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Biological Macromolecules: Bioactivity and Biomedical Applications presents a comprehensive study of biomacromolecules and their potential use in various biomedical applications. Consisting of four sections, the book begins with an overview of the key sources, properties and functions of biomacromolecules, covering the foundational knowledge required for study on the topic. It then progresses to a discussion of the various bioactive components of biomacromolecules. Individual chapters explore a range of potential bioactivities, considering the use of biomacromolecules as nutraceuticals, antioxidants, antimicrobials, anticancer agents, and antidiabetics, among others. The third section of the book focuses on specific applications of biomacromolecules, ranging from drug delivery and wound management to tissue engineering and enzyme immobilization. This focus on the various practical uses of biological macromolecules provide an interdisciplinary assessment of their function in practice. The final section explores the key challenges and future perspectives on biological macromolecules in biomedicine. Covers a variety of different biomacromolecules, including carbohydrates, lipids, proteins, and nucleic acids in plants, fungi, animals, and microbiological resources Discusses a range of applicable areas where biomacromolecules play a significant role, such as drug delivery, wound management, and regenerative medicine Includes a detailed overview of biomacromolecule bioactivity and properties Features chapters on research challenges, evolving applications, and future perspectives

An introduction to macromolecular chemistry, covering the structure of macromolecules, their properties, their applications, how they are made, and methods used for studying them. Includes discussion of synthetic materials as well as important biological entities. Physical and chemical aspects are addressed with a minimum of mathematics.

DSC is a straightforward, non-perturbing thermodynamic technique first developed in the early 1960s. The large number of parameters and the high sensitivity has made DSC one of the key calorimetric tools used for investigating thermodynamic properties of biopolymers, proteins, peptides and nucleic acids. There are numerous reviews covering the different macromolecular applications of DSC: this chapter will primarily focus on proteins and nucleic acids.

Provided here are the latest techniques of NMR as applied to the study of proteins, carbohydrates and nucleic acids. The first chapters are devoted to an introduction to NMR and parameters related to molecular structure and molecular interactions. NMR experiments from basic 1D to 2D, 3D and 4D, used in combination with isotopically labelled molecules, are described and a general strategy is presented for biomacromolecular structure determination. Subsequent chapters deal with more advanced principles and techniques and their applications to structural and dynamic processes involving biomacromolecules in solution. Advanced results on peptide, protein, oligosaccharide and nucleic acid structure and recognition are presented.

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.

High Resolution NMR of Macromolecules presents the development in the NMR study of polymers. This book discusses the exciting area of application of NMR to polymer science as the result of the more general accessibility of instruments of high magnetic field. Organized into 15 chapters, this book begins with an overview of the spectral analysis and the dependence of chemical shifts and J couplings on structure. This text then discusses the isomerism in polymer chains without special reference to NMR. Other chapters consider the interpretation of synthetic polymer spectra in terms of structure, stereochemical configuration, conformation, and chain growth mechanism. This book discusses as well the application of high resolution NMR to the study of nucleic acids, which has not been so well developed as that of polypeptides and proteins. The final chapter deals with biopolymers and their model compounds. This book is a valuable resource for chemists and research workers.

Examining the physical basis of the structure ofmacromolecules—proteins, nucleic acids, and theircomplexes—using calorimetric techniques Many scientists working in biology are unfamiliar with thebasics of thermodynamics and its role in determining molecularstructures. Yet measuring the heat of structural change a moleculeundergoes under various conditions yields information on theenergies involved and, thus, on the physical bases of theconsidered structures. Microcalorimetry of Macromolecule-soffers protein scientists unique access to this importantinformation. Divided into thirteen chapters, the book introduces readers tothe basics of thermodynamics as it applies to calorimetry, theevolution of the calorimetric technique, as well as howcalorimetric techniques are used in the thermodynamic studies ofmacromolecules, detailing instruments for measuring the heateffects of various processes. Also provided is general informationon the structure of biological macromolecules, proteins, andnucleic acids, focusing on the key thermodynamic problems relatingto their structure. The book covers: The use of supersensitive calorimetric instruments, includingmicro and nano-calorimeters for measuring the heat of isothermalreactions (Isothermal Titration Nano-Calorimeter), the heatcapacities over a broad temperature range (ScanningNano-Calorimeter), and pressure effects (Pressure PerturbationNano-Calorimeter) Two of the simplest but key structural elements: the α andpolyproline helices and their complexes, the α-helicalcoiled-coil, and the pyroline coiled-coils Complicated macromolecular formations, including small globularproteins, multidomain proteins and their complexes, and nucleicacids Numerous examples of measuring the ground state of proteinenergetics, as well as changes seen when proteins interact The book also reveals how intertwined structure andthermodynamics are in terms of a macromolecule's organization,mechanism of formation, the stabilization of its three-dimensionalstructure, and ultimately, its function. The first book to describemicrocalorimetric technique in detail, enough for graduate studentsand research scientists to successfully plumb the structuralmysteries of proteins and the double helix, Microcalorimetry ofMacromolecules is an essential introduction to using amicrocalorimeter in biological studies.

“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.

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.

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

[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 fundamen-

tals 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

Overall, the work described in this dissertation represents several approaches to the study of larger organic and biological systems using computational methods, with an overall aim of obtaining structural and/or mechanistic information from which we may verify theoretical methods, and predict future results.