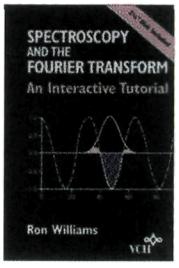
Fourier Transform for Beginners



Spectroscopy and the Fourier Transform: An Interactive Tutorial
Ron Williams
VCH
220 East 23rd St.
New York, NY 10010-4606
1995, 102 pp., $69.95

Because the Fourier transform is an integral part of modern IR and NMR spectroscopy and the basis for an important technique in MS, a basic understanding of the Fourier transform and its use in spectroscopy has become essential for students and practitioners of analytical chemistry and particularly analytical spectroscopy. Unfortunately, the most often cited books devoted specifically to the Fourier transform are primarily designed as advanced mathematics or engineering texts. These books lack a connection to spectroscopy and contain a level of mathematical detail that can make them unattractive to a chemistry audience. Similarly, books devoted to Fourier transform spectroscopy techniques often give only a superficial treatment of the mathematics and properties of the Fourier transform.

In *Spectroscopy and the Fourier Transform: An Interactive Tutorial*, Ron Williams has written a compact, accessible introduction to the Fourier transform and its connection to spectroscopy. As the title states, the book is a tutorial designed to be used in conjunction with spreadsheet calculations on a personal computer. A diskette with the completed spreadsheets in Microsoft Excel format is included. The hardcover book is even produced with a spiral binding, allowing it to lie flat when open and thereby facilitating its role as a companion to the computer program.

Chapters 1 to 5 lead the reader step-by-step through the calculations, which begin with the generation of simple waveforms and progress to more advanced calculations. The goal is to paint a conceptual picture of the Fourier transform that is reinforced by simple calculations. In this regard, the book clearly fills a niche. Formulas are provided in spreadsheet notation, thereby making the spreadsheet easy to use at each step in the presentation. The book relies on plotting the results of the spreadsheet calculations; most of the plots are reproduced in the text to allow the reader to confirm the spreadsheet results.

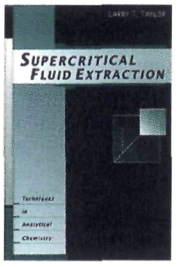
The material covered should be judged in light of the book's introductory nature. The book does not attempt to provide an exhaustive and mathematically detailed presentation. Nevertheless, the essential topics of sampling theory, aliasing, convolution, cross-correlation, autocorrelation, and Fourier filtering are demonstrated. This book is a bridge to the more advanced texts; the explanations are clear, and I judge the level of the presentation to be appropriate for an advanced undergraduate. It is suitable for self-study or for an instrumental analysis laboratory or lecture course.

Following the introduction to Fourier transform calculations, Chapters 6 to 8 connect the mathematical concepts to Fourier transform approaches in IR spectroscopy, NMR spectroscopy, and MS. Although these chapters are short, they convey the essential elements of how the Fourier transform becomes an integral part of the spectral measurement. This material can provide an effective bridge to the many specialized books on individual spectroscopic techniques.

My only significant criticism of the book is its price. At $69.95, it is too expensive for students to purchase as a companion text to an undergraduate course. Similarly, someone seeking self-study might be wiser to purchase one of the more comprehensive advanced texts at about the same price. Thus, although the author has done a fine job making the material accessible to the novice, the book's price prevents me from giving it an unconditional recommendation.

Reviewed by Gary Small, Ohio University

Practicalities of SFE



Supercritical Fluid Extraction
Larry T. Taylor
John Wiley & Sons
605 Third Ave.
New York, NY 10158
1996, 181 pp., $49.95

Supercritical fluid extraction (SFE) is a technique with lots of potential that has not yet been matched by its actual performance. A fairly small group of active practitioners, including the author of this book, has striven mightily to demonstrate that SFE can be done successfully. The present slim volume gives a thoroughly practical overview of ana-

lytical SFE. Indeed, the book is so practical that there are only about five equations to be found (the first of which contains a major typographical error).

The lack of quantitative theory may be regarded as a limitation of the book, but like many other separation techniques, a little SFE theory goes a long way if your job is to quickly develop a method to separate A from B. In any case, there is no theory of solutions for liquid solvents, let alone supercritical fluids, that allows prediction of which solvent or set of conditions to use for a specific extraction. However, supercritical fluids do possess certain unique properties, an understanding of which facilitates starting off in the right direction in developing an SFE method.

The basic properties of supercritical fluids (mainly supercritical CO_2, reflecting its predominant use in practice) that affect their use as solvents are considered with more confidence in the three chapters concerned with practical SFE than in the chapter supposedly devoted to this topic. The author is well-qualified in these areas, having been responsible for many of the basic studies in SFE restrictors, collectors, and procedures. These chapters are laid out clearly and methodically and should be studied closely by anyone who wants to get started on a recently obtained SFE instrument. As such, the book is ideally suited as a text for a short training course in SFE, if not for an advanced course in analytical separations.

Numerous selected applications are examined in some detail in the final chapter. It well meets the objective of practicality of the "Techniques in Analytical Chemistry Series", of which it is the most recent title. The work is well-referenced (through 1994), has many useful tables of data, and contains a helpful index.

Reviewed by David C. Locke, CUNY–Queens College

BOOKS RECEIVED

Computer-Assisted Analytical Spectroscopy

Steven D. Brown, Ed.
John Wiley & Sons
605 Third Ave.
New York, NY 10158
1996, 259 pp., $79.95

This book is intended for spectroscopists and those interested in the application of chemometric techniques. The nine contributed chapters cover such fields as multiple-modulation step-scanning FT-IR, single-molecule fluorescence detection, feed-forward neural networks, and multivariate instrument standardization.

Modern Techniques in Electroanalysis

Petr Vanýsek, Ed.
John Wiley & Sons
605 Third Ave.
New York, NY 10158
1996, 369 pp., $79.95

This book is intended for all electrochemists, regardless of specialty. The eight contributed chapters cover such topics as vacuum surface techniques, microscopy of electrochemical surfaces, and steady-state voltammetry at microelectrodes. A subject index is included.

Gas Chromatography and Mass Spectrometry: A Practical Guide

Fulton G. Kitson, Barbara S. Larsen, and Charles N. McEwen
Academic Press
525 B St., Ste. 1900
San Diego, CA 92101-4495
1996, 381 pp., $49.95

This book is intended to provide the practical information necessary for GC/MS operation in a single source. It is divided into four sections that cover fundamentals of GC/MS, GC conditions and mass spectral interpretation of specific compound types, possible precursors for ions of unknown structures, and appendices with operational and troubleshooting tips. A subject index is included.

Handbook of Chemical and Biological Sensors

R. F. Taylor and J. S. Schultz, Eds.
Institute of Physics
Public Ledger Building, Ste. 1035
150 S. Independence Mall W.
Philadelphia, PA 19106
1996, 604 pp., $229

This book is intended for scientists and engineers who are interested in the construction and application of biological and chemical sensors. The 11 chapters in Section I describe the general properties and fabrication of sensors, including ways to make sensors biologically and chemically specific. Section II covers examples of sensor systems and concludes with a chapter on the market for and commercialization of chemical and biological sensors. A subject index is included.

Modern Techniques in Raman Spectroscopy

J. J. Laserna, Ed.
John Wiley & Sons
605 Third Ave.
New York, NY 10158
1996, 427 pp., $145

This book is intended for academic and industrial molecular spectroscopists. The 10 contributed chapters cover a wide range of topics, including instrumentation, multiplexed Raman spectroscopy, microspectroscopy, surface-enhanced Raman, time-resolved techniques, and the use of fiber optics. The references for each chapter are extensive. A subject index is included.