The latter two are treated in the book by Munk, Worcester, and Wunsch, while the former three still await book treatment; they are available only in isolated journal articles.

Acoustical oceanography is viewed by its proponents as the science of measuring ocean properties using sound as a probe. The output of an acoustical oceanographic measurement will be something oceanic, like the average temperature of an ocean basin, the variance of ocean wave height, or the number of phytoplankton per cubic meter as a function of depth. Medwin and Clay provide a glimpse into a few of the techniques needed to measure some of those properties. They hope to inspire young scientists and engineers from various disciplines to become fascinated with the ocean and to use a manifestly physics-oriented tool to help explore one of our great frontiers. The success of the first edition of their book suggests that they have built an audience and that this new edition will be welcomed by those who hope for growth in this young field.

Stanley M. Flatté
University of California, Santa Cruz

Femtosecond Laser Pulses: Principles and Experiments

Edited by Claude Rullière
Springer-Verlag, New York, 1998. 309 pp. $59.95 hc
ISBN 3-540-63663-3

The field of ultrafast laser technology started in the late 1960s with a handful of scientists, most of whom were at industrial research laboratories, with a few at universities in the US, England, and Germany. The members of this small, elite clan of scientists could produce their own working picosecond lasers.

Ultrafast technology emerged as an active research area with the generation of pulses in the 5 to 10 ps range. A major advance occurred when Stanley Shapiro and I demonstrated the white-light supercontinuum based on self-phase modulation and four-photon mixing. The supercontinuum is currently being used to produce femtosecond pulses and for ultra high speed optical communications.

The next significant advance toward the femtosecond era was the development by Erich Ippen, Richard Fork, and Charles Shank of the colliding-pulse mode-locked dye laser, termed the CPM laser, reliably to generate subpicosecond, and later femtosecond, pulses. Then the production of table-top high-power fs and ps lasers was revolutionized by Gerard Mourou's group, using grating pulse compression (first demonstrated in the early 1970s by Brian Treacy) and decompression methods.

Ultrashort technology really exploded in the late '80s and '90s, when commercial laser manufacturers began offering several kinds of picosecond and femtosecond lasers. The femtosecond era truly started when Wilson Sibbett's team demonstrated ~100 fs pulse generation from a solid-state Ti:sapphire laser without an apparent mode locker, where the mechanism was later traced to Kerr-lens mode-locking.

Over the years, a number of useful textbooks have focused on various aspects of ultrafast laser technology. Of these, *Ultrafast Light Pulses*, edited by Stanley L. Shapiro (Springer, 1977), gives the best overview of the subject; it was followed by *Lasers for Ultrafast Light Pulses* by Joachim Hermann and Bernd Wilhelms (North Holland, 1987), *Ultrashort Laser Pulse Phenomena* by Jean Claude Diels and Wolfgang Rudolph (Academic Press, 1996), and *Ultrashort Laser Pulses and Applications* edited by Wolfgang Kaiser (Springer, 1988). A series of books that I edited focused on applications: *Biological Events Probed by Ultrafast Laser Spectroscopy* (Academic Press, 1982), *Semiconductors Probed by Ultrafast Laser Spectroscopy* (Academic Press, 1984), and *The Supercontinuum Laser Source* (Springer, 1989). Graham Fleming's *Chemical Applications of Ultrafast Spectroscopy* (Oxford U. P., 1986) surveyed the chemistry application area.

Femtosecond Laser Sources, edited by Claude Rullière, covers much of the history of these devices and complements the earlier books. It offers useful information for the beginner and graduate student entering the field, as well as the old-timer who is interested in a recent update of the field. An outgrowth of a series of lectures given at France's Bordeaux University in the early 1990s, the book is a compendium of articles written principally by French scientists, who present a cursory overview of the topics required to undertake a program in picosecond measurements.

Although it is described as a textbook, this collection of articles lacks in many places enough detail and depth on femtosecond optics and problems to sustain that claim. Only half of the chapters give problems for students to work on.

The first chapter gives an overview of the basic laser principles needed to understand how ultrashort pulses are generated. The second chapter gives too brief an introduction to the basic principles of ultrafast optics; the topics covered are adequate for pulsewidths greater than ⅓ psec but fall short on the experimental problems encountered in the femtosecond regime. Chapters 3 and 4 give a good review of how ultrashort light pulses are generated from various laser media. There are some important omissions, however. For example, chromium (Cr^{4+})-ion doped lasers are of particular interest for the wavelength ranges they cover, but Chapter 3 misses important references to prior work. Chapter 5 adequately describes semiconductor lasers used to generate ultrashort laser pulses and their properties. Chapter 6 briefly presents methods used to amplify and compress short pulses but gives no examples of calculations for selecting femtosecond optical components. Chapter 7 describes how to measure the characteristics of pulses (duration and spectral content). Here again, the authors give no details on the problems associated with the measurement of pulses shorter than 50 fs caused by optics, output mirrors, spectrometers, and nonlinear optical crystals.

Chapter 8 describes in detail the principles behind the various time-resolved spectroscopic techniques based on fluorescence, absorption, and Raman phenomena. Chapter 9 addresses coherence properties of the underlying processes in materials and laser pulses arising when the pulse duration is as short as the coherence time of the excitation. The last chapter provides an in-depth view of terahertz pulse generation and its applications for characterizing electronic devices and spectroscopy of materials.

Overall, although the book has some shortcomings, I believe the reader will obtain beneficial information on various aspects of ultrafast laser technology.

Robert R. Alfano
City College of the City University of New York
New York, New York

New Books

Condensed Matter Physics

Atomic Simulation of Electro-optic and Magneto-optic Oxide Materials. *Springer Tracts in Modern Physics 151.* H. Donnerberg. Springer-Verlag, New York, 1999. 205 pp. $129.00 *hc* ISBN 3-540-65111-X

Condensed Matter Theories, Vol. 13. Proc. Wksp., Luso, Portugal, Sep. 1997. J. da Providência, F. B. Malik, eds. Nova Science, Commack, N.Y., 1998. 525 pp. $97.00 *hc* ISBN 1-56072-602-4, *Diskette*

Dynamics and Defects in Liquid Crystals: A Festschrift in Honor of Alfred Saupe. P. E. Cladis, P. Palffy-Muhoray, eds. Gordon and Breach, Amsterdam, the Neth-

erlands, 1998. 447 pp. $125.00 *hc* ISBN 90-5699-649-5

Ferroelectric Phenomena in Crystals: Physical Foundations. B. A. Strukov, A. P. Levanyuk. Springer-Verlag, New York, 1998. 308 pp. $64.95 *hc* ISBN 3-540-63132-1

High Pressure in Semiconductor Physics II. *Semiconductors and Semimetals 55*. T. Suski, W. Paul, eds. Academic, San Diego, Calif., 1998. 461 pp. $145.00 *hc* ISBN 0-12-752163-1

Microstructures and Structural Defects in High-Temperature Superconductors. Z.-X. Cai, Y. Zhu. World Scientific, River Edge, N.J., 1998. 507 pp. $68.00 *hc* ISBN 981-02-3285-3

Nonlinear Optics in Semiconductors I. *Semiconductors and Semimetals 58*. E. Garmire, A. Kost, eds. Academic, San Diego, Calif., 1999. 426 pp. $145.00 *hc* ISBN 0-12-752167-4

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Physical Properties of Quasicrystals. *Springer Series in Solid-State Sciences 126*. Z. M. Stadnik, ed. Springer-Verlag, New York, 1999. 438 pp. $134.00 *hc* ISBN 3-540-65188-8

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Superconductivity and Superfluidity. T. Tsuneto (translated from the Japanese by M. Nakahara). Cambridge U. P., New York, 1998. 208 pp. $69.95 *hc* ISBN 0-521-57073-5

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Transistors: From Crystals to Integrated Circuits. M. Levinshtein, G. Simin (translated from the Russian by M. M. Perelman). World Scientific, River Edge, N.J., 1998. 241 pp. $48.00 *hc* ISBN 981-02-2743-4

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On Einstein's Path: Essays in Honor of Engelbert Schucking. A. Harvey, ed. Springer-Verlag, New York, 1999. 517 pp. $89.95 *hc* ISBN 0-387-98564-6

Space, Time, Matter: Modern Kaluza-Klein Theory. P. S. Wesson. World Scientific, River Edge, N.J., 1999. 209 pp. $22.00 *hc* ISBN 981-02-3588-7

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Energy and Environment: Modelling and Simulation. B. K. Bala. Nova Science, Commack, N.Y., 1998. 268 pp. $79.00 *hc* ISBN 1-56072-608-3

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Before Big Science: The Pursuit of Modern Chemistry and Physics 1800–1940. M. J. Nye. Harvard U. P., Cambridge, Mass., 1999 [1996]. 282 pp. $16.95 *pb* ISBN 0-674-06382-1

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Crystallography Across the Sciences: A Celebration of 50 Years of *Acta Crystallographica* and the IUCr. H. Schenk, ed. International Union of Crystallography, Chester, UK, 1998. 955 pp. $25.00 *hc* ISBN 87-16-16327-3

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