

Series Preface

In my career I've found that "thinking outside the box" works better if I know what's "inside the box."

Dave Grusin, composer and jazz musician

Different people think in different time frames: scientists think in decades, engineers think in years, and investors think in quarters.

Stan Williams, Director of Quantum Science Research,
Hewlett Packard Laboratories

Everything can be made smaller, never mind physics;
Everything can be made more efficient, never mind thermodynamics;
Everything will be more expensive, never mind common sense.

Tomas Hirschfeld, pioneer of industrial spectroscopy

Integrated Analytical Systems

Series Editor: Dr. Radislav A. Potyrailo, GE Global Research, Niskayuna, NY

The book series *Integrated Analytical Systems* offers the most recent advances in all key aspects of development and application of modern instrumentation for chemical and biological analysis. The key development aspects include: (i) innovations in sample introduction through micro- and nanofluidic designs, (ii) new types and methods of fabrication of physical transducers and ion detectors, (iii) materials for sensors that became available due to the breakthroughs in biology, combinatorial materials science, and nanotechnology, and (iv) innovative data processing and mining methodologies that provide dramatically reduced rates of false alarms.

A multidisciplinary effort is required to design and build instruments with previously unavailable capabilities for demanding new applications. Instruments with more sensitivity are required today to analyze ultratrace levels of environmental pollutants, pathogens in water, and low vapor pressure energetic materials in air. Sensor systems with faster response times are desired to monitor transient in vivo events and bedside patients. More selective instruments are sought to analyze specific proteins in vitro and analyze ambient urban or battlefield air.

For these and many other applications, new analytical instrumentation is urgently needed. This book series is intended to be a primary source of both fundamental and practical information on where analytical instrumentation technologies are now and where they are headed in the future.

Looking back over peer-reviewed technical articles from several decades ago, one notices that the overwhelming majority of publications on chemical analysis has been related to chemical and biological sensors and has originated from departments of chemistry in universities and divisions of life sciences of governmental laboratories. Since then, the number of disciplines has dramatically increased because of the ever-expanding needs for miniaturization (e.g., for *in vivo* cell analysis, embedding into soldier uniforms), lower power consumption (e.g., harvested power), and the ability to operate in complex environments (e.g., whole blood, industrial water or battlefield air) for more selective, sensitive, and rapid determination of chemical and biological species. Compact analytical systems that have a sensor as one of the system components are becoming more important than individual sensors. Thus, in addition to traditional sensor approaches, a variety of new themes has been introduced to achieve an attractive goal of analyzing chemical and biological species on the micro- and nanoscale.

Microarrays

Preparation, Microfluidics, Detection Methods, and
Biological Applications

Dill, K.; Liu, R.; Grodzinsky, P. (Eds.)

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