Read & Win: Bioanalytics

Analytical Methods and Concepts in Biochemistry and Molecular Biology

The molecular life sciences have undergone an unprecedented development in the past 10 to 15 years that has revolutionized our understanding of biological relationships. The speed of this development is closely correlated with the development of novel separation and analysis methods. Two-dimensional gel electrophoresis, DNA sequencing, and the polymerase chain reaction are but a few examples of novel methods that have made significant advances in science possible. It is fair to say that analytical methods have become the essential enabling tools for modern bioscience. This book presents a comprehensive introduction into current bioanalytical methods, including their physical and chemical principles, as well as an unbiased discussion of their strengths and weaknesses. It covers all major techniques for the determination and experimental analysis of biological macromolecules, including proteins, carbohydrates, lipids and nucleic acids. By virtue of the systematic overview presented here, the reader will be able to select the most appropriate method for any given bioanalytical challenge. The depth of the analysis and the comprehensive nature of the coverage mean that there will be a great deal of valuable information even for experienced experimentalists.

Interview with the authors:

G.I.T.: What is your main focus in research, what is your main scientific interest?

F. Lottspeich: Focus of my research was methods development and application of protein chemistry and proteomics with an intimate love for mass spectrometry
J. W. Engels: Modified nucleic acids, their synthesis, sequence analysis, some structural analysis by nmr and epr as well as therapeutic oligonucleotides for antisense, ribozyme, and siRNA applications against e.g. HIV and HCV. Having taught “Chemical Biology” for 30 years, the interface between chemistry and biology has - and still does - fascinate me.

G.I.T.: What is the structure of the book?

F. Lottspeich / J. W. Engels: Starting from a biological sample, we present the analytic repertoire to determine peptides, proteins, nucleic acids, be it DNA or RNA, carbohydrates, lipids qualitatively and qualitatively including structure methods.

Combining the full analytical repertoire we introduce functional analysis in order to derive at understanding biological systems.

G.I.T.: What is the target audience for the book?

F. Lottspeich / J. W. Engels:

- Everybody dealing with biomacromolecules like DNA/RNA Proteins, carbohydrates and lipids
- biochemists, (molecular)biologists, chemists - for this group, the book is interesting because it describes methods and basics from its own field of work
- pharmacists, food chemists, physicians and biophysicists – For this group, the book will be relevant because it will provide the background and foundation for a wealth of knowledge in their own disciplines.
- the book is intended for any interested reader who is willing to explore more closely modern tools to elucidate complex biological issues.
G.I.T.: Which field has, in your opinion, made the most progress in the last few years?

F. Lottspeich / J. W. Engels: MS, EM, DNA sequencing/ CRISPR/ cas and especially integrating bioinformatic tools in bioanalytics (e.g. the omics world).

G.I.T.: Does computer-based prediction of 3D structures of proteins play an important role?

F. Lottspeich / J. W. Engels: Homology based *in-silico* prediction as well as *ab-initio* predictions have been quite successful in several as cases with e.g. the Rosetta program. Considering the fact that posttranslational modifications are structurally relevant and not fully understood for many proteins there is still a lack for basic data.

G.I.T.: How important are Laboratory Information Management Systems (LIMS) in Bioanalysis?

F. Lottspeich / J. W. Engels: Extremely important. Since legal requirements, data amounts, and efficiency optimization increases continuously at an ever higher speed.

G.I.T.: Do you think that proteome analysis will be as common place as “normal” bloodwork some time soon?

F. Lottspeich / J. W. Engels: Not soon, since the complexity is enormous and equipment remains prohibitively expensive.

G.I.T.: What was the reason to write the book?

F. Lottspeich / J. W. Engels: Bioanalytics is unique in scope and approach. It supplies you with an overview on analytical methods in modern biosciences. We present a thorough introduction into the physical and chemical background, and discuss the strengths, and weaknesses of each analytical method. It covers all major techniques for the structure determination and experimental analysis of biological macromolecules, including proteins, carbohydrates, lipids, and nucleic acids. Unique concept of a comprehensive method book, which places special emphasis on the positioning of the individual methods in bioanalytics. Only the knowledge of field of application, advantages, and especially limitations of analytical methods allows a meaningful selection and the successful implementation for solving your complex biological questions.
G.I.T.: What knowledge is prerequisite for the book?

**F. Lottspeich / J. W. Engels**: Basic knowledge of physics, chemistry and biology. The treated substance presupposes that the user has at least heard a basic lecture in biochemistry or molecular genetics or that he has already dealt with it more intensively. In our imagination, it would be ideal if the book were used as an accompaniment to such a lecture. It should certainly be consulted during the experimental activity (internship, diploma or doctoral thesis or daily work in the laboratory).

**Friedrich Lottspeich/Joachim W. Engels (Eds.)**

**Bioanalytics**

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studied chemistry in Vienna and received his PhD in biochemistry at the Max-Planck Institute in Munich. After habilitation in Munich and Innsbruck, he was head of the protein analytics group at the Max-Planck Institute in Munich until his retirement in 2013. His focus of research was methods development and application of protein chemistry and proteomics. Friedrich Lottspeich is author of more than 750 original publications. He received several international prizes like ASAC Pregl Medal 2009, DGMS Award Mass spectrometry in Life Sciences 2012, EUPA Juan Pablo Albar Proteomics Pioneer Award 2016.

**Joachim W. Engels**

studied chemistry in Berlin and Munich and received his PhD in Regensburg. After post-doctoral studies at Stanford University he did his habilitation in Konstanz. As a visiting scientist at the University of Colorado he joined Hoechst, where he developed gene synthesis. Since 1985 he was appointed full Professor of Chemistry at Goethe-University Frankfurt. His interests range from chemical biology to bioanalytics. He has authored more than 300 original publications. On retirement, he was chosen Professor Emeritus and acts now as President of the Goethe-Wissenschaftliche Gesellschaft (Academy).