

Apodization Effects In Fourier Transform Infrared

In the past few years it has become apparent that Fourier Transform infrared spectroscopy is developing into an excellent technique for solving some of the very difficult problems encountered in analytical chemistry. The applications of FT-IR include the detection and identification of chemical components separated by gas chromatography techniques, determination of low concentration components in a mixture, and problems which have energy limitations such as water samples, opaque samples and biological systems. The lectures presented in this volume will be utilized at the NATO Advanced Study Institute in Florence, Italy from August 31 to September 12, 1980. These lectures are divided into three main sections: Instrumentation and Theory, Techniques, and Applications. The first section includes a basic introduction to interferometry and the operating parameters. The Techniques section consists of several lectures on accessories used in FT-IR, software and data systems, and special handling techniques. The third section contains an abundance of information on the applications of the FT-IR technique to inorganic and organic molecules, polymers, biological systems, solids and to the determination of molecular structures and conformational analyses. The contents of this volume should provide the reader with the present applications in this field as well as an indication of possible future trends. In general the lectures are of a pedagogical nature and are not to be considered as review articles.

Algorithms for line finding, fitting spectra to Voigtian profiles, filtering, Fourier transforming, and spectrum synthesis are a basis for spectrum analysis tools from which complex signal-processing procedures can be constructed."

Co-published by the European Medical Imaging Technology e-Encyclopaedia for Lifelong Learning (EMITEL) consortium and supported by the International Organization for Medical Physics (IOMP), Encyclopaedia of Medical Physics contains nearly 2,800 cross-referenced entries relating to medical physics and associated technologies. Split into two convenient volumes, this textbook deals with Fourier analysis applications in optics, and in particular with its applications to diffraction, imaging, optical data processing, holography and optical communications. Fourier analysis is a universal tool that has found application within a wide range of areas in physics and engineering and this third edition has been written to help your students understand the complexity of a subject that can be challenging to grasp at times. Chapters cover foundations of scalar diffraction theory, Fresnel and Fraunhofer diffraction moving onto Wave-Optics Analysis of Coherent Optical Systems and Wavefront Modulation. Joseph Goodman's work in Electrical Engineering has been recognised by a variety of awards and honours, so his text is able to guide students through a comprehensive introduction into Fourier Optics.

Fundamentals of Fourier Transform Infrared Spectroscopy teaches the basics of FTIR spectroscopy to those new to the field and serves as an excellent reference for experienced users. This book explains difficult theoretical concepts using diagrams and easy-to-understand language with a minimum of complex mathematics. It contains a unique chapter on spectral data manipulation and a discussion of the 15 pitfalls of quantitative analysis. The comprehensive glossary provides quick and easy access to important FTIR terms.

A bestselling classic reference, now expanded and updated to cover the latest instrumentation, methods, and applications The Second Edition of Fourier Transform Infrared Spectrometry brings this core reference up to date on the uses of FT-IR spectrometers today. The book starts with an in-depth description of the theory and current instrumentation of FT-IR spectrometry, with full chapters devoted to signal-to-noise ratio and photometric accuracy. Many diverse types of sampling techniques and data processing routines, most of which can be performed on even the less expensive instruments, are then described. Extensively updated, the Second Edition: * Discusses improvements in optical components * Features a

full chapter on FT Raman Spectrometry * Contains new chapters that focus on different ways of measuring spectra by FT-IR spectrometry, including fourteen chapters on such techniques as microspectroscopy, internal and external reflection, and emission and photoacoustic spectrometry * Includes a new chapter introducing the theory of vibrational spectrometry * Organizes material according to sampling techniques Designed to help practitioners using FT-IR capitalize on the plethora of techniques for modern FT-IR spectrometry and plan their experimental procedures correctly, this is a practical, hands-on reference for chemists and analysts. It's also a great resource for students who need to understand the theory, instrumentation, and applications of FT-IR.

An introduction to practical IR and Raman spectroscopy. This interactive course shows newcomers the decisive and central steps in IR and Raman spectroscopy, together with their processing. Using the latest version of the packaged BRUKER software, users can manipulate the data to meet their own special requirements for further evaluation, allowing them to do without automatic processing or expert help. Furthermore, the CD-ROM contains a comprehensive library of spectra for comparing data results with model compounds. Unique in its successful interplay of text, software and pre-prepared data.

This book provides an introduction to design of biomedical optical imaging technologies and their applications. The main topics include: fluorescence imaging, confocal imaging, micro-endoscope, polarization imaging, hyperspectral imaging, OCT imaging, multimodal imaging and spectroscopic systems. Each chapter is written by the world leaders of the respective fields, and will cover: principles and limitations of optical imaging technology, system design and practical implementation for one or two specific applications, including design guidelines, system configuration, optical design, component requirements and selection, system optimization and design examples, recent advances and applications in biomedical researches and clinical imaging. This book serves as a reference for students and researchers in optics and biomedical engineering.

The evolution of silicon processing technologies towards greater reliance on internal gettering by oxygen precipitates has led to the need for greater reproducibility in the measurement of the interstitial oxygen content of silicon slices. This measurement is presently being carried out with the use of either Fourier-transform or dispersive infrared spectrophotometers. This paper concerns the investigation of the effects of changing the apodization function and beam geometry on the quantitative determination of oxygen in silicon by Fourier-transform spectrophotometers. The apodization functions used include the boxcar, cosine, Happ-Genzel, and triangular functions. The beam geometry is varied by placing apertures between the interferometer and the silicon specimen. The effects of beam polarization and detector nonlinearity were also investigated.

The field of material analysis has seen explosive growth during the past decades. Almost all the textbooks on materials analysis have a section devoted to the Fourier transform theory. For this reason, the book focuses on the material analysis based on Fourier transform theory. The book chapters are related to FTIR and the other methods used for analyzing different types of materials. It is hoped that this book will provide the background, reference and incentive to encourage further research and results in this area as well as provide tools for

practical applications. It provides an applications-oriented approach to materials analysis written primarily for physicist, Chemists, Agriculturalists, Electrical Engineers, Mechanical Engineers, Signal Processing Engineers, and the Academic Researchers and for the Graduate Students who will also find it useful as a reference for their research activities.

This volume contains the papers presented at the Seventh International Symposium on Acoustical Imaging and Holography. The meeting was held in Chicago, Illinois U.S.A. on August 30 - September 1, 1976. Since 1967 this series of conferences has served as an international forum for bringing together the many different facets of the ultrasonic visualization field. Medical diagnosis, nondestructive testing, underwater viewing, seismic the mapping, and acoustic analytical microscopy are examples of broad range applications of this technology. Thoroughly broad in scope, the common denominator that binds this volume together is the application of engineering and physics disciplines to the creation of images by means of ultrasonic waves. Efforts on the part of the program committee and their institutions are greatly appreciated, They are acknowledged below: Newell Booth Navelex Arlington, Va. Byron B. Brendan Holosonics, Inc. Richland, Wa. Reginald C. Eggleton ICFAR-IU Medical School Indianapolis, In. Stanford Research Institute Philip S. Green Menlo Park, Ca. Henry Karplus Argonne National Labs Argonne, Il. J.D. Meindl Stanford University Stanford, Ca. Alexander F. Metherell University of California Irvine, Ca. R.K. Mueller University of Minnesota Stillwater, Mn. Frederick L. Thurstone Duke University Durham, N.C. vii viii PREFACE Glen Wade University of California Santa Barbara, Ca. Keith Wang University of Houston Houston, Tx.

Advances in Imaging and Electron Physics merges two long-running serials-Advances in Electronics and Electron Physics and Advances in Optical and Electron Microscopy. This series features extended articles on the physics of electron devices (especially semiconductor devices), particle optics at high and low energies, microlithography, image science and digital image processing, electromagnetic wave propagation, electron microscopy, and the computing methods used in all these domains. Includes grey systems and grey information Discusses Phase diversity Recent developments in the imaging of magnetic domains Explores stochastic deconvolution over groups

Protein pharmaceuticals form a fast-growing category in the arsenal of drugs. This book explores the nature of different analytical techniques and the way in which they are related to pharmaceutical proteins. In addition to serving the analytical chemist, this book is needed by the formulation scientist who is responsible for design and formulation of a pharmaceutical protein that can be monitored during production and over time.

This volume is a collection of contributions to the FT-IR Workshop held under the auspices of the Spectroscopy Society of Canada and organized by Professor Theophile Theophanides, Director of the Workshop. The gathering of leading spectroscopists and researchers at Gray Rocks to discuss .Fourier Transform

Infrared Spectroscopy was the occasion of the 29th Annual Conference of the Spectroscopy Society of Canada. The pleasant surroundings of Gray Rocks, St-Jovite, Quebec, Canada contributed most positively to the success of the two-day Workshop held September 30, October 1, 1982. The preliminary program and the proceedings were distributed at the Workshop by Multiscience Publications Ltd. The publication of this volume provides the occasion to thank all the contributors for kindly accepting to lecture at the Workshop and for their collaboration. I thank Mr. Al. Dufresne for accepting to act as manager of the Workshop and Mrs. Susane Dufresne secretary of the Workshop for patiently contacting all the participants and for making the necessary arrangements of registration and accommodation.

One of major challenges facing Earth's science in the next decade and beyond is the development of an accurate long term observational data set to study global change. To accomplish this, a wide range of observations will be required to provide both new measurements, not previously achievable and measurements with a greater degree of accuracy and resolution than the ones which are presently and currently available. Among the parameters that are currently retrieved from satellite vertical sounding observations, temperature and moisture profiles are the most important for the description of the thermodynamic state of the medium. Other parameters, like those describing the cloud fields, the surface state or the conditions close to the surface are also key parameters for meteorology and climatology. A new generation of high spectral atmospheric sounders in the infrared has recently been designed to provide both new and more accurate data about the atmosphere, land and oceans for application to climate studies. Among the important observations that these instruments should contribute to the climate data set are day and night global measurements of: atmospheric temperature profiles; relative humidity profiles; cloud field parameters; total ozone burden of the atmosphere; distribution of minor atmospheric gases (methane, carbon monoxide and nitrous oxide).

NMR spectroscopy has proven to be a powerful technique to study the structure and dynamics of biological macromolecules. *Fundamentals of Protein NMR Spectroscopy* is a comprehensive textbook that guides the reader from a basic understanding of the phenomenological properties of magnetic resonance to the application and interpretation of modern multi-dimensional NMR experiments on ¹⁵N/¹³C-labeled proteins. Beginning with elementary quantum mechanics, a set of practical rules is presented and used to describe many commonly employed multi-dimensional, multi-nuclear NMR pulse sequences. A modular analysis of NMR pulse sequence building blocks also provides a basis for understanding and developing novel pulse programs. This text not only covers topics from chemical shift assignment to protein structure refinement, as well as the analysis of protein dynamics and chemical kinetics, but also provides a practical guide to many aspects of modern spectrometer hardware, sample preparation, experimental set-up, and data processing. End of chapter exercises are included to emphasize important concepts. *Fundamentals of Protein NMR Spectroscopy* not only offer students a systematic, in-depth, understanding of modern NMR spectroscopy and its application to biomolecular systems, but will also be a useful reference for the experienced investigator.

19 plenary lectures and 203 poster papers presented at the 10th International Conference of Fourier Transform Spectroscopy in Budapest 1995 give an overview on the state-of-the-art of this technology and its wide range of applications. The reader will get information on any aspects of FTS including the latest instrumental developments, e.g. in diode array detection, time resolution FTS, microscopy and spectral mapping, double modulation and two-

dimensional FTS.

Written by an international panel of professional and academic peers, the book provides the engineer and technologist working in research, development and operations in the food industry with critical and readily accessible information on the art and science of infrared spectroscopy technology. The book should also serve as an essential reference source to undergraduate and postgraduate students and researchers in universities and research institutions. Infrared (IR) Spectroscopy deals with the infrared part of the electromagnetic spectrum. It measure the absorption of different IR frequencies by a sample positioned in the path of an IR beam. Currently, infrared spectroscopy is one of the most common spectroscopic techniques used in the food industry. With the rapid development in infrared spectroscopic instrumentation software and hardware, the application of this technique has expanded into many areas of food research. It has become a powerful, fast, and non-destructive tool for food quality analysis and control. Infrared Spectroscopy for Food Quality Analysis and Control reflects this rapid technology development. The book is divided into two parts. Part I addresses principles and instruments, including theory, data treatment techniques, and infrared spectroscopy instruments. Part II covers the application of IRS in quality analysis and control for various foods including meat and meat products, fish and related products, and others.

*Explores this rapidly developing, powerful and fast non-destructive tool for food quality analysis and control *Presented in two Parts -- Principles and Instruments, including theory, data treatment techniques, and instruments, and Application in Quality Analysis and Control for various foods making it valuable for understanding and application *Fills a need for a comprehensive resource on this area that includes coverage of NIR and MVA

Details theory, methods, and successful application of NMR technology for chemists, chemical engineers, and biochemists those with specialized knowledge of NMR spectroscopy and those who want to catch up with the spectacular evolution of the field during the last decade.

Reviews one-dimensional NMR,

This new book describes modern terahertz (THz) systems and devices and presents practical techniques for accurate measurement with an emphasis on evaluating uncertainties and identifying sources of error. This is the first THz book on the market to address measurement methodologies and issues -- perfect for practitioners and aspiring practitioners wishing to learn good measurement practice and avoid pitfalls. This book provides a brief review of different THz systems and devices, followed by chapters detailing the measurement issues encountered in using each of the main types of THz systems, and a guide to performing measurements rigorously. Particular attention is given to evaluating uncertainties, and recognizing potential sources of errors. The main focus is on time-domain spectroscopy, by far the most widely used technique. Readers are also presented with examples of applications with the emphasis on utility, both in research and in industry.

This book covers both the mathematics of inverse problems and optical systems design, and includes a review of the mathematical methods and Fourier optics. The first part of the book deals with the mathematical tools in detail with minimal assumption about prior knowledge on the part of the reader. The second part of the book discusses concepts in optics, particularly propagation of optical waves and coherence properties of optical fields that form the basis of the computational models used for image recovery. The third part provides a discussion of specific imaging systems that illustrate the power of the hybrid computational imaging model in enhancing imaging performance. A number of exercises are provided for readers to develop further understanding of computational imaging. While the focus of the book is largely on optical imaging systems, the key concepts are discussed in a fairly general manner so as to provide useful background for understanding the mechanisms of a diverse range of imaging modalities.

MRI from Picture to Proton presents the basics of MR practice and theory in a

unique way: backwards! The subject is approached just as a new MR practitioner would encounter MRI: starting from the images, equipment and scanning protocols, rather than pages of physics theory. The reader is brought face-to-face with issues pertinent to practice immediately, filling in the theoretical background as their experience of scanning grows. Key ideas are introduced in an intuitive manner which is faithful to the underlying physics but avoids the need for difficult or distracting mathematics. Additional explanations for the more technically inquisitive are given in optional secondary text boxes. The new edition is fully updated to reflect the most recent advances, and includes a new chapter on parallel imaging. Informal in style and informed in content, written by recognized effective communicators of MR, this is an essential text for the student of MR.

This book contains the proceedings of the Symposium on FT-IR Characterization of Polymers, which was held under the auspices of the Division of Polymer Chemistry, American Chemical Society (ACS) during the annual ACS meeting in Philadelphia, August, 1984. The content of each paper has been substantially extended from the papers presented during the conference. Due to the accidental, irrecoverable loss of the entire contents of the book by the computer system used for editorial purposes, the publication of this book has been delayed more than one year over the initial scheduled date. It has been a continuous, frustrating experience for the editor as well as for the authors. An extended Murphy's law, -anything can go wrong goes multiply wrong- has been demonstrated in editor's office. It necessitated, otherwise unnecessary, repeated proof reading during which time the editor had valuable experience ~n familiarizing himself with each paper much more than usual. The papers in this book are state-of-the-art even after such a delay. It is the authors pride and integrity toward the quality of each paper that makes the value of this book long lasting, while responsibility of the loss of any timeliness rests at the editor's hand. For the purpose of official records, submission and acceptance dates must be stated. All papers had been submitted by September, 1984, and had been accepted for publication by November, 1984, after the critical review processes. The final and largest volume to complete this four-volume treatise is published in response to the intense commercial and research interest in Fourier Transform Interferometry. Presenting current information from leading experts in the field, Volume 4 introduces new information on, for example, applications of Diffuse Reflectance Spectroscopy in the Far-Infrared Region. The editors place emphasis on surface studies and address advances in Capillary Gas Chromatography - Fourier Transform Interferometry. Volume 4 especially benefits spectroscopists and physicists, as well as researchers in physical, analytical, and surface chemistry. FROM THE PREFACE: Several reasons can be cited for the need to publish Volume 4 in this treatise. First, interest in Fourier transform interferometry (FT-IR) has continued. The number of commercial manufacturers of FT-IR instrumentation has increased, reflecting the increase in demand for such instrumentation. The main thrust in FT-IR instrumentation has

focused on applications, and many techniques using FT-IR instrumentation have been generated in order to solve problems heretofore unsolvable. The interest in surfaces relative to catalysts, polymers, and electrical conductors has escalated. Three chapters in Volume 4 are devoted to surfaces. Second, the great acceptance of Volumes 1 through 3 and the demand to continue the treatise have induced us to publish Volume 4. The present volume contains nine chapters, making it the largest of the four volumes. Chapter 1 deals with infrared data processing techniques. Chapter 2 concerns itself with circular dichroism*^{b1}FT-IR. Chapter 3 presents an update on GC*^{b1}FT-IR, a rapidly moving field. Chapter 4 deals with the combination of FT-IR and thermal analysis. Advances in coal analyses using FT-IR are presented in Chapter 5. Reflectance studies are highlighted in Chapters 6, 7, and 8. Chapter 6 deals with structural characterizations made with Langmuir*^{b1}Blodgett monolayers. Also in Chapter 6, the extension of DRIFT into the far-infrared region is shown to be feasible and valuable. Reflection*^{b1}absorption surface studies (FT-IRRAS) are discussed in Chapter 8. Chapter 9 updates us on photoacoustic spectroscopy*^{b1}FT-IR. All of the contributions are made by working experts in these areas. It is the hope that Volume 4 continues in the spirit of the purpose of these volumes, namely, to keep the scientific communities abreast of new developments in FT-IR as applied to chemical systems.

CSIE2012 is an integrated conference concentrating its focus on Computer Science and Information Engineering . In the proceeding, you can learn much more knowledge about Computer Science and Information Engineering of researchers from all around the world. The main role of the proceeding is to be used as an exchange pillar for researchers who are working in the mentioned fields. In order to meet the high quality of Springer, AISC series, the organization committee has made their efforts to do the following things. Firstly, poor quality paper has been refused after reviewing course by anonymous referee experts. Secondly, periodically review meetings have been held around the reviewers about five times for exchanging reviewing suggestions. Finally, the conference organizers had several preliminary sessions before the conference. Through efforts of different people and departments, the conference will be successful and fruitful.

NMR spectroscopy is the most valuable and versatile analytical tool in chemistry. While excellent monographs exist on high-resolution NMR in liquids and solids, this is the first book to address multidimensional solid-state NMR.

Multidimensional techniques enable researchers to obtain detailed information about the structure, dynamics, orientation, and phase separation of solids, which provides the basis of a better understanding of materials properties on the molecular level. Dramatic progress-much of it pioneered by the authors-has been achieved in this area, especially in synthetic polymers. Solid-state NMR now favorably competes with well-established techniques, such as light, x-ray, or neutron scattering, electron microscopy, and dielectric and mechanical

relaxation. The application of multidimensional solid-state NMR inevitably involves use of concepts from different fields of science. This book also provides the first comprehensive treatment of both the new experimental techniques and the theoretical concepts needed in more complex data analysis. The text addresses spectroscopists and polymer scientists by treating the subject on different levels; descriptive, technical, and mathematical approaches are used when appropriate. It presents an overview of new developments with numerous experimental examples and illustrations, which will appeal to readers interested in both the information content as well as the potential of solid-state NMR. The book also contains many previously unpublished details that will be appreciated by those who want to perform the experiments. The techniques described are applicable not only to the study of synthetic polymers but to numerous problems in solid-state physics, chemistry, materials science, and biophysics. Key Features

- * Presents original theories and new perspectives on scattering techniques *
- Provides a systematic treatment of the whole subject *
- Gives readers access to previously unpublished material *
- Includes extensive illustrations

Trends in Analytical Chemistry, Volume 5 focuses on the advancements of processes, technologies, automation, and applications of analytical chemistry. The selection first offers information on graphics programming for the IBM PC using FORTRAN, PASCAL, and C, including graphics hardware system software, assembly language routines, and high level interface. The text then elaborates on the place of affinity chromatography in the production and purification of biomolecules from cultured cells and zone electrophoresis in open-tubular capillaries. Discussions focus on column and instrument design, applications, affinity chromatography in protein production from cells, and economic aspects of production and purification of proteins from cell cultures. The manuscript takes a look at polarographic and voltammetric techniques and their application to the determination of vitamins and coenzymes and activation analysis with charged particles. Topics include accelerators, principle of charged particle activation analysis, and applications. The text then examines the development of microbiological and immunological assays for antibiotics and the use of computer system for a small analytical research laboratory. The book is a dependable reference for readers interested in the trends in analytical chemistry.

In virtually all types of experiments in which a response is analyzed as a function of frequency (e. g. , a spectrum), transform techniques can significantly improve data acquisition and/or data reduction. Research-level nuclear magnetic resonance and infra-red spectra are already obtained almost exclusively by Fourier transform methods, because Fourier transform NMR and IR spectrometers have been commercially available since the late 1960-s. Similar transform techniques are equally valuable (but less well-known) for a wide range of other chemical applications for which commercial instruments are only now becoming available: for example, the first commercial Fourier transform mass spectrometer was introduced this year (1981) by Nicolet Instrument Corporation.

The purpose of this volume is to acquaint practicing chemists with the basis, advantages, and applica of Fourier, Hadamard, and Hilbert transforms in chemistry. For tions almost all chapters, the author is the investigator who was the first to apply such methods in that field. The basis and advantages of transform techniques are described in Chapter 1. Many of these aspects were understood and first applied by infrared astronomers in the 1950-s, in order to improve the otherwise unacceptably poor signal-to-noise ratio of their spec tra. However, the computations required to reduce the data were painfully slow, and required a 1 arge computer.

Preceded by Magnetic resonance imaging: physical principles and sequence design / E. Mark Haacke ... [et al.]. c1999.

Provides an overview of Fiber Bragg Gratings (FBGs), from fundamentals to applications Evaluates the advantages and disadvantages of particular applications, methods and techniques Contains new chapters on sensing, femtosecond laser writing of FBGs and poling of glass and optical fibers Includes a special version of the photonic simulator PicWave(tm), allowing the reader to make live simulations of many of the example devices presented in the book. This fully revised, updated and expanded second edition covers the substantial advances in the manufacture and use of FBGs in the years since the publication of the pioneering first edition. It presents a comprehensive treatise on FBGs and addresses issues such as the merits of one solution over another; why particular fabrication methods are preferred; and what advantages a user may gain from certain techniques. Beginning with the principles of FBGs, the book progresses to discuss photosensitization of optical fibers, Bragg grating fabrication and theory, properties of gratings, specific applications, sensing technology, glass poling, advances in femtosecond laser writing of Bragg gratings and FBG measurement techniques. In addition to material on telecommunications usage of FBGs, application areas such as fiber lasers and sensors are addressed in greater detail. This special version of Picwave is limited to modelling only the passive fibre devices covered in this book. However the full PicWave package is capable of modelling other non-linear and active devices such as laser diodes and SOAs as discussed in Chapter 8. More information about PicWave can be found at www.photond.com/products/picwave.htm. In addition to researchers, scientists, and graduate students, this book will be of interest to industrial practitioners in the field of fabrication of fiber optic materials and devices. Raman Kashyap, Canada Research Chair holder on Future Photonics Systems, and Professor at École Polytechnique, University of Montréal since 2003, has researched optical fibers and devices for over 30 years. He pioneered the fabrication of FBGs and applications in telecommunications and photonics. Provides an overview of Fiber Bragg Gratings (FBGs), from fundamentals to applications Evaluates the advantages and disadvantages of particular applications, methods and techniques Contains new chapters on sensing, femtosecond laser writing of FBGs and poling of glass and optical fibers Includes a special version of the

photonic simulator PicWave(tm), allowing the reader to make live simulations of many of the example devices presented in the book

We are pleased to present Volume 9 of our highly successful series, which now celebrates 12 years of providing the magnetic resonance community with topical, authoritative chapters on new aspects of biological magnetic resonance. As always, we try to present a diversity of topic coverage in each volume, ranging from applications of in vivo magnetic resonance to more fundamental aspects of electron spin resonance and nuclear magnetic resonance. Philip Yeagle presents an eagerly awaited chapter on ³¹P NMR studies of membranes and membrane protein interactions. Alan Marshall has contributed two chapters to the volume: one, with Jiejun Wu, describes magnetic resonance studies of 5S-RNA as probes of its structure and conformation; the second

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