in several places.

In a foreword, the editors joke that Nambu's work is ten years ahead of us, because it takes ten years to understand him. The clear and well-written research papers belie this exaggeration. But it is in the less formal presentations that the motivation for Nambu's ideas, as well as his charming modesty, become evident and make reading this collection the pleasure that it is.

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Introduction to Superconductivity

Michael Tinkham
McGraw-Hill, New York, 1996.
454 pp. $61.88 hc
ISBN 0-07-064878-6

It is fashionable to declare that various branches of science are dead, or at least no longer likely to produce genuinely new conceptual developments. This has been said of superconductivity, although not as often as of physics itself. The last time was in the mid-1980s, just in time to be confounded by the revolution in high-temperature superconductivity sparked by Georg Bednorz and Alex Müller. One of the happy products of the ensuing expansion of the field is a second and enlarged edition of Michael Tinkham's *Introduction to Superconductivity*, which surely is one of the most useful texts for those engaged in this extensively developed area of research.

This book, like the first edition, published in 1975 and by now familiar to several generations of students and researchers, covers the middle ground between applications and detailed microscopic theory. Drawing on the author's many outstanding contributions to our understanding of the phenomena of superconductivity, it gives a clear account of the experimental foundations of the subject, together with an uncluttered interpretation in terms of the order parameter theory of Vitaly Ginzburg and Lev Landau and the microscopic theory of John Bardeen, Leon Cooper and J. Robert Schrieffer.

The new edition is a testament to the fact that neither the field nor the author has been inactive over the past 20 years. Tinkham has taken advantage of his experience in teaching with the first edition to rearrange or expand the original material to make it more accessible for beginners. He has also added a substantial discussion of recent important developments and active research areas, notably high-temperature, nonequilibrium and mesoscopic superconductivity.

A new chapter on the high-temperature superconductors largely eschews the microscopic theory to focus on the elegant ideas introduced to describe the behavior of magnetic flux lines in the superconducting state. This was a wise choice, even though it meant excluding recent developments on the theory of strongly correlated electron systems, which will undoubtedly find their place in future texts. The phenomenology of the superconducting state is less controversial and lends itself to a rather compact exposition based on a more-or-less conventional Ginzburg–Landau model of layered superconductors.

The new chapters on nonequilibrium superconductivity and on the properties of small, low-capacitance junctions produced by modern nanofabrication techniques include discussions of the Coulomb blockade, the single-electron tunneling transistor, macroscopic quantum tunneling and the consequences of the uncertainty relation between phase and number. In the past, much of this material could be found only in conference articles or in the original literature.

The modifications for this edition of *Introduction to Superconductivity* have made a good book even better. It should continue to serve as a reference for researchers and a source of inspiration for teachers for many years to come.

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Introduction to Molecular Dynamics and Chemical Kinetics

G. D. Billing and K. V. Mikkelsen
Wiley, New York, 1996. 183 pp.
$49.95 hc ISBN 0-471-12739-6

We can divide the possible areas of coverage for a book like this into either kinetics and dynamics or experiment and theory. In this context, kinetics refers to chemical reaction rates in thermal ensembles, whereas dynamics also includes molecular-beam studies, laser-assisted processes, ultrafast events and energy transfer. *Introduction to Molecular Dynamics and Chemical Kinetics* by G. D. Billing and K. V. Mikkelsen is essentially all kinetics. As far as theory versus experiment, it is essentially all theory. Thus a better name might be "Introduction to Theoretical Chemical Kinetics." Within this corner of the kinetics-dynamics universe, though, the coverage is rather broad, including reactions in the gas phase, at gas–solid interfaces and in solution. The references are primarily to classic and pedagogical sources; there are 15 references to other books, 27 references to journal articles from the years 1918–42, 23 to articles from the 1949–79 period and only 11 from 1980–95. There are 16 chapters and 7 appendices, and the chapters tend to be very short; excluding exercises and references, the average chapter length is seven pages.

One feature contributing to the conciseness of the chapters is that some of the algebra is relegated to the exercises, which are answered in a 16-page section at the back of the book. But some subjects are simply insufficiently developed. For example, the chapter on generalized transition-state theory consists of algebraic manipulations that could be useful for introducing variational transition-state theory or vibrationally adiabatic models. But then the chapter ends, and the subject is abandoned. I found the chapters on classical trajectories and electronically nonadiabatic collisions frustratingly short as well.

The authors of this book are both widely respected research scientists in the areas they cover. The pedagogical quality of their book is a compromise between brevity and clarity. For example, the transition state is defined first in chapter 6 as "an activated complex" and then specified to be a point along the reaction path where the energy gradient is zero and the Hessian has one negative eigenvalue. Then the fundamental assumption of transition-state theory is stated to be that once a system has crossed the transition state it does not return. A novice to the theory might find it hard to appreciate the beauty and rigor of the transition-state theory from this discussion. For example, what if the system reacts without passing through this "point" along the reaction path? Modern treatments, following Wigner's approach from the 1930s, define the transition state as a hypersurface or, based on modern scattering theory, define it as a metastable quantum state, either of which allows a better appreciation of the fundamental dynamical assumption.

The best part of the book is its treatment of chemical reactions in solution. Unfortunately, this section makes little connection to the gas-phase part of the book. For example, in chapter 14 transition-state theory is derived from scratch—more clearly than it was in chapter 6, but also with no reference to chapter 6. A section I found especially interesting is the treatment of the electrostatic energy of the dielectric polarization of the sol-

vent in an electron transfer reaction; this provides a good introduction to the subject at a graduate level.

Chemical kinetics is a hot topic now for two reasons: Fundamental theory is poised to make critical contributions, and several application areas involving combustion, catalysis, atmospheric processes and environmental concerns are all currently timely. Thus there is a need for modern texts. I think an instructor or student considering this book should compare it to some classic books of the past, such as those by Harold Johnston (*Gas Phase Reaction Rate Theory*, Ronald Press, 1966), by Ralph Weston and Harold Schwarz (*Chemical Kinetics*, Prentice-Hall, 1972), by Evgeny E. Nikitin (*Theory of Elementary Atomic and Molecular Processes in Gases*, Oxford University Press, 1974) or by Ian Smith (*Kinetics and Dynamics of Elementary Gas Reactions*, Butterworths, 1980). Those books cover similar topics but in a more complete fashion, and I recommend them all strongly. The fundamentals they cover will never be out of date, although, of course, post-1980 developments are lacking. The third edition of Keith Laidler's *Chemical Kinetics* (Harper & Row, 1987) is a more recent attempt at comprehensive coverage, and it does include some of the more modern developments.

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Photothermal Spectroscopy Methods for Chemical Analysis

Stephen E. Bialkowski
Wiley, New York, 1996. 584 pp.
$89.95 hc ISBN 0-471-57467-8

Photothermal spectroscopy is unique in its ability to measure optical absorption coefficients and absorbances. Its importance in the analytical sciences cannot be overstated. In my 20 years of involvement in this field and its broader offshoots, I have always felt the need for a treatise that deals with photothermal spectroscopy's broad underpinnings, an imperative in a field that, unlike many other spectroscopic techniques, draws from disparate disciplines, not all of them housed within the same university department.

Stephen Bialkowski's *Photothermal Spectroscopy Methods for Spectral Analysis* seems to be precisely that treatise. The book is at the upper undergraduate and graduate level, and it could be used as the text in a course on photothermal spectroscopy. It may also be a real companion to the working scientist in this field and a valuable springboard for those intending to enter photothermal spectroscopy. Bialkowski goes into the major disciplines that make up photothermal spectroscopy and succeeds in thoroughly familiarizing the reader with the basic physics, chemistry and engineering behind each topic: absorption, energy transfer and excited-state relaxation; fluid mechanics and engineering hydrodynamics; electromagnetic theory of optical fields, Fourier optics and beam propagation theory; and, finally, conduction heat transfer.

To be sure, these topics can be found in upper undergraduate- and graduate-level books in the various disciplines. This book's major contribution is its success in giving rather detailed mathematical presentations (some of them refreshingly novel) of what the author thinks is needed to carry the reader through the research-level descriptions of photothermal spectroscopy.

Bialkowski is definitely among the leaders in photothermal spectroscopy, having helped make major contributions in the instrumentation and measurement-science domain of ultrasensitive detection in analytical chemistry. This book stands alone among the dozen or so existing books on photoacoustic and photothermal phenomena in that Bialkowski actually worked on the research results of his colleagues and has placed them in the proper perspective within the array of photothermal spectroscopic techniques. The tables in chapter 8, on comparative applications of photothermal spectroscopy, are unique and will withstand the passage of time. The prospects of the book are those of a "classic."

One of the highlights of this book for me was its detailed discussions of photothermal data processing, analysis, signal-to-noise ratios and instrumentation. Bialkowski's talents as an experimentalist are clearly shown in those crucial sections, which are usually glossed over by workers in the field.

I found one shortcoming in this otherwise splendid book: Despite its sometimes excessive detail, it essentially neglects photothermal spectroscopic techniques other than those that deal with the laser thermal lens, photothermal deflection, refraction, diffraction or interferometry. In recent years, important advances have been made in, for instance, infrared photothermal radiometric spectroscopy, photopyroelectric spectroscopy and thermal dynamic gratings with applications in the analytical sciences. A slight redistribution of the material might easily have accommodated those novel areas of research and growth. All in all, this does not detract from the considerable strengths of the volume. I strongly recommend it to both students and professionals.

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New Books

Astronomy and Astrophysics

Active Galactic Nuclei. *Wiley-Praxis Series in Astronomy and Astrophysics.* I. Robson. Wiley, New York, 1996. 350 pp. $44.95 *pb* ISBN 0-471-96050-0

Jets from Stars and Galactic Nuclei. *Lecture Notes in Physics 471.* Proc. Wksp., Bad Honnef, Germany, Jul. 1995. W. Kundt, ed. Springer-Verlag, New York, 1996. 290 pp. $73.00 *hc* ISBN 3-540-61136-3

Plasma Astrophysics. *Lecture Notes in Physics 468.* Proc. Sch., San Miniato, Italy, Oct. 1994. C. Chiuderi, G. Einaudi, eds. Springer-Verlag, New York, 1996. 326 pp. $78.00 *hc* ISBN 3-540-61014-6

Spiral Galaxies in the Near-IR. *ESO Astrophysics Symposia.* Proc. Wksp., Garching, Germany, Jun. 1995. D. Minniti, H.-W. Rix, eds. Springer-Verlag, New York, 1996. 350 pp. $39.95 *hc* ISBN 3-540-60937-7

Spiral Structure in Galaxies: A Density Wave Theory. G. Bertin, C. C. Lin. MIT Press, Cambridge, Mass., 1996. 271 pp. $40.00 *hc* ISBN 0-262-02396-2

Supernovae and Supernova Remnants. *IAU Colloquium 145.* Proc. Colloq., Xian, China, May 1993. R. McCray, Z. Wang, eds. Cambridge U. P., New York, 1996. 431 pp. $69.95 *hc* ISBN 0-521-46080-8

Atomic and Molecular Physics

Atomic, Molecular and Optical Physics: Atoms and Molecules. *Experimental Methods in the Physical Sciences 29B.* F. B. Dunning, R. G. Hulet, eds. Academic, San Diego, Calif., 1996. 435 pp. $99.00 *hc* ISBN 0-12-475976-9

Introduction to the Theory of X-Ray and Electronic Spectra of Free Atoms. *Physics of Atoms and Molecules.* R. Karazija. Plenum, New York, 1996. 311 pp. $85.00 *hc* ISBN 0-306-44218-3

Biophysics and Medical Physics

Annual Review of Biophysics and Biomolecular Structure, Vol. 25. R. M. Stroud, ed. Annual Reviews, Inc., Palo Alto, Calif., 1996. 492 pp. $67.00 *hc* ISBN 0-8243-1825-0

Electric and Magnetic Fields: Invisible Risks? L. A. Sagan. Gordon and Breach, New York, 1996. 214 pp. $19.95 *pb* ISBN 2-8844-2917-8

Electromagnetic Fields: Biological Interactions and Mechanisms. *Advances in Chemistry Series 250.* M. Blank, ed. American Chemical Society, Washington, DC, 1995. 497 pp. $129.95 *hc* ISBN 0-8412-3135-4

Visualizing Biological Information. C. A. Pickover, ed. World Scientific, River