of spinor analysis and the application of twistor techniques.

The organization of the book is excellent. Penrose and Rindler present the important results on the use of spinors in general relativity and in the study of the structure and properties of asymptotically flat space–times side by side with those on the use of the twistor formalism in describing space–time geometry and fields on that geometry. Therefore, for those to whom the subject is new, a guide through the book would have been useful. In the preface, the authors indicate that Chapter 8 can be read independently. However, the first three sections of Chapter 7 form an introduction to that material. Also, much of Chapter 9 can be read before becoming involved with twistor theory. I don't mean to imply that the purely spinorial material should have been separated from the twistor applications—such an approach would have destroyed the coherence of the presentation noted earlier.

Although this volume makes use of the algebraic techniques and results of volume 1, geometrical ideas are emphasized throughout. There are more of Penrose's carefully drawn figures and this time they are more or less uniformly distributed. The volume also has an excellent index and list of references. In the appendix, the authors present a useful description of spinors in n-dimensional space.

Whether or not twistors ultimately live up to Penrose and Rindler's expectations, there is no doubt that the material in these two volumes will continue to be studied for many years and will lead to new results in differential geometry, general relativity and other parts of physics.

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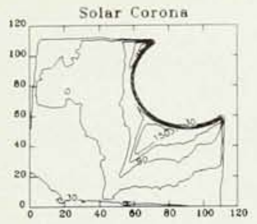
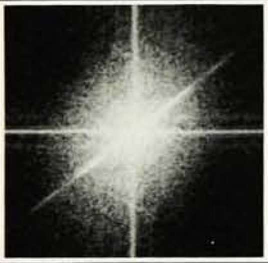
General Biophysics, Volumes I and II

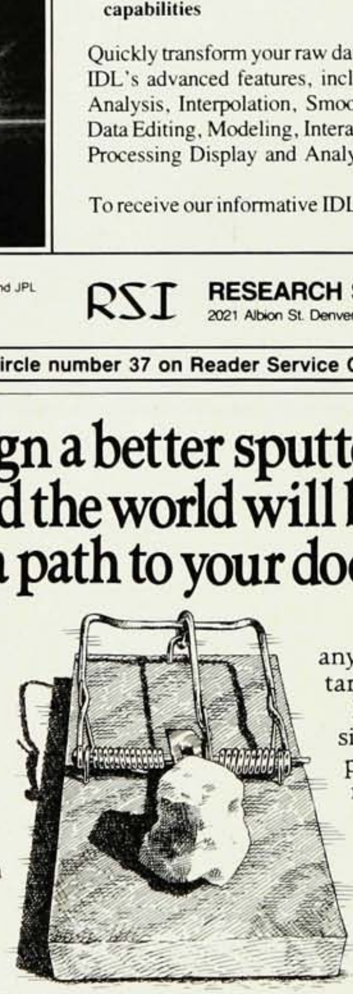
M. V. Volkenstein
(Translated from the Russian by I. C. Melamed and M. V. Volkenstein)
302 + 314 pp. Academic Press, 1983. Vol. I. $61.00, Vol. II. $51.00

The late George Gamow once said that he dreaded the day when physics would leave the era of Columbus and Magellan and enter into the era of *National Geographic.* No biophysicist need have such fears yet, and indeed, in his later years, even Gamow made contributions to this field.

Biophysics is the physics of biological phenomena; it is not an auxiliary to the fields of biology and physiology. The phenomena are considered at three levels, the macroscopic, the microscopic and the molecular, and while the research interests of individual investiga-






tors may be narrowly defined, these levels are all interrelated. For example, one may study muscle motion and energy in athletes by investigating myograms of the muscles, or the motion and energy of single muscle fibers, or the interaction of troponin, myosin and actin at the molecular level, but no level is understandable without information from the other levels. Any attempt to describe all of the research results in biophysics, theoretical and experimental, must be encyclopedic in scope—and it should be in a loose-leaf binder to accommodate frequent updates reflecting the rapid advances in our understanding.

Mikhail Vladimirovich Volkenstein of the Institute of Molecular Biology of the Academy of Sciences in Moscow has previously written *Configurational Statistics of Polymer Chains* (Wiley, New York, 1963) and *Molecular Biophysics* (Academic, New York, 1977). The two volumes of *General Biophysics* represent his continuing interest in understanding macroscopic behavior from the molecular level. They were first published in Russian in 1978 and have been translated into superb English by I. C. Melamed and the author. Volkenstein states in the preface to *General Biophysics* that it and *Molecular Biophysics* "constitute in a sense, a single work, though the present volumes can also be read independently by those who have some acquaintance with proteins and nucleic acids. The three volumes can be used as a textbook for graduate and postgraduate students having the necessary knowledge of physics." I might also add that some acquaintance with organic and physical chemistry is desirable. Recognizing the author's continuing interest in molecular biophysics, one should not look for topics such as radiation biology, the design of cardiac pacemakers and the effects of pulsed electric fields on bone growth. Such topics lie outside the scope and direction of the volumes. *Molecular Biophysics* emphasizes the various physical measurements that have yielded an understanding of organic macromolecules and biopolymers; it thus has a rather different character from *General Biophysics.*

In the present two volumes, after an introductory chapter, Volkenstein begins by tersely establishing the mathematical background of the thermodynamics of nonequilibrium systems and nonlinear coupled chemical reactions in biological systems. This chapter is a good summary, but the novice would do better to start with a more extensive book on this topic, such as *Nonequilibrium Thermodynamics in Biophysics,* by Aharon Katchalsky and Peter F. Curran (Harvard U. P., Cambridge, Mass., 1965). Later chapters apply the concepts of nonequilibrium thermodynamics to such areas as membrane transport, nerve impulse, muscular contraction, photobiology and even prebiotic and biological evolution. Although Volkenstein frequently refers the reader back to the second chapter, the later chapters provide still further mathematical development.

Chapter 8 is on nonlinear chemical dynamic processes in biology. To illustrate the kinetics of nonlinear processes Volkenstein discusses oscillatory chemical reactions, which result from autocatalytic reactions in which there is a periodic disturbance. He shows how such reactions can reduce the "biological clock" to a "chemical clock" controlled by periodic enzymatic reactions or photosynthesis. He also shows how these nonlinear chemical systems can be applied to such phenomena as membrane transport, enzymatic oscillations and the fibrillation of cardiac muscle membrane, and he suggests that other biological systems be examined in this way. Of particular interest is his well-illustrated summary of Russian work in this area. Oscillations in growth due to periodic disturbances are now being investigated as a cause of variations in animal populations as well as in plant growth.

The 600 pages of the two volumes are not sufficient space to develop all of the topics and concepts Volkenstein mentions, and he concentrates on those that are of immediate interest to him; he summarizes results in other areas with references and underived equations.

The volumes contain over 1300 references, with perhaps 95% of these in English-language journals and books. There are no problems or sample calculations as one would find in a conventional textbook.

These books represent a significant contribution to the literature of biophysics, and scientists in the field will appreciate the enormous amount of time that the author must have spent in assembling and summarizing this body of knowledge.

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new books

Astronomy, cosmology and space physics

Cosmological Constants: Papers in Modern Cosmology. J. Bernstein, G. Feinberg, eds. 328 pp. Columbia U. P., New York, 1986. $38.00. *Compendium*

Einstein's Dream: The Search for a Unified Theory of the Universe. B. Parker. 287 pp. Plenum, New York, 1986. $18.95. *Lay readers*

Gamma-Ray Astronomy. *Cambridge Astrophysics Series.* P. V. Ramana Murthy, A. W. Wolfendale. 248 pp. Cambridge U. P., New York, 1986. $49.50. *Text*

Atomic, molecular and chemical physics

Chemical Bonds Outside Metal Surfaces. N. H. March. 284 pp. Plenum, New York, 1986. $52.50. *Text*

Handbook of Infrared Standards: With Spectral Maps and Transition Assignments between 3 and 2600 μm. G. Guelachvili, K. N. Rao. 851 pp. Academic, New York, 1986. $75.00

Multiple-Photon Excitation and Dissociation of Polyatomic Molecules. *Topics in Current Physics 35.* C. D. Cantrell, ed. 288 pp. Springer-Verlag, New York, 1986. *Price not stated. Compendium*

Orbitals, Terms and States. M. Gerloch. 176 pp. Wiley, New York, 1986. $31.95. *Text*

Perturbations in the Spectra of Diatomic Molecules. H. Lefebvre-Brion, R. W. Field. 420 pp. Academic, New York, 1986. $80.00 hardcover, $44.95 paper. *Monograph*

Spectroscopy of Molecular Excitons. *Springer Series in Chemical Physics 16.* V. L. Broude, E. I. Rashba, E. F. Sheka. 271 pp. Springer-Verlag, New York, 1985. $48.00. *Monograph*

Transport Processes in Chemically Reacting Flow Systems. D. E. Rosner. 540 pp. Butterworth, Stoneham, Mass., 1986. $52.95. *Monograph*

Biological and medical physics

Biophysical Effects of Steady Magnetic Fields. *Springer Proceedings in Physics 11.* Proc. Wksp., Les Houches, France, February 1986. G. Maret, J. Kiepenheuer, N. Boccara eds. 231 pp. Springer-Verlag, New York, 1986. DM 84.00

CRC Handbook of Biological Effects of Electromagnetic Fields. C. Polk, E. Postow. 503 pp. CRC, Boca Raton, Fla., 1986. $165.00

NMR in the Life Sciences. *NATO ASI Series A: Life Sciences 107.* Proc. Inst., Erice, Italy, June 1985. E. M. Bradbury, C. Nicolini, eds. 237 pp. Plenum, New York, 1986. $45.00

Condensed-matter physics

Atomic Transport and Defects in Metals by Neutron Scattering. *Springer Proceedings in Physics 10.* Proc. Wksp., Jülich, FRG, October 1985. C. Janot, W. Petry, D. Richter, T. Springer, eds. 241 pp. Springer-Verlag, New York, 1986. $39.00

Hydrogen in Disordered and Amorphous Solids. *NATO ASI Series B: Physics 136.* Proc. Inst., Rhodes, Greece, September 1985. G. Bambakidis, R. C. Bowman, eds. 428 pp. Plenum, New York, 1986. $69.50

Magnetic Properties of Low-Dimensional Systems. *Springer Proceedings in Physics 14.* Proc. Int. Wksp., Taxco, Mexico, January 1986. L. M. Falicov, J. L. Morán-López eds. 189 pp. Springer-Verlag, New York, 1986. $47.50

Positron Studies of Solids, Surfaces, and Atoms. Proc. Symp., Waltham, Mass., December 1984. A. P. Mills, W. S. Crane, K. F. Canter, eds. 335 pp. World Scientific, Singapore (US dist. Taylor and Francis, Philadelphia), 1986. $37.00

Sino-Japan Bilateral Workshop on Statistical Physics and Condensed Matter Theory. Proc. Wksp., Shanghai, April 1986. X. Xide, ed. 381 pp. World Scientific, Singapore (US dist. Taylor and Francis, Philadelphia), 1986. $56.00

History and philosophy

A Machine Called Indomitable. S. Kleinfield. 250 pp. Times Books, New York, 1985. $16.95. *Lay readers*

Sadi Carnot: Reflexions on the Motive Power of Fire. A Critical Edition with the Surviving Manuscripts. R. Fox, ed. 230 pp. Lilian Barber, New York, 1986. $39.50. *Monograph*

The Shaky Game: Einstein, Realism and the Quantum Theory. A. Fine. 186 pp. U. of Chicago P., Chicago 1986. $25.00. *Monograph*

Society and government

The Tender Ship: Governmental Management of Technological Change. A. M. Squires. 247 pp. Birkhäuser, Boston, 1986. $24.95

Nuclear Weapons: The Balance of Terror, the Quest for Peace. A. J. C. Edwards. 275 pp. State U. of New York P., New York, 1986. $39.50 hardcover; $12.95 paper

Star Wars: A Defense Expert's Case Against the Strategic Defense Initiative. R. M. Bowman. 180 pp. Tarcher, Los Angeles (dist. by St. Martin's, New York), 1986. $7.95 *Lay readers*

The Mars Project: Journeys Beyond the Cold War. S. M. Matsunaga. 216 pp. Hill and Wang, New York, 1986. $17.95

The Night After: Climate and Biological Consequences of a Nuclear War. Yevgeni Velikhov, ed. 165 pp. Mir, Moscow, 1985. $8.95. *Compendium*

Miscellaneous

Legged Robots That Balance. M. H. Raibert. 233 pp. MIT Press, Cambridge, Mass., 1986. $30.00. *Monograph*

The High-Tech Industry Manual. Part 1: Obtaining Government-R&D Technology Spin-offs; Part 2: Building A High-Technology Transfer. H. Olken. 132 pp. Olken, Livermore, Calif., 1986. *Price not stated*

A Dictionary of Scientific Units, Including Dimensionless Numbers and Scales. Fifth edition. H. G. Jerrard, D. B. McNeill. 222 pp. Chapman and Hall, New York, 1986. $39.95 hardcover; $19.95 paper □