

of human papilloma virus related cancers, prostate cancer and pancreatic cancer are compiled by M. A. Curran and B. S. Glisson from the University of Texas MD Anderson Cancer Centre at Houston.

There are several on-going clinical trials to evaluate the safety, feasibility and efficacy of immunotherapy using neoadjuvant checkpoint inhibitors for early stage non-small cell lung cancer. S. Rosner, J. E. Reuss and P. M. Forde from Johns Hopkins University School of Medicine at Baltimore summarize these studies and provide the rationale for neoadjuvant immunotherapy. Early results from clinical trials with neoadjuvant PD-1 blockade are promising for provisionally including the strategy in standard clinical care.

CD3 bispecifics are those drugs which recruit and redirect T cells to kill tumour cells. They cross link a CD3 component of the T cell receptor with a tumour associated antigen and bypass the human leucocyte antigen. Their action is also independent of tumour mutational load. They are useful in combination with check point blockers. A large number of CD3 bispecific antibodies are in clinical development. Among them, blinatumomab has been approved for treatment of relapsed or refractory B cell acute lymphocytic leukemia. Several others are being investigated for both solid and haematologic malignancies. In their article on CD3 bispecifics, R. A. Clynes and J. R. Desjarlais from Xencor Inc. at California also explain the management of cytokine release syndrome and neurotoxicity associated with the use of CD3 bispecifics.

Novel therapeutic agents for multiple myeloma are mitogen activated protein kinase inhibitors, protease inhibitors, drugs that target anti apoptotic pathways and adoptive cellular immunotherapy. C. Kunacheewa and R. Z. Orlowski of University of Texas MD Anderson Cancer Centre at Houston apprise on recent regulatory approvals for small molecules and monoclonal antibodies and outcomes of recent trials of novel agents for multiple myeloma.

C. K. Kuhl of RWTH Aachen University in Germany deliberates on the current controversies on breast cancer screening, drawbacks of mammographic screening and describes the rationale and concept of abbreviated breast magnetic resonance imaging (MRI). He suggests that abbreviated MRI has a broad range of clinical applications which include

screening for liver metastases in patients with cirrhosis, to rule out musculoskeletal injuries in the emergency room and to avoid sedation for MRI in children. Abbreviated MRI protocols are designed to answer specific clinical questions resulting in reduction in the time for image acquisition and interpretation.

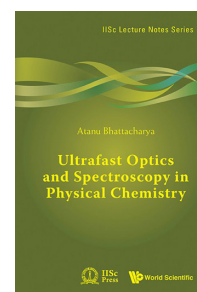
Three reviews relate to prostate cancer. One of them is an update on prostate magnetic resonance imaging for lesion detection and local staging. Another considers preclinical development of small molecule radiotracers for positron emission tomography imaging to target prostate specific membrane antigen (PSMA) and the clinical utility of these agents for imaging patients with prostate cancer. The authors also remark on the potential role of PSMA targeted agents for imaging non-prostate malignancies. The third review on prostate cancer examines the broad landscape of therapy for metastatic castration resistant prostate cancer and metastatic hormone sensitive prostate cancer. Better knowledge of the different genomic pathways of these cancers and advanced functional imaging tools have aided the development of biomarkers and better treatment options in the management of patients with advanced prostate cancer.

Other reviews in the book relate to (i) progress in the development of Zika virus vaccines; (ii) recent advancements and current status of living donor liver transplantations in the USA; (iii) mechanisms of action, metabolic effects, risk reduction in renal and cardiovascular outcomes, results of safety trials and safety concerns of sodium glucose cotransporter 2 inhibitors; (iv) opportunities and challenges in mutation repair in patients with Duchenne muscular dystrophy (DMD) by CRISPR/CAS-9 mediated genome editing and the lessons learnt from studies on gene editing strategies in DMD; (v) the novel approaches that employ globin gene addition and gene editing to correct sickle cell disease mutation and enhance production of foetal haemoglobin through genetic control; (vi) the state of the anti-sense oligonucleotide technology for treatment of genetic diseases, and (vii) the differences between Asia and the Western countries in the causes, screening programmes, diagnostic methods and treatment strategies such as the use of minimally invasive techniques and peri-operative adjuvant therapies for gastric adenocarcinoma.

In summary, the latest volume of *Annual Reviews of Medicine* has concise yet comprehensive reviews which provide recent insights on pathogenesis and evolving strategies to improve diagnosis and treatment of several diseases. All articles have prefatory synopsis of the prior knowledge on the topics reviewed. There are clear illustrations of concepts and pertinent references. The book is thus illuminating and valuable for both physicians as well as biomedical scientists.

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**Ultrafast Optics and Spectroscopy in Physical Chemistry.** Atanu Bhattacharya. World Scientific Publishing Co. Pte. Ltd, 5 Toh Tuck Link, Singapore 596224. 2018. 292 pages. Price: US\$ 58 (soft cover)/US\$ 118 (hard cover).

The new arrival on the Indian and global scene of education in ultrafast science is a refreshing take on the subject from a relatively young author. Atanu Bhattacharya's book on ultrafast science is a welcome contribution to the existing body of instructional literature. There can be no better time than now to emphasize the dynamics and nature of femtosecond science which is heralded by the Nobel prize 2018 given in part to the inventors of the chirped pulse amplification technique, the most essential amplification scheme in vogue in most modern day ultrafast lasers producing such pulses.

In spite of excellent texts by Akhmanov, Ruliere *et al.*, Diels and Rudolph, A Weiner and the ongoing one by R. Trebinno, Atanu's fresh take on the subject is relevant for several reasons. This book presents femtosecond laser pulses with chemical physics, or molecular science, as the key application. This may misleadingly sound like a limited take on this

## BOOK REVIEWS

vast subject, but the presence of a context helps a reader to find purpose very quickly and diversify or digress, if needed. Indeed, the first prominent application of these laser pulses was to study molecules, which, again, was recognized by a Nobel prize to A. Zewail. The next important reason that one finds this book very relevant is a geographical context. Pedagogy and curricula are also shaped by local education systems and practices. The author, with formative education in India and a global research experience, understands very well what his students as well as that of his local peers know and understand, learn and believe. This makes his exposition relevant for teaching this as a subject at the masters' or graduate level in India.

This book is an introduction to ultrafast optics and spectroscopy for use with any introductory college/university course in optics, spectroscopy, or experimental physical chemistry or chemical physics of the kind usually taken by undergraduate and graduate students in physical chemistry. Contents of this book revolve around the basic concepts which are essential to develop understanding of ultrafast optics and spectroscopy. The level of mathematics is suitably selected in the book so that any student with basic knowledge of algebra, differentiation and integration would comfortably go through the book. Significant discussion on the meaning of mathematical expressions is included. Many example-figures have been included to portray the concept hidden in a mathematical expression. This will help beginners to build a virtual ultrafast spectroscopy lab in their imagination/mind.

The chapters in this book are seamlessly interconnected. The design, construction and implementation of optics in conventional femtosecond lasers are discussed after the presentation of propagation of ultrafast pulses through nonlinear and dispersive medium because many nonlinear and dispersive effects are utilized in the construction of ultrafast laser. Similarly, kinetic model of ultrafast spectroscopy is presented after presenting pulse measurement techniques because the idea of 'time delay zero' is introduced only in the pulse measurement technique. The first couple of chapters of this book nicely introduce the concept of stroboscopic photography and realization of optical pulses from plane wave. Characteristics of transform-

limited and chirped pulse are discussed in detail keeping new students in mind. Definition of intensity of a pulse is also given and representation of short pulses in both time and frequency domains are discussed. First two chapters essentially develop the basic concepts and terminologies which will be used throughout the book.

Propagation of ultrafast pulses is discussed in chapters 3 and 4. Here, both nonlinear optical effects and dispersive effects are discussed. Nonlinear effects include second order, third order and higher order effects, including sum frequency generation, difference frequency generation, white light generation, polarization gating, transient grating and self-phase modulation. Phase matching conditions are discussed to explain efficiency of the nonlinear frequency conversion process. Dispersive effects, on the other hand, include group velocity dispersion, group delay dispersion and dispersion compensation. In the subsequent chapters, transverse electromagnetic modes of femtosecond laser beams and the characteristics of Gaussian beams are worked out in some detail. The fundamentals of laser follow this discussion, this is usually a good pedagogic practice. Longitudinal modes and mode locking are quickly introduced to retain the book's focus on femtosecond laser pulses. The key aspects of modern femtosecond lasers, the laser oscillator, the stretcher, the amplifier and the compressor required for generating pulses of sufficient energy are succinctly presented. No book on femtosecond or ultrafast physics is complete without the important discussion on pulse measurement techniques. Chapter 7 discusses autocorrelation-based techniques and frequency resolved optical gating methods. A nice aspect of this book, from the perspective of being used as a teaching and instruction resource is the set of elegant mathematical derivations related to these methodologies. This book specializes in ultrafast spectroscopic techniques which are presented in chapter 8 and the related kinetic models are presented in chapter 9. The techniques surveyed with sufficient examples include time resolved single photon counting (TCSPC), fluorescence up-conversion, transition absorption spectroscopy, transient grating spectroscopy and femtosecond stimulated Raman spectroscopy. Furthermore, the essentials of pump-probe response

functions are introduced using rate equations with details of many features of transient spectra, including the role of an error function. This is followed by a discussion on the quantum mechanical model of ultrafast spectroscopy and interaction of matter with short pulse using perturbation theory. Advanced topics such as conical intersections and their role in ultrafast photophysics and photochemistry, ultrafast processes in solid state systems, plasmon decay and carrier dynamics in semiconductor and ultrafast processes in biomolecules and transition metal complexes are discussed in the final chapters of this book.

In summary, the author begins with a gentle introduction to femtosecond laser pulses without presuming too much background knowledge on the part of the reader. While presenting both the conceptual and rigorous aspects of this development in sufficient details, he moves on to various other aspects. The illustrations in this book classic, pedagogically important plots and figures presented in sufficient number. Through this a student should be able to find adequate information which will support a regular lecture course, especially in the Indian context, but surely anywhere in the world this subject is taught. The sections on using such pulses for photophysics or photochemistry are the best part. These are written drawing the author's own experience in this area, and this is very apparent – every book should have an individuality and this is where the current work finds its home zone. While the merits of this book are not limited to these alone, one could in future editions hope to see further exercises and problems added to this literature which, after all, finds its origins in the lecture series of the Indian Institute of Science. Thus, we may see that this work on femtosecond science should quickly be adapted in instruction and research a good reference.

Many congratulations to Dr Atanu Bhattacharya for successfully authoring this book scripted landscape of femtosecond science, which is dynamic and moves on ultrafast!

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