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BOOK REVIEWS

Two-Dimensional Optical Spectroscopy. By Minhaeng Cho (Korea University, Seoul). CRC Press (an imprint of Taylor & Francis Group): Boca Raton, FL.2009. xvi + 378 pp. $139.95. ISBN 978-1-4200-8429-0.

This is the first book dedicated exclusively to two-dimensional nonlinear optical spectroscopy and is a much needed contribution to the field. The technique uses multiple ultrafast laser pulses—UV through infrared—for studying a diverse range of phenomena, from biomolecular structure and dynamics to exciton dynamics in semiconductors. It has garnered a great deal of interest in recent years and has become remarkably well developed as a result. The timing of the book is ideal.

Overall, the book is carefully thought-out and organized. Considering the complexity of the technique with its numerous variants and applications, this is a noteworthy achievement. Cho does an exceptional job of paring down the material into its key components. Along with well-chosen examples, the material is presented in a logical and concise manner. To be clear, the book is not merely a collection of independent subtopics; each chapter is a unique body of work that flows naturally from those that precede it. Those new to the field will find this approach appealing. In addition, the instructive style does not sacrifice rigor for the seasoned practitioner and each chapter can be referenced independently.

One of the strengths of the book is its use of real-world examples to illustrate the practical application of the underlying theory. In nonlinear optical spectroscopy, there is often a large disconnect separating the two—a firm understanding of the theory does not imply the ability to utilize it. Cho recognizes this and attempts to bridge the gap by striking a suitable balance. Although the emphasis of the book is still heavily weighted toward theory, application and interpretation are always taken into consideration. Personally, I would also like to have seen a chapter or two on experimental methods. Two-dimensional optical spectroscopy is not a "turnkey" technique. The experiment requires a nuanced approach and considerable proficiency in ultrafast spectroscopic procedures. This omission does not diminish the value of the book in any way; however, its inclusion would have rounded it out quite nicely.

According to the Preface, the book is intended to be a self-contained resource requiring "the usual undergraduate background knowledge of quantum mechanics, electromagnetic theory, spectroscopy, statistical mechanics, and physical chemistry." However, I feel that some introduction to nonlinear optical spectroscopy should be added to that list. Without prior exposure, a reader is not likely to fully appreciate the book's content. The introductory chapters simply do not provide the depth necessary for a thorough understanding of the underlying principles. Although well written, the introductory chapters are not a suitable replacement for a more comprehensive treatment. To be fair, this is a double-edged sword: without these chapters, the book would be considered incomplete; on the other hand, if they were developed further, the focus of the book would change and it would become a textbook on nonlinear optical spectroscopy. Overall, the coverage in Cho's book is appropriate.

At times, the language can be awkward. I found myself occasionally having to go back and reread a sentence to obtain its intended meaning. This was a minor distraction and did not detract from the quality of the book as a whole. Unfortunately, it did sometimes undermine an otherwise elegantly presented thought.

Overall, I highly recommend this book. It presents a concise, yet thorough, overview of two-dimensional optical spectroscopy. The book is a valuable resource for experts and nonexperts alike. To the latter, it provides a comprehensive introduction; to the former, it serves as an up-to-date reference source summarizing the current state-of-the-art. In short, it is poised to become *the* standard text in two-dimensional optical spectroscopy.

Eric B. Brauns, *University of Idaho*

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