Neutrons In Biology

The advent of new neutron facilities and the improvement of existing sources and instruments world wide supply the biological community with many new opportunities in the areas of structural biology and biological physics. The present volume offers a clear description of the various neutron-scattering techniques currently being used to answer biologically relevant questions. Their utility is illustrated through examples by some of the leading researchers in the field of neutron scattering. This volume will be a reference for researchers and a step-by-step guide for young scientists entering the field and the advanced graduate student.

Neutron Scattering: Applications in Chemistry, Materials Science and Biology, Volume 49, provides an in-depth overview of the applications of neutron scattering in the fields of physics, materials science, chemistry, biology, the earth sciences, and engineering. The book describes the tremendous advances in instrumental, experimental, and computational techniques over the past quarter-century. Examples include the coming-of-age of neutron reflectivity and spin-echo spectroscopy, the advent of brighter accelerator-based neutron facilities and associated techniques in the United States and Japan over the past decade, and current efforts in Europe to develop long-pulse, ultra-intense spallation neutron sources. It acts as a complement to two earlier volumes in the Experimental Methods in the Physical Science series, Neutron Scattering: Fundamentals(Elsevier 2013) and Neutron Scattering: Magnetic and Quantum Phenomena (Elsevier 2015). As a whole, the set enables researchers to identify aspects of their work where neutron scattering techniques might contribute, conceive the important experiments to be done, assess what is required, write a successful proposal for one of the major facilities around the globe, and perform the experiments under the guidance of the appropriate instrument scientist. Completes a three-volume set, providing extensive coverage on emerging and highly topical applications of neutron scattering Addresses the increasing use of neutrons by chemists, life scientists, material scientists, and condensed-matter physicists Presents up-to-date reviews of recent results, enabling readers to identify new opportunities and plan neutron scattering experiments in their own field

Isotope is Biology is a six-chapter supplementary text that covers the properties and application of isotopes as labels or analytical tools in biological research. The first chapters deal with the physico-chemical properties and radioactivity of isotopes. These chapters also explore their synthesis, preparation, radiation decomposition, and decay of radioactivity. The succeeding chapter considers other aspects of isotopes, including their effect of health, disposal, spills, and laboratory use. Another chapter examines the chemical and biochemical behavior, natural abundance, and the chemical stability of isotopic compounds. The final chapters describe several isotopic methods, namely, isotope dilution, paper chromatography, and autoradiography, with emphasis on their application in biological studies. This book will be of value to biologists, and graduate and undergraduate biology students.

Neutrons, which are a penetrating yet non destructive probe, are ideally suited to studying the structure, organisation and motion of molecules responsible for the physical properties of materials under a variety of conditions. Applications are in fields as diverse as colloid and polymer science, earth sciences, pharmaceutics, biology and engineering. This book will be of interest to both present and potential future users of neutron sources working in these areas, as both a useful reference and a comprehensive overview.

Small-angle scattering of X-rays or neutrons is a technique that allows one to study the structures and interactions of disordered materials like polymers in the solid state, melt or solution or metal clusters in alloys. It is also the method of choice to characterize biological macromolecules in solution, in particular when they cannot be crystallized. A further advantage of the technique is that it can easily be combined with standard perturbation methods such as temperature and pressure jumps and stopped flow mixing thus offering useful information complementary to spectroscopic methods. The book describes all aspects of the technique: instrumentation, sample requirements, data interpretation and modelling methods in a comprehensive way and gives examples of applications in various fields of biophysics and biochemistry. Appendices describe the mathematical background and additional resources relevant to the method.

With the most comprehensive and up-to-date overview of structure-based drug discovery covering both experimental and computational approaches, Structural Biology in Drug Discovery: Methods, Techniques, and Practices describes principles, methods, applications, and emerging paradigms of structural biology as a tool for more efficient drug development. Coverage includes successful examples, academic and industry insights, novel concepts, and advances in a rapidly evolving field. The combined chapters, by authors writing from the frontlines of structural biology and drug discovery, give readers a valuable reference and resource that: Presents the benefits, limitations, and potentiality of major techniques in the field such as X-ray crystallography, NMR, neutron crystallography, cryo-EM, mass spectrometry and other biophysical techniques, and computational structural biology Includes detailed chapters on druggability, allostery, complementary use of thermodynamic and kinetic information, and powerful approaches such as structural chemogenomics and fragment-based drug design Emphasizes the need for the in-

depth biophysical characterization of protein targets as well as of therapeutic proteins, and for a thorough quality assessment of experimental structures Illustrates advances in the field of established therapeutic targets like kinases, serine proteinases, GPCRs, and epigenetic proteins, and of more challenging ones like protein-protein interactions and intrinsically disordered proteins

Soft condensed matter physics, which emerged as a distinct branch of physics in the 1990s, studies complex fluids: liquids in which structures with length scale between the molecular and the macroscopic exist. Polymers, liquid crystals, surfactant solutions, and colloids fall into this category. Physicists deal with properties of soft matter system

Practical Radiobiology for Proton Therapy Planning covers the principles, advantages and potential pitfalls that occur in proton therapy, especially its radiobiological modelling applications. This book is intended to educate, inform and to stimulate further research questions. Additionally, it will help proton therapy centres when designing new treatments or when unintended errors or delays occur. The clear descriptions of useful equations for high LET particle beam applications, worked examples of many important clinical situations, and discussion of how proton therapy may be optimized are all important features of the text. This important book blends the relevant physics, biology and medical aspects of this multidisciplinary subject.

Neutron Scattering - Applications in Biology, Chemistry, and Materials Science

Isotopes in Biology

Neutrons in Biology, International Workshop "Neutron Scattering Highlights on Biological Systems" ; 4th General Integrated Infrastructure Initiative for Neutron Scattering and Muon Spectroscopy Meeting, Taormina, Sicily, Italy, October 2006

Neutron Protein Crystallography

Neutrons in Biology

Application of the Slow Neutron Scattering Technique for Investigations in Biology, Physics and Chemistry

Soft Condensed Matter Physics in Molecular and Cell Biology

Introduction to Nuclear Techniques in Agronomy and Plant Biology

Neuherberg/München, September 30–October 4, 1974

Concepts of Biology

Dynamics of Soft Matter: Neutron Applications provides an overview of neutron scattering techniques that measure temporal and spatial correlations simultaneously, at the microscopic and/or mesoscopic scale. These techniques offer answers to new questions arising at the interface of physics, chemistry, and biology. Knowledge of the dynamics at these levels is crucial to understanding the soft matter field, which includes colloids, polymers, membranes, biological macromolecules, foams, emulsions towards biological & biomimetic systems, and phenomena involving wetting, friction, adhesion, or microfluidics. Emphasizing the complementarities of scattering techniques with other spectroscopic ones, this volume also highlights the potential gain in combining techniques such as rheology, NMR, light scattering, dielectric spectroscopy, as well as synchrotron radiation experiments. Key areas covered include polymer science, biological materials, complex fluids and surface science.

Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand.We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

Neutron contrast variation is a powerful technique for studying biomolecular complexes and the conformational flexibility that is inherent in bio-molecular signaling and regulation. We use this technique to study intra-cellular signaling and regulatory mechanisms mediated by second messengers such as calcium and cyclic nucleotides. Our recent results on the multifunctional, multi-subunit cyclic nucleotide-dependent protein kinases as well as kinases that play a role in regulating muscle mechanics will be presented. From this work we see common mechanistic themes in kinase activation as well as distinctive attributes that provide for specificity and functional diversity in this important class of enzymes that catalyze the most common type of reversible protein modification used to modulate protein function.

Over 2500 references with abstracts from the literature of 1935-1970, i.e., from the first uses of neutrons in biology and medicine. Among sources used were the major scientific and medical bibliographies. Entries arranged in alphabetical order by primary authors. Author index, 2 subject category indexes, and keyword index.

Hydrogen, Protons, and Hydration in Bio-macromolecules

Methods, Techniques, and Practices

Small Angle X-Ray and Neutron Scattering from Solutions of Biological Macromolecules

Neutrons and the Structural Biology of Second Messenger Signaling and Regulation

Neutron Applications

Report of Symposium Held June 2-6, 1975

With Applications in Chemistry, Biology, Materials Science and Catalysis

Applications of Neutron Scattering to Soft Condensed Matter

Neutron and Synchrotron Radiation for Condensed Matter Studies: Applications to soft condensed matter and biology

Quasielastic Neutron Scattering, Principles and Applications in Solid State Chemistry, Biology and Materials Science

' Inelastic neutron scattering (INS) is a spectroscopic technique in which neutrons are used to probe the dynamics of atoms and molecules in solids and liquids. This book is the first, since the late 1960s, to cover the principles and applications of INS as a vibrational-spectroscopic technique. It provides a hands-on account of the use of INS, concentrating on how neutron vibrational spectroscopy can be employed to

obtain chemical information on a range of materials that are of interest to chemists, biologists, materials scientists, surface scientists and catalyst researchers. This is an accessible and comprehensive single-volume primary text and reference source. Contents:The Theory of Inelastic Neutron Scattering SpectroscopyInstrumentation and Experimental MethodsInterpretation and Analysis of Spectra Using Molecular ModellingAnalysis of INS SpectraDihydrogen and HydridesSurface Chemistry and CatalysisOrganic and Organometallic CompoundsHydrogen BondingSoft Condensed Matter — Polymers and BiomaterialsNon-Hydrogenous Materials and CarbonVibrational Spectroscopy with Neutrons — The Future Readership: Users and potential users of neutron scattering spectroscopy (academics, staff of neutron scattering institutes, researchers and graduate students); solid state vibrational spectroscopists. Keywords:Inelastic Neutron Scattering;Vibrational Spectroscopy;Hydrogen;Solid State;Density Functional Theory;Hydrogen Bonding;Water;Proton;Polymer;Biominerals;Phosphate;Catalyst;Zeolite;Sulfide;Cross SectionKey Features:Acquaints the reader with the basic concepts of neutron scatteringOffers an insight into how theory and experiment connect in the interpretation of INS scattering dataShows how useful information can be extracted from experimental dataDescribes studies of dihydrogen and its compounds using INS spectroscopyProvides a comprehensive listing of compounds and materials studied by INSReviews:"This book provides a very good account of the principles and applications of Inelastic Neutron Scattering (INS) as a vibrational spectroscopic technique, without assuming a high level of background knowledge. It is a piece of work factually novel and done properly, which meets the needs of graduate students as well as both users and potential users of inelastic neutron spectroscopy at academic and research institutions. On the whole the book is quite clearly written, the subject matter rather well developed and the applications of the INS well described in a wide range of materials and problems."Notiziario Neutroni e Luce di Sincrotrone '

This is one of the first books dedicated to the emerging field of neutron protein crystallography (NPC). The text covers all of the practical aspects of NPC, from the basic background of neutron scattering and diffraction, to the technical details of neutron facilities, growth of high-quality crystals, and data analysis. The final chapter is devoted to providing many examples of using NPC to investigate a wide range of different proteins. It demonstrates how NPC can explore hydrogen bonds, protonation and deprotonation of amino acid residues, hydration structures, and hydrogen-to-deuterium exchange

ratios. To avoid redundancy with other textbooks on X-ray protein crystallography (XPC), this book assumes a familiarity with the basics of XPC and strives to highlight and explain the differences between XPC and NPC. It is therefore especially useful for X-ray protein crystallographers who are eager to have a sound, scientific basis for judging if NPC is the right technique for furthering their experimental programs.

Written by an author who is widely recognized as one of the specialists of the techniques for the investigation of molecular motions in solids, the subject is given a thorough theoretical treatment and is illustrated with numerous examples of recent experimental applications.

Neutron Crystallography in Structural Biology, Volume 634, the latest volume in the Methods in Enzymology series, continues the legacy of this premier serial with quality chapters authored by leaders in the field. Chapters in this updated release include Fundamentals of neutron crystallography, Preparation of deuterated and perdeuterated proteins, Large crystal growth for neutron protein crystallography, Monochromatic - BIODIFF at FRM-II, Quasi-Laue 2 - IMAGINE at HIFER, Qusai-Laue 3 DALI (LADI-IIIB at ILL) -Narrow bandpass, Short wavelength - D19 at ILL, MaNDi at SNS, Current status and near future plan of neutron protein crystallography at J-PARC, and much more.

Structural Biology in Drug Discovery

Proceedings, Third Symposium on Neutron Dosimetry in Biology and Medicine

Vibrational Spectroscopy with Neutrons

Neutron Dosimetry for Biology and Medicine

A Discussion

Proceedings of the Neutrons in Biology Conference, Santa Fe, NM, October 1994

Gamma-ray Neutron Dosimetry of the Biology Neutron Irradiation Facility

Techniques and Applications

Neuherberg/München, 23-27 May 1977

Neutron Scattering in Biology

This volume provides the proceedings for the Neutrons in Biology Conference held in Sante Fe, New Mexico October 1994. The volume is composed of full papers authored by the presenters at the conference. The sessions by which the presentations were organized are entitled Neutron Anatomy, Neutron Sources, Neutron Instrumentation, Small Angle Scattering, Membrane Structures and Dynamics, Protein Structures, Fiber Diffraction, and New Analysis and Experimental Techniques. Each paper has been

separately indexed and abstracted for the database.

The Principles of Biology sequence (BI 211, 212 and 213) introduces biology as a scientific discipline for students planning to major in biology and other science disciplines. Laboratories and classroom activities introduce techniques used to study biological processes and provide opportunities for students to develop their ability to conduct research.

Introduction to Nuclear Techniques in Agronomy and Plant Biology is a 15-chapter book that begins with an explanation of the nature of isotopes and radiation, nuclear reactions, and radioisotopes. Subsequent chapters describe the radioassay, use of stable isotopes as tracers, and activation analysis for biological samples. Other chapters discuss X-ray fluorescence spectrography for plants and soils; autoradiography; isotopes in soils studies; isotopic tracers in field experimentation; and nuclear techniques in plant science and soil water. The last chapter centers on the radiation and other induced mutations in plant breeding.

This compendium presents some of the major applications of neutron scattering techniques to problems in biology. It is a record of the papers presented at the Neutrons in Biology Conference, the third in an occasional series held to highlight progress in the field and to provide a focus for future direction. The strength ofthe neutron scattering technique remains principally in the manipula tion of scattering density through hydrogen and deuterium atoms. The development ofad vanced detectors, innovative instrument and beamline components, and sophisticated data acquisition systems through the 1970s and early 1980s provided a sound foundation for the technique. With continued development, some of the exotic and expensive equipment has become affordable by the medium-sized facilities, thereby broadening the user base considerably. Despite problems with the major neutron sources in the late 1980s and early 1990s, some spectacular results have been achieved. Whilst the high and medium flux beam reac tors will continue to make a major impact in the field, the results from the first experi ments, and the planned developments on spallation neutron sources, clearly indicate that the technique has enormous potential.

Neutron Crystallography in Structural Biology

Workshop : Papers

Pergamon International Library of Science, Technology, Engineering and Social Studies

Biology 211, 212, and 213

Neutrons in biology at KENS

Neutron Scattering for the Analysis of Biological Structures

Biological Macromolecular Dynamics