Macromolecules Study

This volume is the scientific chronicle of the NATO Advanced Research Workshop on Computational Aspects of the Study of Biological Macro molecules by Nuclear Magnetic Resonance Spectroscopy, which was held June 3-8, 1990 at Il Ciocco, near Barga, Italy. The use of computers in the study of biological macromolecules by NMR spectroscopy is ubiquitous. The applications are diverse, including data col lection, reduction, and analysis. Furthermore, their use is rapidly evolv ing, driven by the development of new experimental methods in NMR and molecular biology and by phenomenal increases in computational perfor mance available at reasonable cost. Computers no longer merely facilitate, but are now absolutely essential in the study of biological macromolecules by NMR, due to the size and complexity of the data sets that are obtained from modern experiments. The Workshop, and this proceedings volume, provide a snapshot of the uses of computers in the NMR of biomolecules. While by no means exhaustive, the picture that emerges illustrates both the· importance and the diversity of their application.

Quantitative elucidation of structural, energetic and dynamic aspects of macromolecular interactions is indispensable for understanding the functional activities of biomolecules and their interactions. The optical spectroscopic methods are not confined to small molecules or macromolecules but permit the studies of even the largest biological systems in their full splendor, including the living cell. In, Spectroscopic Methods of Analysis: Methods and Protocols, expert researchers in the field detail many of the methods which are now commonly used to study properties of individual macromolecules, their complexes, organelles, and cells,

using optical spectroscopic techniques. These include methods and approaches for experimental and theoretical analyses of fluorescence properties of the examined systems, single molecule approaches, electronic absorption, and electro-optical analyses of macromolecular interactions, structures, and dynamics. Written in the highly successful Methods in Molecular Biology(tm) series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step laboratory protocols, and key tips on troubleshooting and avoiding known pitfalls. Authoritative and practical, Spectroscopic Methods of Analysis : Methods and Protocols seeks to aid scientists in the further study of optical spectroscopic methods.

[Truncated abstract] The phloem long distance translocation system is not only involved in the transport of nutrients and photo-assimilates to different organs of the plant, but it also appears to be important for the transport of information molecules including growth-regulators, proteins and RNA. Translocation of signals appears to be involved in the coordination of developmental processes and also in the response of the plant to environmental cues. Much of the information about macromolecules in phloem comes from analyses of exudates collected from the stylets of sap sucking insects or from incisions made to the vasculature. Among the legumes, members of the genus Lupinus exude phloem 'freely' from incisions made to the vasculature at most organs of the plant. This feature was exploited in this study to document some of the macromolecules present in exudate of L. albus and which might represent potential mobile signals. Phloem exudate was collected mainly from the sutures of developing pods and from inflorescence racemes. Two-dimensional polyacrylamide gel electrophoresis and tandem mass spectrometry were used to identify 83 proteins in exudate. Analysis of a cDNA library

constructed from exudate identified 609 unique transcripts. Both proteins and mRNA were classified into functional groups. The largest group was related to general and energy metabolism, suggesting some metabolic activity probably to support the sieve element (SE). Other significant functional groups were represented by proteins and transcripts involved in protein synthesis, turnover and sorting, and in redox homeostasis. Proteins in these categories could play a role in maintaining the functions and stability of proteins in SE. Macromolecules involved in signalling such as transcripts encoding proteins mediating calcium levels and the Flowering locus T (FT) protein were also identified in phloem exudate of L. albus. FT protein has been recently identified as a mobile signal that induces flowering. ... The hen1 mutant accumulates low, sometimes even undetectable levels of miRNA due to the lack of methylation. No translocation of the five miRNA assayed under nutrient replete (non stress) conditions was observed. Translocation of miR395 in response to sulphur (S) deficiency was also investigated, and while conclusive evidence of translocation was not obtained, the data suggested some movement from roots to shoots (possibly in xylem) of a signal in response to S-deficiency. Future work is required to provide greater insight into the translocation path and identity of this S-deficiency signal. This study suggests that not all miRNA identified in phloem exudates are mobile, which raises the question about their biological relevance in SE and how they reached this location (e.g. through the action of a non-selective transport mechanism). However, there is also the possibility that miRNA are translocated only in response to specific internal or external cues not tested in this study. This is the first study that provides information on macromolecules present in the phloem exudate of a member of the Fabaceae. The information obtained from this work, provides a basis for future studies in the identification of

potential mobile signals that may play a role in a communication network that traffics information around the plant, regulating its various developmental processes and responding to environmental cues.

Structure and Dynamics of Macromolecules: Absorption and Fluorescence Studies is clearly written and contains invaluable examples, coupled with illustrations that demonstrate a comprehensible analysis and presentation of the data. This book offers practical information on the fundamentals of absorption and fluorescence, showing that it is possible to interpret the same result in different ways. It is an asset to students, professors and researchers wishing to discover or use absorption and fluorescence spectroscopy, and to scientists working on the structure and dynamics of macromolecules. * Offers concise information on the fundamentals of absorption and fluorescence * Critically reviews examples taken from previously published literature * Highly illustrated, it is suitable for academic and institutional libraries and government laboratories

This volume and its companion, Volume 339, supplement Volumes 176, 177, 239, and 261. Chapters are written with a "hands-on" perspective. That is, practical applications with critical evaluations of methodologies and experimental considerations needed to design, execute, and interpret NMR experiments pertinent to biological molecules.

Molecular Dynamics is a two-volume compendium of the ever-growing applications of molecular dynamics simulations to solve a wider range of scientific and engineering challenges. The contents illustrate the rapid progress on molecular dynamics simulations in many fields of science and technology, such as nanotechnology, energy research, and biology, due to the advances of new dynamics theories and the extraordinary power of today's

computers. This second book begins with an introduction of molecular dynamics simulations to macromolecules and then illustrates the computer experiments using molecular dynamics simulations in the studies of synthetic and biological macromolecules, plasmas, and nanomachines. Coverage of this book includes: Complex formation and dynamics of polymers Dynamics of lipid bilayers, peptides, DNA, RNA, and proteins Complex liquids and plasmas Dynamics of molecules on surfaces Nanofluidics and nanomachines

Following the enormous increase in the use of nuclear magnetic resonance to study the conformations and interactions of biological macromolecules, this book provides detailed guidance on how to choose the most appropriate protocol to obtain the required information, how to carry out theexperiment, and how to analyze the resulting spectra. Graduate students and post-doctoral researchers in biochemistry, biophysics, chemistry, and other disciplines who use NMR to study biological macromolecules will find this exemplary volume one of the few genuinely practical books on thesubject.

Computational Aspects of the Study of Biological Macromolecules by Nuclear Magnetic Resonance SpectroscopySpringer Science & Business Media

The hydrogen bond (H bond) is one of the most important interactions that form the foundation of secondary and tertiary protein structure. Beyond holding protein structures together, H bonds are also intimately involved in solvent coordination,

ligand binding, and enzyme catalysis. The H bond by definition involves the light atom, H, and it is very difficult to study directly, especially with X-ray crystallographic techniques, due to the poor scattering power of H atoms. Neutron protein crystallography provides a powerful, complementary tool that can give unambiguous information to structural biologists on solvent organization and coordination, the electrostatics of ligand binding, the protonation states of amino acid side chains and catalytic water species. The method is complementary to X-ray crystallography and the dynamic data obtainable with NMR spectroscopy. Also, as it gives explicit H atom positions, it can be very valuable to computational chemistry where exact knowledge of protonation and solvent orientation can make a large difference in modeling. Finally, this article gives general information about neutron crystallography and shows specific examples of how the method has contributed to structural biology, structure-based drug design; and the understanding of fundamental questions of reaction mechanisms. This book is a comprehensive study of the subject of ionic interactions in macromolecules. The first parts of the book review and analyze the conventional treatments of fixed charges (e.g. in polyelectrolytes and polyampholytes), including screening and condensation by mobile ions. The interaction of ions with less polar sites on the macromolecule (e.g. amide bonds), and the origin of the

lyotropic effects (focusing on binding versus condensation) will also be extensively addressed. The book also explores complex micellar organizations involving charged macromolecules (e.g. DNA) and low-molecular-weight ampholytes and strong protein associations. The resulting structures are relevant to a variety of functional biological systems and synthetic analogs. The contribution of electrostatic and hydrophobic interaction to the stability of proteins and other supramolecular structures will also be analyzed. There are chapters on applications such as deionization and cosmetic formulation. This 21-chapter book is divided into three sections: Fundamentals Mixed Interactions Functions and Applications

“This excellent work fills the need for an upper-level graduate course resource that examines the latest biochemical, biophysical, and molecular biological methods for analyzing the structures and physical properties of biomolecules... This reviewer showed [the book] to several of his senior graduate students, and they unanimously gave the book rave reviews. Summing Up: Highly recommended...” CHOICE Chemical biology is a rapidly developing branch of chemistry, which sets out to understand the way biology works at the molecular level. Fundamental to chemical biology is a detailed understanding of the syntheses, structures and behaviours of biological macromolecules and

macromolecular lipid assemblies that together represent the primary constituents of all cells and all organisms. The subject area of chemical biology bridges many different disciplines and is fast becoming an integral part of academic and commercial research. This textbook is designed specifically as a key teaching resource for chemical biology that is intended to build on foundations lain down by introductory physical and organic chemistry courses. This book is an invaluable text for advanced undergraduates taking biological, bioorganic, organic and structural chemistry courses. It is also of interest to biochemists and molecular biologists, as well as professionals within the medical and pharmaceutical industry. Key Features: A comprehensive introduction to this dynamic area of chemistry, which will equip chemists for the task of understanding and studying the underlying principles behind the functioning of biological macro molecules, macromolecular lipid assemblies and cells. Covers many basic concepts and ideas associated with the study of the interface between chemistry and biology. Includes pedagogical features such as: key examples, glossary of equations, further reading and links to websites. Clearly written and richly illustrated in full colour.

Three-part series remains the definitive text on the physical properties of biological macromolecules and the physical techniques used to study them. It is

appropriate for a broad spectrum of advanced undergraduate and graduate courses and serves as a comprehensive reference for researchers. Part I: The Conformation of Biological Macromolecules 1980, paper, 365 pages, 158 illustrations 0-7167-1188-5 Part II: Techniques for the Study of Biological Structure and Function 1980, paper, 365 pages, 158 illustrations 0-7167-1190-7 Part III: The Behavior of Biological Macromolecules 1980, paper, 597 pages, 243 illustrations 0-7167-1192-3

"Human Biological Aging will introduce the student to human aging from the level of macromolecules to organ systems. Age changes in proteins, DNA, polysaccharides and lipids are discussed relative to known age-related alterations in structure and function produced by free radicals and oxidants. At the cellular level, age-dependent mechanisms that diminish organelle function are described. Cellular phenomena of replicative senescence apoptosis, autophagy and neuroplasticity are detailed as to their contribution to compromised cellular functions. The unique age changes of each organ-system are presented. Some important changes include photo-aging in the integument, increased airway resistance, decreased thoracic chest compliance and reduction of active lung tissue in the pulmonary system, endothelial dysfunction in the cardiovascular system, cognitive changes influenced by negative and positive neuroplasticity in the central nervous system, the impact of presbyopia, presbycusis and sensory fiber loss on sensory perception, sarcopenia and dynapenia in the skeletal muscle system, the effects of menopause, altered stress response and loss of growth hormone in the hypothalamic pituitary system, age changes in bone remodeling and modeling

in the skeletal system and prostatic hypertrophy and urinary incontinence in the excretory system. The selection of book material is based on Dr. Bilder's lectures developed over the years as the teacher for a Biology of Aging course at Gwynedd Mercy University. Her lectures covered biological aging from the bottom up - macromolecules to organ-systems. Additionally the student is introduced to methods and measurements in aging and the tools to critique future findings, the effects of classic caloric restriction studies and newer gene manipulations and the evolutionary theory of aging that accepted biological aging as truly biological. Major age-related diseases are absent from this textbook as biogerontologists consider disease distinct from aging. Instead this textbook includes many age changes that highlight how aging is a risk factor for disease. To fully understand biological aging, it is necessary to include primary biological content and then to develop aging insights. For example, to understand the role of aging in the development of sarcopenia and dynapenia, an appreciation of skeletal muscle structure and function is important, after which age changes of sarcopenia and dynapenia and the influence of exercise and protein consumption becomes meaningful. Similarly comprehension of the theories of aging require rudimentary knowledge of oxidation/reduction reactions, protein function, cell organelles, mitosis, acquired immunity, and evolution, to name a few basic biological concepts. Without some biological fundamentals, the student of biological aging struggles to learn the essentials of biological aging and to appreciate the research advances on aging. With regards to format, basic knowledge is given first. Biological terms are defined; key questions to aid with study are given with each chapter. Specifically the reader will learn the current theories of aging, their origins and their value in the scientific literature. The reader will learn why aging is not a disease but a risk for disease. The

reader will understand how age changes are measured and appreciate the difficulties of obtaining accurate observations on aging. Thus, in forthcoming findings, the student will be equipped to discriminate between hype and worthwhile advances. This textbook will provide the reader with an overview of the major animal models of aging so that the relevance of this data on conserved mechanisms is evident. Finally, this textbook will give to the reader a framework to incorporate new information. The reader will realize the significance of the health span and gain competency to select lifestyle choices that prolong it."--

Copyright: b7152d2ae9ae100c98fa8cb1fc41ccbb