming the process of transferring research to the market usually is. Successful development and marketing depend on trans-disciplinary collaboration, which means, that there has to be a critical mass of innovative and well-educated scientists with complementary qualifications which are prepared to learn the language and the terminology of each other's disciplines.

The development of electronic devices and *advanced chemical materials* has allowed sensor technology to be improved continuously over the last decade. There are, therefore, reasons for being optimistic about the sensor market in the third millenium.

Unfortunately, it is never possible to receive papers from all the representative research groups addressed to be included in this volume. Some are, however, included in the special issue of CHIMIA on 'Analytical Science in Switzerland' (*Chimia* **1997**, *51*, 10). So this volume can be considered complementary to the latter one.

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