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Proceedings of the Meeting on Theory and Application of Ion Selective Electrodes in Physiology and Medicine, held at Dortmund on July 28-30, 1980

Every cell of the body is dependent on calcium to function. Calcium is found in teeth and bones, and calcium signalling is necessary for the movement of muscles and for the action of the heart and the intestines as well as blood coagulation. Calcium in Living Cells will update classic techniques in detecting microscopic levels of calcium ions (Ca2+) in living cells, as well as address new techniques in the field of calcium detection and calcium signaling. Such detection and measurement of intracellular calcium is important to researchers studying the heart, musculoskeletal, gastrointestinal, and immune systems, whose findings will aid in the advancement of drug and genomic therapies to treat heart, gastrointestinal, autoimmune, and infectious diseases. Gives researchers much needed information on how to study calcium in live cells, which is becoming increasingly important in heart, musculoskeletal, and immune system research Provides an overview of the latest methods--fluorescence resonance energy transfer (FRET), for example-- that are new to the field Allows understanding of how calcium plays a role in intracellular function at the cellular level, which has proved important in Alzheimer's research, heart disease, and areas of musculoskeletal research Updated chapters reflect advancements in the classic techniques used'preparing calcium buffers, vibrating the Ca2+ Electrode and confocal imaging

Electrochemistry plays a key role in a broad range of research and applied areas including the exploration of new inorganic and organic compounds, biochemical and biological systems, corrosion, energy applications involving fuel cells and solar cells, and nanoscale investigations. The Handbook of Electrochemistry serves as a source of electrochemical information, providing details of experimental considerations, representative calculations, and illustrations of the possibilities available in electrochemical experimentation. The book is divided into five parts: Fundamentals, Laboratory Practical, Techniques, Applications, and Data. The first section covers the fundamentals of electrochemistry which are essential for everyone working in the field, presenting an overview of electrochemical conventions, terminology, fundamental equations, and electrochemical cells, experiments, literature, textbooks, and specialized books. Part 2 focuses on the different laboratory aspects of electrochemistry which is followed by a review of the various electrochemical techniques ranging from classical experiments to scanning electrochemical microscopy, electrogenerated chemiluminesence and spectroelectrochemistry. Applications of electrochemistry include electrode kinetic determinations, unique aspects of metal deposition, and electrochemistry in small places and at novel interfaces and these are detailed in Part 4. The remaining three chapters provide useful electrochemical data and information involving electrode potentials, diffusion coefficients, and methods used in measuring liquid junction potentials. * serves as a source of electrochemical information * includes useful electrochemical data and information involving electrode potentials, diffusion coefficients, and methods used in measuring liquid junction potentials * reviews electrochemical techniques (incl. scanning electrochemical microscopy, electrogenerated chemiluminesence and spectroelectrochemistry)

This volume presents recent developments and the state-of-the-art of ion-selective electrodes, taken from discussions and papers presented at the 5th Symposium, held at Matrafured in Hungary. Contains 44 papers.

Covering the huge developments in sensor technology and electronic sensing devices that have occurred in the last 10 years, this book uses an open learning format to encourage reader understanding of the subject. An invaluable distance learning book Applications orientated providing invaluable aid for anyone wishing to use chemical and biosensors Key features and subjects covered include the following: Sensors based on both electrochemical and photometric transducers Mass-sensitive sensors Thermal-sensitive sensors Performance factors for sensors Examples of applications Detailed case studies of five selected sensors 30 discussion questions with worked examples and 80 self-assessment questions 140 explanatory diagrams An extensive bibliography

Composite materials are formed when the combination of separate materials acquire new properties distinct from its components. They have a range of applications in fields such as mechanical and electrical engineering, food science and biomedicine and represent a fast-growing area of research. Composite Materials: Applications in Engineering, Biomedicine and Food Science provides an overview of current technologies and applications related to composite materials in these fields. Organized by discipline, the text encompasses a wide variety of composite materials, including polymer, ceramic, biomaterial, hydroxyapatite, nanofiber and green composites. Early chapters detail the enhanced mechanical, magnetic, dielectric properties of electrical and thermal conductive composite materials, which are essential in daily science. Subsequent chapters focus on filler or reinforcement materials, including carbon materials, hybrid materials and nanomaterials. Particular emphasis is placed on nanocomposite materials, as these have increasingly diverse field applications. Various manufacturing methods, such as the synthesis method and top--down/bottom-up manufacturing, are also discussed. Coverage of the recent progress, challenges and opportunities surrounding composite materials make this text a one-stop reference for engineers, scientists and researchers working in this exciting field.

The Encyclopedia of Electrochemical Power Sources is a truly interdisciplinary reference for those working with batteries, fuel cells, electrolyzers, supercapacitors, and photo-electrochemical cells. With a focus on the environmental and economic impact of electrochemical power sources, this five-volume work consolidates coverage of the field and serves as an entry point to the literature for professionals and students alike. Covers the main types of power sources, including their operating principles, systems, materials, and applications Serves as a primary source of information for electrochemists, materials scientists, energy technologists, and engineers Incorporates nearly 350 articles, with timely coverage of such topics as environmental and sustainability considerations

Solid Electrolytes: General Principles, Characterization, Materials, Applications presents specific theories and experimental methods in the field of superionic conductors. It discusses that high ionic conductivity in solids requires specific structural and energetic conditions. It addresses the problems involved in the study and use of solid electrolytes. Some of the topics covered in the book are the introduction to the theory of solid electrolytes; macroscopic evidence for liquid nature; structural models; kinetic models; crystal structures and fast ionic conduction; interstitial motion in body-centered cubic structures; and materials with the fluorite and antifluorite structures. The diffraction studies of superionic conductors are covered. The significance of defects and disorder to ionic conductivity are discussed. The text describes the transport mechanisms and lattice defects. A study of the diffusion and ionic conductivity equations is presented. A chapter is devoted to the quasi-elastic neutron scattering. Another section focuses on the complex conductivity in the microwave range. The book can provide useful information to scientists, physicists, students, and researchers.

The first section introduces the electrochemical nomenclature necessary for under standing the literature on ion-selective electrodes and discusses the general principles behind all electrodes. The second section is concerned with the problems which arise in any accurate elec trode potential measurement in practice. Here the most important reference electrodes are discussed with special reference to their use in conjunction with ion-selective elec trodes. From experience, almost 75% of all problems which arise when working with ion-selective electrodes are on account of the reference electrode. After the reader is aquainted with the basic problems involved, the third section deals with individual ion-selective electrodes; their properties, handling and methods of pre paration. Here the discussion of these electrodes is not arranged according to the spe cies detected, but rather according to the kind of construction, since from this view point characteristic properties are much the same and handling procedures need only be described once for an entire series of similar electrodes. The fourth section discusses amplifiers. Here the problems of high-ohmic EMF meas urements such as noise level, insulation, static charging and ground loops are discussed. The fifth section is devoted to the various evaluation methods. Here a few schemes and examples are provided to indicate optimum practical procedures and the accura cies attainable with the various methods are discussed. The last section describes special set-ups such as clinical flow-thru cells, microelec trodes for measuring intracellular ionic activities, industrial on-line techniques and continuous environmental protection monitors.

Analytical Chemistry–3 provides information pertinent to the development of analytical chemistry. This book discusses the significant role of analytical chemistry in the progress of the chemical industry. Organized into nine chapters, this book begins with an overview of the contribution of analytical chemistry in the development as well as in process control of the industrial chemistry. This text then presents a brief history concerning the development of analytical chemistry in Romania. Other chapters consider the general problem of utilizing gradients in chromatography. This book discusses as well the developments in the determination of some common anions and describes the separation of anions of the same species. The final chapter deals with the classification of enrichment methods according to the type of sample for which they are to be used. This book is a valuable resource for chemists, analytical chemists, and pharmaceutical chemists. Teachers, scientists, researchers, and specialists in Romanian school of chemistry will also find this book useful.

Ion-selective electrodes (ISEs) have been widely used for clinical, agricultural, and environmental analysis, as well as for fundamental studies in solution chemistry. This book provides comprehensive data regarding the selectivity coefficients for ion-selective electrodes, including ISEs published from 1966-1988. Nearly 200 ionic species are discussed, with over 1600 electrode membranes cited. The book contains a general introduction, exact chemical composition of each membrane, detection limit, response time, and other important experimental conditions.

For many chemists, potentiometry is the first analytical procedure that they encounter, during the use of an electrode to measure pH. The advances in the field of ion selective electrodes now make it a valuable technique in the modern analytical laboratory.

Membrane Electrodes considers the significant developments in the field of sensing probes, with an emphasis on membrane electrodes. This book is organized into three parts encompassing 11 chapters. Part I is an introduction to the variety of ion-selective membrane electrodes that have been constructed and with which experiments have been conducted. This part deals first with the thermodynamic principles and other concepts underlying the description of the behavior of electrolyte solutions, followed by a discussion on the various theories of membrane potential applicable to a variety of solid and liquid membrane electrodes. Part II describes the preparation, properties, and uses of the various solid and liquid membrane electrodes. Part III presents glass membrane electrodes as a prelude to the description of other membrane systems in which glass electrodes are invariably used as the primary sensing device. This book will prove useful to students, technologists, and researchers in various fields of science and technology.

Since the first implant of a carbon microelectrode in a rat 35 years ago, there have been substantial advances in the sensitivity, selectivity and temporal resolution of electrochemical techniques. Today, these methods provide neurochemical information that is not accessible by other means. The growing recognition of the versatility of electrochemical techniques indicates a need for a greater understanding of the scientific foundation and use of these powerful tools. Electrochemical Methods for Neuroscience provides an updated summary of the current, albeit evolving, state of the art and lays the scientific foundation for incorporating electrochemical techniques into on-going or newly emerging research programs in the neuroscience disciplines. With contributions from pioneers in the field, the text outlines the applications and benefits of a wide range of electrochemical techniques. It explores the methodology behind the acquisition of neurochemical and neurobiological data through continuous amperometry, fast scan cyclic voltammetry, high-speed chronoamperometry, ion-selective microelectrodes, enzyme based microelectrodes, and in vivo voltammetry with telemetry. The text also introduces emerging concepts in the field such as the correlation of electrochemical recordings with information obtained from patch clamp, electrophysiological, and behavioral techniques. By presenting up-to--date information on the growing collection of electrochemical methods, microsensors, and research techniques, Electrochemical Methods for Neuroscience assists seasoned researchers and newcomers to the field in making sound decisions about adopting the most appropriate of these tools for their future research objectives.

The critically acclaimed guide to the principles, techniques, and instruments of electroanalytical chemistry-now expanded and revised Joseph Wang, internationally renowned authority on electroanalytical techniques, thoroughly revises his acclaimed book to reflect the rapid growth the field has experienced in recent years. He substantially expands the theoretical discussion while providing comprehensive coverage of the latest advances through late

1999, introducing such exciting new topics as self-assembled monolayers, DNA biosensors, lab-on-a-chip, detection for capillary electrophoresis, single molecule detection, and sol-gel surface modification. Along with numerous references from the current literature and new worked-out examples, Analytical Electrochemistry, Second Edition offers clear, reader-friendly explanations of the fundamental principles of electrochemical processes as well as important insight into the potential of electroanalysis for problem solving in a wide range of fields, from clinical diagnostics to environmental science. Key topics include: The basics of electrode reactions and the structure of the interfacial region Tools for elucidating electrode reactions and high-resolution surface characterization An overview of finite-current controlled potential techniques Electrochemical instrumentation and electrode materials Principles of potentiometric measurements and ion-selective electrodes Chemical sensors, including biosensors, gas sensors, solid-state devices, and sensor arrays

This book deals with the principles and practices of electrochemical methods as applied to soil and water research, particularly those that can be carried out in the field. Beginning with the basis of potentiometric methods, including electrode potential, principles of potentiometric methods, reference electrodes, liquid-junction potential and characteristics of ion-selective electrodes, the author then proceeds to describe the properties and applications of various types of potentiometric electrodes, including glass, solid-state membrane, liquid-state membrane, oxidation-reduction and gas sensors. A special chapter devoted to commonly encountered problems will aid readers not familiar with potentiometric methods. Voltammetric methods, conductometric methods and electrochemical instruments are also discussed.

Although it was shown very early [1] that the isotope 29Si is very valuable for NMR research, severe technical difficulties had to be overcome before silicon spectra could be recorded. This was due to the low sensitivity of the isotope resulting from its low gyro magnetic ratio, its low abundance and the rather long relaxation times. The introduction of the Fourier-Transform-Technique (FT-NMR) helped to surmount most of these problems, with the result, that more and more papers concerning silicon NMR appear. Thus, it seems now that most of the salient features of 29Si-NMR are known today. Some resume of the state of the art of 29Si_NMR have been reported [1-4]. Although the theory of 29Si-NMR is not yet understood beyond the basic features, it promises to be of value mainly for two reasons: 1. Silicon is strategically located in the Periodic Table of the elements between the elements carbon, aluminum and phosphorus. For an unified theory of chemical shifts and coupling constants of the heavier elements silicon NMR values will be important. 2. The normal coordination number of silicon is four. If the current view of the chemical shifts of the heavier elements is correct, then the paramagnetic part is dominant for the measured shift data. Two of the parameters used for the calcu lation of the paramagnetic part are bond orders and angles. Bond angles are rare ly determined experimentally with high precision.

We continue in this second volume the plan evident in the first; i.e., of presenting a number of well-rounded up-to-date reviews of important developments in the exciting field of ion-selective electrodes in analytical chemistry. In this volume, in addition to the exciting applications of ISE'S to biochemistry systems represented by the description of enzyme electrodes, there is featured the most recent development in ISE'S, namely, the joining of the electrochemical and solid state expertise, resulting in CHEMFETS. The scholarly survey of the current status of ISE'S will undoubtedly be welcomed by all workers in the field. Tucson, Arizona Henry Freiser vii Contents Chapter 1 Potentiometric Enzyme Methods Robert K. Kobos 1. Introduction . . . . . 1 2. Soluble Enzyme Systems . . . 5 2.1. Substrate Determinations 5 2.2. Enzyme Determinations . 13 2.3. Inhibitor Determinations. 18 3. Immobilized Enzyme Systems . 19 3.1. Methods of Immobilization. 19 3.2. Characteristics of Immobilized Enzymes 23 3.3. Analytical Applications with Ion-Selective Electrodes 23 4. Enzyme Electrodes 31 4.1. Urea Electrodes 35 4.2. Amygdalin Electrodes 39 4.3. Glucose Electrodes . 40 4.4. Penicillin Electrodes 40 4.5. Amino Acid Electrodes 41 4.6. Nucleotide Electrodes 46 4.7. Uric Acid Electrode 47 4.8. Creatinine Electrode 48 48 4.9. Acetylcholine Electrodes. 4.10. D-Gluconate Electrode 49 4.11. Lactate Electrode 49 4.12. Inhibitor Determination 50 4.13. Substrate Electrodes 50 4.14. Current Trends . . . .

Electrochemical Sensor Analysis (ECSA) presents the recent advances in electrochemical (bio)sensors and their practical applications in real clinical, environment, food and industry related samples, as well as in the safety and security arena. In a single source, it covers the entire field of electrochemical (bio)sensor designs and characterizations. The 38 chapters are grouped in seven sections: 1) Potentiometric sensors, 2) Voltammetric sensors, 3) Electrochemical gas sensors 4) Enzyme-based sensors 5) Affinity biosensors 6) Thick and thin film biosensors and 7) Novel trends. Written by experts working in the diverse technological and scientific fields related to electrochemical sensors, each section provides an overview of a specific class of electrochemical sensors and their applications. This interdisciplinary text will be useful for researchers and professionals alike. Covers applications and problem solving (sensitivity, interferences) in real sample analysis Details procedures to construct and characterize electrochemical (bio)sensors

Analytical Techniques in Environmental Chemistry contains the Proceedings of the International Congress held at Barcelona, Spain in November 1978. Separating 60 papers of the Congress as chapters, this book begins with a description of the natural and pollutant organic compounds in contemporary aquatic environments; recognition of the sources of isoprenoid alkanes in recent environments; and patterns of hydrocarbon contamination in California coastal waters. Other topics discuss include determination of trace level hydrocarbons in marine biota; recent progress in polycyclic aromatic chemistry and its significance for environmental chemistry; profiles of polycyclic aromatic hydrocarbons in suspended particles; and chemical carcinogenesis.

The microelectrode technique is today the most widely used method in electrophy siology. Microelectrodes offer a unique approach to measurements of electrical pa rameters and ion activities of single cells. Several important breakthroughs in trans port physiology have arisen from microelectrode studies. Undoubtedly, there is a progressively wide-spread use of conventional and ion-selective microelectrodes. Due to their particular dimension and properties micro electrodes are exclusive ly applied to measurements on living matter. This must have many consequences to my thoughts on experiments with microelectrodes. In this book, my concern is fo cussing on the description of an intracellular method that should lead to reliable in formation on cellular parameters. The methodical basis for any meaningful applica tion is treated extensively. However, technical perfection and accurate results are not the only concern when working on animals and human beings. Rather, my thoughts are governed by the intellectual and moral mastery of the experimental ap proach on living subjects. A measurement with microelectrodes usually necessitates the sacrifice of an ani mal. This is an immense fact, and means that the knowledge gained by the experi ment must justify the death of a living subject.

The Principles of Ion Selective Electrodes and of Membrane Trans-

port is a collection of research works on the theory, principles, and fundamentals of ion-selective electrodes and of membrane transport. This book is organized into two parts encompassing 15 chapters that highlight the application of the membrane model. Part A is a general discussion of membrane potentials and membrane transport. This part describes the formulations of the interfacial potential contribution due to phase boundaries. This part also explores the diffusion potential, the nonideality of diffusion layers or membrane phases, the liquid-junction potential arising in conventional potentiometric measuring cells. Other topics covered in this part include the practical solution for the membrane potential; the ion-transport and the electrical properties of bulk membranes; and the characteristics of lipid bilayer membranes. Part B considers the fundamentals of ion-selective electrodes. This part begins with discussions of the principles, response behavior, ion selectivity, and detection limits of solid-state membrane electrodes. This part also examines several important extensions and modifications of the Sandblom-Eisenman-Walker theory; the characteristics of neutral carrier membrane electrodes; and the theory of glass electrodes.

Ion-selective electrodes continue to be one of the more excIting developments in electro analytical chemistry in the last 10 years. This is evidenced in the large and continually growing literature in the field. It is important and necessary in such a rapidly growing area to be able to "take stock," i. e. , to present a well-rounded, up-to-date review of important developments. In this volume, reviews by many of the leading practitioners and pioneers in this field contribute to what we consider to be a generous coverage of both fundamental aspects of ion-selective electrodes and their applications to analytical chemistry. Although this volume is not intended to be exhaustive, we have attempted to produce a "stand alone" text dealing with all major current developments. Indeed, since some of the theoretical approaches are not yet universally agreed on, each of the first five chapters deals with theory and principles of the nature and behavior of ion-selective electrodes from the vantage point of the authors' own experience and understanding. In view of the rapid expansion of this field, plans for future volumes are now being formulated. Henry Freiser Tucson, Arizona vii Contents Chapter 1 Theory and Principles of Membrane Electrodes R. P. Buck 1. Potential Generating Processes . . . . . 1 1. 1. Interfaces, Fixed Charges, Charged Sites, and Charge Carriers 1 1. 2. Ion Exchange as a Potential-Generating Process 5 1. 3. Diffusion and Migration . . . . . 8 1. 4. Electrochemical Potentials, Fluxes, and Mobility . . 10 1. 5.

Ion-selective electrodes (ISEs) have a wide range of applications in clinical, environmental, food and pharmaceutical analysis as well as further uses in chemistry and life sciences. Based on his profound experience as a researcher in ISEs and a course instructor, the author summarizes current knowledge for advanced teaching and training purposes with a particular focus on ionophore-based ISEs. Coverage includes the basics of measuring with ISEs, essential membrane potential theory and a comprehensive overview of the various classes of ion-selective electrodes. The principles of constructing ISEs are outlined, and the transfer of methods into routine analysis is considered. Advanced students, researchers, and practitioners will benefit from this expedient introduction.

Ion -Selective Electrodes for Biological Systems provides a user-friendly and practical guide to the manufacture and use of ion-selective electrodes for a wide variety of experimental systems used in biology. The book is aimed at researchers with little practical experience in the field and will direct them through the steps involved in making electrodes, interpretation of the data, requirements of the recording apparatus, potential pitfalls involved in their use, and the range of situations in which they can be used. This is the first book that deals comprehensively with such practical details and will enable the reader to become competent in the use of ion-selective electrodes.

Following on from Recent Developments in the History of Chemistry, this book aims to familiarise newcomers to the history of chemistry.

This book broadly reviews the modem techniques and significant applications of chemical sensors and biosensors. Chapters are written by experts in the field – including Professor Joseph Wang, the most cited scientist in the world and renowned expert on sensor science who is also co-editor. Each chapter provides technical details beyond the level found in typical journal articles, and explores the application of chemical sensors and biosensors to a significant problem in biomedical science, also providing a prospectus for the future. This book compiles the expert knowledge of many specialists in the construction and use of chemical sensors and biosensors including nitric oxide sensors, glucose sensors, DNA sensors, hydrogen sulfide sensors, oxygen sensors, superoxide sensors, immuno sensors, lab on chip, implatable microsensors, et al. Emphasis is laid on practical problems, ranging from chemical application to biomedical monitoring and from in vitro to in vivo, from single cell to animal to human measurement. This provides the unique opportunity of exchanging and combining the expertise of otherwise apparently unrelated disciplines of chemistry, biological engineering, and electronic engineering, medical, physiological. Provides user-oriented guidelines for the proper choice and application of new chemical sensors and biosensors Details new methodological advancements related to and correlated with the measurement of interested species in biomedical samples Contains many case studies to illustrate the range of application and importance of the chemical sensors and biosensors

Biosensors: From Electric Circuits to Immunosensors discusses underlying circuitry of sensors for biomedical and biological engineers as well as biomedical sensing modalities for electrical engineers while providing an applications-based approach to the study of biosensors with over 13 extensive, hands-on labs. The material is presented using a building-block approach, beginning with the fundamentals of sensor design and temperature sensors and ending with more complicated biosensors.

Using 372 references and 211 illustrations, this book underlines the fundamentals of electrochemistry essential to the understanding of laboratory experiments. It treats not only the fundamental concepts of electrode reactions, but also covers the methodology and practical application of the many versatile electrochemical techniques available. Underlines the fundamentals of electrochemistry essential to the understanding of laboratory experiments Treats the fundamental concepts of electrode reactions Covers the methodology and practical application of the many versatile electrochemical techniques available

Ambient ionization has emerged as one of the hottest and fastest growing topics in mass spectrometry enabling sample analysis with minimal sample preparation. Introducing the subject and explaining the basic concepts and terminology, this book will provide a comprehensive, unique treatise devoted to the subject. Written by acknowledged experts, there are full descriptions on how new ionization techniques work, with an overview of their strengths, weaknesses and applications. This title will bring the reader right up to date, with both applications and theory, and will be suitable as a tutorial text for those starting in the field from a variety of disciplines.

Increased hydrogen supplies using cleaner methods are seen as essential for potential hydrogen based power systems for trans-

portation and renewable energy conversion into fuel. This book provides a comprehensive picture of the various routes to use electricity to produce hydrogen using electrochemical science and technology. Edited by an expert in the field, this title will be of interest to graduate students and researchers in academia and industry working in energy, electrochemistry, physical chemistry and chemical engineering.

A broad and comprehensive survey of the fundamentals for electrochemical methods now in widespread use. This book is meant as a textbook, and can also be used for self-study as well as for courses at the senior undergraduate and beginning graduate levels. Knowledge of physical chemistry is assumed, but the discussions start at an elementary level and develop upward. This revision comes twenty years after publication of the first edition, and provides valuable new and updated coverage.

Helmut Sigel, Astrid Sigel and Roland K.O. Sigel, in close cooperation with John Wiley & Sons launch a new Series “Metal Ions in Life Sciences”. There exists a whole range of books on Cytochromes P450, but none with the focus of this volume. This new volume in the Series concentrates on current hot topics in the area and tries to work out the underlying common developments. As a result the reader will find a systematic account of new results in this exciting research area. The table of contents gives an idea on the wide span of chapters, starting with overviews and the presentation of specific systems, and ending with chapters on carbon-carbon bond cleavage by P450 sytems, drug metabolism as catalyzed by P450 systems, decomposition of xenobiotics by P450 enzymes and design and engineering of new P450 systems.

MILS-16 provides an up-to-date review of the impact of alkali metal ions on life. Their bioinorganic chemistry and analytical determination, the solid state structures of bio-ligand complexes and the properties of alkali metal ions in solution in the context of all kinds of biologically relevant ligands are covered, this includes proteins (enzymes) and nucleic acids (G-quadruplexes). Minerals containing sodium (Na+) and potassium (K+) are abundant in the Earth's crust, making Na+ and K+ easily available. In contrast, the alkali elements lithium (Li+), rubidium, and cesium are rare and the radioactive francium occurs only in traces. Since the intra- and extracellular, as well as the compartmental concentrations of Na+ and K+ differ significantly, homeostasis and active transport of these ions are important; this involves transporters/-carriers and pore-forming ion channel proteins. Systems like Na+/K+-ATPases, H+/K+-ATPases or Na+/H+ antiporters are thoroughly discussed. The role of K+ in photosynthesis and the role of Na+ in charging the "battery of life" are pointed out. Also, the relationships between alkali metal ions and diseases (e.g., Parkinson or traumatic brain injury) are covered and the relevance of Li+ salts in medicine (pharmacology and mechanism) is reviewed. This and more is treated in an authoritative and timely manner in the 16 stimulating chapters of Volume 16, The Alkali Metal Ions: Their Role for Life, which are written by 44 internationally recognized experts from 12 nations. The impact of this vibrant research area is manifested in nearly 3000 references, over 30 tables and more than 150 illustrations (two thirds in color). MILS-16 also provides excellent information for teaching. Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel have long-standing interests in Biological Inorganic Chemistry. Their research focuses on metal ion interactions with nucleotides and nucleic acids and on related topics. They edited previously 44 volumes in the series Metal Ions in Biological Systems.