State-Specific Chemistry

Photodissociation Dynamics. Spectroscopy and Fragmentation of Small Polyatomic Molecules. REINHARD SCHINKE. Cambridge University Press, New York, 1993. xvi, 417 pp., illus. $89.95 or £50. Cambridge Monographs on Atomic, Molecular, and Chemical Physics.

In the closing paragraphs of his famous textbook *The Principles of Quantum Mechanics* Paul Dirac wrote: "The domain of applicability of the [quantum] theory is mainly in the treatment of electrons and other charged particles interacting with the electromagnetic field—a domain which includes most of low-energy physics and chemistry." This kind of stuff does little to reduce the sense of unease that plagues some chemists who believe their discipline is, in principle, ultimately reducible to quantum physics. It feeds the prejudice that chemistry is somehow second-class, inferior to the first-class fundamentalism of physics.

This perception of chemists scrambling for the leavings of theoretical physicists is perhaps nowhere stronger than in the area of chemical reaction dynamics. The elementary act of chemical transformation lies at the center of the chemists' domain. Many theories of chemical change—often little more than pictorial representations making use of dots and arrows to show the "movement" of electrons—appear hopelessly naïve compared to the elegant mathematics of the quantum formalism. The notion that the "true" description lies at the quantum level is compelling: nobody would deny that the heart of the act of chemical change beats with a quantum beat.

Chemists salvage some self-respect by pointing to the difficulty—if not the sheer impossibility—of applying quantum theory's complex mathematical structure to most systems of chemical interest. Principle is one thing, they say, practice another. But the reality is even more heartening. Over the last 10 to 20 years it has been the experimental chemists who have done the most to expose the quantum nature of chemical change. The theoreticians have been running hard to catch up.

The tremendous progress that has been made in the laboratory derives primarily from developments in technology (particularly laser technology) and careful selection and tailoring of research programs. Small molecules in the gas phase or in the ultracold environment of a supersonic expansion are amenable to ultrafast or high-resolution laser spectroscopy studies that provide information resolved at the atomic level of motion or at individual molecular quantum states. Photodissociating such molecules through selected quantum states allows the chemist to probe the last half of the elementary act of chemical change—the "half-collision"—in unprecedented detail.

In *Photodissociation Dynamics* theoretician Reinhard Schinke provides the research scientist with the essential tools of this trade. For the budding theoretician, here are the various approaches to the theoretical description of the photodissociation of small molecules expertly developed from undergraduate quantum mechanics. For the budding experimentalist, here is the lingua franca—the common theoretical language—that has long dominated this research field and provides the accepted means of interpreting and communicating the results of experiments.

The book has three main components. A broad general overview of the basic theory is followed by a series of detailed discussions of its application in the calculation of such observables as absorption spectra (structured and diffuse), photodissociation cross sections, and photofragment state and energy distributions. In a friendly but authoritative way, Schinke illustrates the different perspectives available from the time-dependent and time-independent quantum treatments and discusses their relative merits. In the closing chapters he examines the photodissociation of van der Waals molecules and vibrationally highly excited molecules, emission from dissociating molecules, nonadiabatic transitions, and the relatively new experimental science of femtosecond time-resolved chemical dynamics. Throughout the book he compares and contrasts the theory with examples from the "real" world.

If I have one criticism, it is that Schinke seems to portray a science in maturity. The reader receives the impression that experiment and theory are closely in line, the few differences here and there fixable through some tweaking of the relevant ab initio molecular potential energy surfaces. It would have been useful to point out a few areas of future challenge, areas in which the ambitious researcher can seek to make a mark. Experiments in real time are now revealing molecular quantum behavior in impressive detail, bringing the transition state—once no more than a theoretical abstraction—directly into the world of experience. At the same time, the practical dynamicist must become increasingly suspicious of the many approximations necessary to bend the quantum formalism to the task of prediction, beginning with the assumption of quantum molecules in a classical radiation field. And how long will it be before some of the more well-known conceptual problems and paradoxes of quantum theory become manifest on a molecular scale?

But these are quibbles. Schinke has distilled a vast and complex scientific literature into an accessible monograph. This book is destined to become standard reading for graduate students about to embark on research careers in chemical dynamics, as well as reflective reading for more mature scientists who thought they understood their subject.

Jim Baggott
Earley, Reading RG6 2PB,
United Kingdom

■

Books Received

Antarctic Microbiology. E. Imre Friedmann with Anne B. Thistle. Wiley-Liss, New York, 1993. x, 634 pp., illus. $165. Wiley Series in Ecological and Applied Microbiology.

Artificial Intelligence and Molecular Biology. Lawrence Hunter, Ed. AAAI, Menlo Park, CA and MIT Press, Cambridge, MA, 1993. x, 470 pp., illus. Paper, $39.95.

The Astronomers. Donald Goldsmith. St. Martin's, New York, 1993. xx, 332 pp., illus., + plates. Paper, $14.95. Reprint, 1991 ed.

Astronomy. A Self-Teaching Guide. Dinah L. Moché. 4th ed. Wiley, New York, 1993. xii, 351 pp., illus. Paper, $16.95.

The Autobiography of Charles Darwin, 1809–1882. Nora Barlow, Ed. Norton, New York, 1993. 253 pp. + plates. Paper, $8.95. Reprint, 1958 ed.

The Aztecs. Richard F. Townsend. Thames and Hudson, New York, 1993 (distributor, Norton, New York). 224 pp., illus. Paper, $14.95. Ancient Peoples and Places. Reprint, 1992 ed.

Birds of Europe. With North Africa and the Middle East. Lars Jonsson. Princeton University Press, Princeton, NJ, 1993. 559 pp., illus. $39.50. Translated from the Swedish edition by David Christie.

Black Skin. Structure and Function. William Montagna, Giuseppe Prota, and John A. Kenney, Jr. Academic, San Diego, CA, 1993. xiv, 158 pp., illus. $64.95.

Bone Circulation and Vascularization in Normal and Pathological Conditions. A. Schoutens *et al.*, Eds. Plenum, New York, 1993. x, 383 pp., illus. $110. NATO Advanced Science Institutes Series A, vol. 247. From a workshop, Brussels, Sept. 1992.

Botulinum and Tetanus Neurotoxins. Neurotransmission and Biomedical Aspects. Bibhuti R. Dasgupta, Ed. Plenum, New York, 1993. xviii, 689 pp., illus. $135. From a conference, Madison, WI, May 1992.

Bourdieu. Critical Perspectives. Craig Calhoun, Edward LiPuma, and Moishe Postone, Eds. Polity Press and University of Chicago Press, Chicago, 1993. viii, 288 pp. $49.95; paper, $16.95.

Brain Activation. Per E. Roland. Wiley-Liss, New York, 1993. x, 589 pp., illus., + plates. $84.95.

The Clausal Theory of Types. D. A. Wolfram. Cambridge University Press, New York, 1993. viii, 124 pp. $39.95. Cambridge Tracts in Theoretical Computer Science, 21.

The Clostridia and Biotechnology. D. R. Woods, Ed. Butterworth-Heinemann, Stoneham, MA, 1993. xvi, 443 pp., illus. $129. Biotechnology Series, 25.

Colonizing the Body. State Medicine and Epidemic Disease in Nineteenth-Century India. David Arnold. University of California Press, Berkeley, 1993. xii, 354 pp., illus. $45; paper, $18.

Compound and Josephson High-Speed Devices. Takahiko Misugi and Akihiro Shibatomi, Eds. Plenum, New York, 1993. xii, 306 pp., illus. $69.50. Microdevices.

Computerized Basin Analysis. The Prognosis of Energy and Mineral Resources. Jan Harff and Daniel F. Merriam, Eds. Plenum, New York, 1993. xii, 340 pp., illus. $95. Computer Applications in the Earth Sciences. From a symposium, Güstrow, Germany, June 1990.

Conduction in Non-Crystalline Materials. Nevill Mott. 2nd ed. Clarendon (Oxford University Press), New York, 1993. x, 150 pp., illus. $38.

Development, Regeneration and Plasticity of the Autonomic Nervous System. I. A. Hendry and C. E. Hill, Eds. Harwood, Langhorne, PA, 1992. xiv, 472 pp., illus. $90 or £48; to institutions, $180 or £96. Autonomic Nervous System, vol. 2.

Diet Selection. An Interdisciplinary Approach to Foraging Behaviour. R. N. Hughes, Ed. Blackwell Scientific, Cambridge, MA, 1993. x, 221 pp., illus. Paper, $54.95.

Discrete Dynamical Modeling. James T. Sandefur. Oxford University Press, New York, 1993. xvi, 428 pp., illus. $39.95.

DNA Sequencing Protocols. Hugh G. Griffin and Annette M. Griffin, Eds. Humana, Totowa, NJ, 1993. xii, 392 pp., illus. Spiral bound, $59.50. Methods in Molecular Biology, 23.

Écologie des Peuplements. Structure, Dynamique et Évolution. Robert Barbault. Masson, Paris, 1992. x, 273 pp., illus. Paper, F 160.

The Ecology of Insect Overwintering. S. R. Leather, K. F. A. Walters, and J. S. Bale. Cambridge University Press, New York, 1993. x, 255 pp., illus. $59.95.

Efficient Algorithms for Listing Combinatorial Structures. Leslie Ann Goldberg. Cambridge University Press, New York, 1993. xvi, 100 pp., illus. $44.95. Distinguished Dissertations in Computer Science.

Electron Beam Testing Technology. John T. L. Thong, Ed. Plenum, New York, 1993. xvi, 462 pp., illus. $89.50. Microdevices.

Empowering Technology. Implementing a U.S. Strategy. Lewis M. Branscomb, Ed. MIT Press, Cambridge, MA, 1993. xii, 315 pp. $37.50; paper, $17.95.

The Fourth Discontinuity. The Co-Evolution of Humans and Machines. Bruce Mazlish. Yale University Press, New Haven, CT, 1993. x, 272 pp., illus. $30.

Fractals Everywhere. Michael F. Barnsley with Hawley Rising III. 2nd ed. Academic, San Diego, CA, 1993. xiv, 534 pp., illus., + plates. $49.95.

Fractals in Geography. Nina Siu-Ngan Lam and Lee De Cola. PTR Prentice Hall, Englewood Cliffs, NJ, 1993. xii, 308 pp., illus., + plates. $65.

Free Lie Algebras. Christophe Reutenauer. Clarendon (Oxford University Press), New York, 1993. xviii, 269 pp., illus. $86. London Mathematical Society Monographs New Series, 7.

Freud, Race, and Gender. Sander L. Gilman. Princeton University Press, Princeton, NJ, 1993. xvi, 277 pp., illus. $24.95 or £19.95.

Fundamentals of Weed Science. Robert L. Zimdahl. Academic, San Diego, CA, 1993. xiv, 450 pp., illus. $54.95.

The Geology of the Belingwe Greenstone Belt, Zimbabwe. A Study of the Evolution of Archaean Continental Crust. M. J. Bickle and E. G. Nisbet, Eds. Balkema, Brookfield, VT, 1993. viii, 239 pp., illus. $95 or Dfl. 165. Geological Society of Zimbabwe Special Publication 2.

Global Warming Unchecked. Signs to Watch For. Harold W. Bernard, Jr. Indiana University Press, Bloomington, 1993. xii, 186 pp., illus. $29.95; paper, $12.95.

The Golem. What Everyone Should Know About Science. Harry Collins and Trevor Pinch. Cambridge University Press, New York, 1993. xii, 164 pp., illus. $19.95.

The Great Ape Project. Equality Beyond Humanity. Paola Cavalieri and Peter Singer, Eds. Fourth Estate, London, 1993. viii, 312 pp., illus. £9.99.

The Great Earthquake Experiment. Risk Communication and Public Action. Dennis S. Mileti and Colleen Fitzpatrick. Westview, Boulder, CO, 1993. x, 149 pp., illus. Paper, $35. Westview Special Studies in Society, Technology, and Public Policy.

Handbook of Polyvinyl Chloride Formulating. Edward J. Wickson, Ed. Wiley, New York, 1993. xviii, 935 pp., illus. $160.

History of Analytical Chemistry. Ferenc Szabadváry. Gordon and Breach, Philadelphia, 1992. xii, 418 pp., illus. Paper, $22 or £12; to institutions, $50 or £27. Classics in the History and Philosophy of Science, vol. 10. Translated from the Hungarian edition (Budapest, 1960) by Gyula Svehla. Reprint, 1966 ed.

A History of Public Health. George Rosen. Johns Hopkins University Press, Baltimore, MD, 1993. xciv, 535 pp. Paper, $19.95. Augmented reprint, 1958 ed.

Human Evolution. An Illustrated Introduction. Roger Lewin. 3rd ed. Blackwell Scientific, Cambridge, MA, 1993. viii, 208 pp. Paper, $21.95.

The Human Nature of Birds. A Scientific Discovery with Startling Implications. Theodore Xenophon Barber. St. Martin's, New York, 1993. xiv, 226 pp. + plates. $19.95.

The Imperiled Academy. Howard Dickman, Ed. Transaction, New Brunswick, NJ, 1993. xiv, 281 pp., illus. $32.95. Studies in Social Philosophy and Policy, no. 17.

An Introduction to Organic Geochemistry. S. D. Killops and V. J. Killops. Longman Scientific and Technical, Harlow, Essex, U.K., and Wiley, New York, 1993. xiv, 265 pp., illus. Paper, $39.95. Longman Geochemistry Series.

Introduction to Probability Models. Sheldon M. Ross. 5th ed. Academic, San Diego, CA, 1993. xii, 556 pp., illus. $59.95.

An Introduction to the Kinetic Theory of Gases and Magnetoplasmas. L. C. Woods. Oxford University Press, New York, 1993. xii, 287 pp., illus. $42.50.

Investigations of Ancient Human Tissue. Chemical Analyses in Anthropology. Mary K. Sandford, Ed. Gordon and Breach, Philadelphia, 1993. xx, 431 pp., illus. $40 or £22; to institutions, $90 or £50. Food and Nutrition in History and Anthropology, vol. 10. Based on a symposium, Kansas City, MO, 1988.

Life Cycles. Reflections of an Evolutionary Biologist. John Tyler Bonner. Princeton University Press, Princeton, NJ, 1993. xii, 209 pp., illus. $19.95 or £14.

Life on a Little-Known Planet. Howard Ensign Evans. Lyons and Burford, New York, 1993. 330 pp., illus. Paper, $14.95. Reprint, 1968 ed.

Limb Development and Regeneration. John F. Fallon *et al.*, Eds. Wiley-Liss, New York, 1993. 2 vols. Variously paged, illus. $295. Progress in Clinical and Biological Research, vol. 383. From a conference, Asilomar, CA, July 1992.

The Limits of Safety. Organizations, Accidents, and Nuclear Weapons. Scott D. Sagan. Princeton University Press, Princeton, NJ, 1993. xvi, 286 pp., illus. $29.95. Princeton Studies in International History and Politics.

Liquid Atomization. L. Bayvel and Z. Orzechowski. Taylor and Francis, Philadelphia, 1993. xiv, 462 pp., illus. $124. Combustion.

The Maya. Michael D. Coe. 5th ed. Thames and Hudson, New York, 1993 (distributor, Norton, New York). 224 pp., illus. Paper, $14.95.

Mechanisms of Conventional and High T_c Superconductivity. Vladimir Z. Kresin, Hans Morawitz, and Stuart A. Wolf. Oxford University Press, New York, 1993. xiv, 181 pp., illus. $39.95. International Series of Monographs on Physics, 84.

Metaphysics and Measurement. Alexandre Koyré. Gordon and Breach, Philadelphia, 1992. viii, 165 pp. Paper, $14 or £10; to institutions, $28 or £15. Classics in the History and Philosophy of Science, vol. 11. Reprint, 1968 ed.

Meteors. Neil Bone. Sky, Cambridge, MA, 1993. 176 pp., illus. Paper, $18.95. Sky and Telescope Observer's Guides.

Microscopic and Spectroscopic Imaging of the Chemical State. Michael D. Morris, Ed. Dekker, New York, 1993. viii, 493 pp., illus. $175. Practical Spectroscopy, 16.

Mirages of Development. Science and Technology for the Third Worlds. Jean-Jacques Salomon and André Lebeau. Rienner, Boulder, CO, 1993. viii, 221 pp., illus. $46. Translated from the French edition (Paris, 1988).

Models and Methods in the Philosophy of Science. Selected Essays. Patrick Suppes. Kluwer, Norwell, MA, 1993. xvi, 510 pp., illus. $128.50 or £84 or Dfl. 210. Synthese Library, vol. 226.

Modern Image Processing. Warping, Morphing, and Classical Techniques. Christopher D. Watkins, Alberto Sadun, and Stephen Marenka. Academic, San Diego, CA, 1993. xx, 234 pp., illus., + diskette. Paper, $49.95.

Network-Based Classrooms. Promises and Realities. Bertram C. Bruce, Joy Kreeft Peyton, and Trent Batson, Eds. Cambridge University Press, New York, 1993. x, 302 pp., illus. $59.95; paper, $19.95.

The Neuroendocrine Theory of Aging and Degenerative Disease. Vladimir Dilman and Ward Dean. Steven Wm. Fowkes, Ed. Center for Bio-Gerontology, Pensacola, FL, 1992. x, 138 pp., illus. $65. New edition of *Law of Deviation of Homeostasis and Diseases of Aging.*

The Norton History of Chemistry. William H. Brock. Norton, New York, 1993. xxx, 744 pp., illus. $35; paper, $15.95. Norton History of Science. American edition of *Fontana History of Chemistry.*

The Norton History of the Environmental Sciences. Peter J. Bowler. Norton, New York, 1993. xxiv, 634 pp., illus. $35; paper, $15.95. Norton History of Science. American edition of *Fontana History of the Environmental Sciences.*

Nucleosides and Nucleotides as Antitumor and Antiviral Agents. Chung K. Chu and David C. Baker, Eds. Plenum, New York, 1993. x, 336 pp., illus. $85. From a symposium, San Francisco, April 1992.

Phantom Risk. Scientific Inference and the Law. Kenneth R. Foster, David E. Bernstein, and Peter W. Huber, Eds. MIT Press, Cambridge, MA, 1993. xii, 457 pp., illus. $39.95.

Pharmacotheon. Entheogenic Drugs, Their Plant Sources and History. Jonathan Ott. Natural Products, Kennewick, WA, 1993 (distributor, agAccess, Davis, CA). 639 pp., illus. $70; paper, $40.

Phase Transitions in Ferroelastic and Co-Elastic Crystals. An Introduction for Mineralogists, Material Scientists and Physicists. Ekhard K. H. Salje. Cambridge University Press, New York, 1993. Variously paged, illus. Paper, $34.95. Cambridge Topics in Mineral Physics and Chemistry. Revised reprint, 1990 ed.

Phospholipids Handbook. Gregor Cevc, Ed. Dekker, New York, 1993. xiv, 988 pp., illus. $195.

Quick Reference to Computer Graphics Terms. Roger T. Stevens. Academic, San Diego, CA, 1993. vi, 237 pp., illus., + plates. Paper, $29.95.

A Skeptic Among Scholars. August Frugé on University Publishing. August Frugé. University of California Press, Berkeley, 1993. xii, 365 pp., illus. $40; paper, $12. Centennial Book.

Specification and Proof in Real-Time CSP. Jim Davies. Cambridge University Press, New York, 1993. xviii, 180 pp. $49.95. Distinguished Dissertations in Computer Science.

Spectral Analysis for Physical Applications. Multitaper and Conventional Univariate Techniques. Donald B. Percival and Andrew T. Walden. Cambridge University Press, New York, 1993. xxviii, 583 pp., illus. $89.95; paper, $39.95.

Star Formation, Galaxies and the Interstellar Medium. José Franco, Federico Ferrini, and Guillermo Tenorio-Tagle, Eds. Cambridge University Press, New York, 1993. xx, 393 pp., illus. $59.95. From a workshop, Marciana Marina, Elba Island, Italy, June 1992.

Stereo Computer Graphics and Other True 3D Technologies. David F. McAllister, Ed. Princeton University Press, Princeton, NJ, 1993. xviii, 267 pp., illus. $75 or £50. Princeton Series in Computer Science.

Sustainable Environmental Economics and Management. Principles and Practice. R. Kerry Turner, Ed. Belhaven, London, and Halsted, New York, 1993. viii, 389 pp., illus. Paper, $29.95.

Thermodynamics in Geochemistry. The Equilibrium Model. Greg M. Anderson and David A. Crerar. Oxford University Press, New York, 1993. xx, 588 pp., illus. $75.

Thermomechanics of Evolving Phase Boundaries in the Plane. Morton E. Gurtin. Clarendon (Oxford University Press), New York, 1993. xii, 148 pp., illus. $54. Oxford Mathematical Monographs.

Viruses and Virus-Like Agents in Disease. Rolf M. Zinkernagel and Werner Stauffacher, Eds. Karger, New York, 1993. 220 pp., illus. $143.25 or SwF 179 or DM 214. From a symposium, Basel, Switzerland, March 1993. Reprint of *Intervirology*, vol. 35, nos. 1–4.

Wolff's Headache and Other Head Pain. Donald J. Dalessio and Stephen D. Silberstein, Eds. 6th ed. Oxford University Press, New York, 1993. xvi, 529 pp., illus. $65.