Preface

In a time when sequencing the human genome has just recently been completed, when Nobel prizes are awarded to inventors of bioanalytical instrumentation and when the reading of journals such as *Science* or *Nature* has become ever more difficult to the chemist due to the flood of molecular biology terminology appearing in these groundbreaking publications . . . At exactly this time, it seems imperative to provide a small introductory textbook covering the most frequently used instrumental methods of analytical chemistry in molecular biology. The increasingly interdisciplinary nature of modern research makes it essential for researchers of different backgrounds to have at least a minimal understanding of neighbouring sciences if they are to communicate effectively.

For many years, Professor Manz has presented a "bioanalytical chemistry" course at Imperial College, whilst being acutely aware of the lack of a suitable textbook for this subject. Of course, each individual subunit could be found in yet another biochemistry, mass spectrometry, separations or analytical chemistry textbook. However, considering the importance of biomolecules in recent academic and industrial research, it is somewhat surprising that this is not yet reflected in current analytical chemistry textbooks. In the light of these facts, it seems appropriate for us to write a new book concerning the various aspects of biomolecular analysis.

This book is aimed primarily at chemistry students, but is also intended to be a useful reference for students, lecturers and industrial researchers in biological and medicinal sciences who are interested in bioanalysis techniques. It is assumed that the basic principles and instrumental techniques of analytical chemistry are already common knowledge. An important objective of this book is to give an appreciation of how analytical methods are influenced by the properties that are peculiar to biomolecules. The priorities that govern the choice of instrumental techniques for the analysis of molecules such as DNA and proteins are radically different to those applicable to classical analytical chemistry (see Summary of Chapter 1). Whereas samples containing small molecules can be characterised by gas or liquid chromatography, when it comes to DNA sequencing or proteomic analysis, there is a sudden need for sheer separation power. Hence, students must have as clear an understanding of isoelectric focussing or 2D slab gel separation as they would of conventional chromatography. Other methods described in this book may be completely new to the chemist. For example, the polymerase chain reaction

used for DNA amplification or the Sanger reaction for DNA sequencing, where low yield chemical reactions are performed to generate hundreds of products.

In the first chapter of this book, a general introduction to biomolecules is given. This is followed by several chapters describing various instrumental techniques and bioanalytical methods. These include: electrophoresis, isoelectric focussing, MALDI-TOF, ESI-MS, immunoassays, biosensors, DNA arrays, PCR, DNA and protein sequencing. Instead of being a comprehensive reference or textbook, it is intended that this book should provide introductory reading, perhaps alongside a taught course. A list of references is given at the end of each chapter, should further information be required on any particular subject.

Hopefully, this book will be well received by both teachers and students, particularly in a time when techniques of bioanalysis should be familiar to every chemistry graduate.

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Andreas Manz, Nicole Pamme, Dimitri Iossifidis
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