"Max Euwe, former world champion, commentating on the Chess 4.7 and David Slate versus David Levy one-game match in Detroit in 1979." [From *Kasparov versus Deep Blue*]

gram that discovered mating combinations contributed to recognition of complex patterns in general, he replied, "Well all right, but when he publishes his dissertation, would he kindly not acknowledge our support."

An extended commentary on making computer chess more scientific will be available at http://www-formal.stanford.edu/jmc/chess.html.

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## Crystals That Came in from the Cold

**Physics of Cryocrystals**. VADIM G. MANZHELII and YURI A. FREIMAN, Eds. English-language version edited by Michael L. Klein and Alexei A. Maradudin. AIP Press, Woodbury, NY, 1996. xx, 691 pp., illus. $135 or £99. ISBN 1-56396-537-2.

Ninety-nine years ago Sir James Dewar cooled hydrogen to record low temperatures and so turned the lightest and most tenuous of gases into a liquid and then, the following year, into a crystalline solid. Though not recognized at the time, a novel state of matter was created, later to be called the quantum crystal. The study of such solidified gases has been a testing ground for fundamental theory, contributing in a major way to the development of modern condensed-matter physics and chemistry. The reason is simple: though modern physics dictates that quantum mechanics must prevail for both the electrons and the atomic nuclei, the classical viewpoint for treating the latter makes the problem of describing fundamental properties of matter both mathematically tractable and physically accessible. However, crystals composed of very light elements push this approximation to its limits—indeed, cause it to break down. Here, the molecular meets the many-body, the classical meets the quantum mechanical, creating new physical phenomena and fueling a creative tension for theory.

*Physics of Cryocrystals* is a review of the state of knowledge, both theoretical and experimental, of these unique materials. The treatment is limited to the solids formed from the linear molecules such as $H_2$, $N_2$, $O_2$, CO, and $CO_2$, but this class of materials is both the most important and the best understood. The editors, V. G. Manzhelii and Y. A. Freiman, have written large sections of the book, together with various members of the Verkin Institute of Low-Temperature Physics in Kharkov. This institute has remained one of the leaders in this field for decades, despite the hardships of both the Soviet and the post-Soviet eras. The book derives from a volume published in 1983 in Russian from the institute. It is also a welcome successor and companion to J. van Kranendonk's elegant treatise *Solid Hydrogen*, as well as to the earlier (but still impressively current) *Rare Gas Solids*, edited by M. L. Klein and J. Venables.

One of the pleasures of reading *Physics of Cryocrystals* is the historical perspective it provides. The successive discoveries of such phenomena as free molecular rotation and rotational melting, anharmonic lattice dynamics, crystal plasticity and orientational ordering, and quantum diffusion—together with the efforts to understand these phenomena theoretically—delineate the development of both low-temperature and solid-state physics.

The book contains 20 chapters in two groups, the first devoted to the quantum solid, $H_2$, and the second to its classical counterparts, the so-called $N_2$-type crystals. The study of both types flourishes, with continuing discoveries of new physics, especially as a result of the application of the combined variables of temperature and pressure. The extensive compilation of current experimental data makes the book an essential reference for researchers and engineers. The theoretical sections capture the essential physics of the field in an accessible manner that offers useful material for graduate students as well as specialists.

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## Books Received

**Black Holes**. Gravitational Interactions. P. D. D'Eath. Clarendon (Oxford University Press), New York, 1996. xii, 286 pp., illus. $80. ISBN 0-19-851479-4. Oxford Mathematical Monographs.

**Boron**. Mineralogy, Petrology and Geochemistry. E. S. Grew and L. M. Anovitz, Eds. Mineralogical Society of America, Washington, DC, 1996. xx, 862 pp., illus. Paper, $32; to MSA members, $24. ISBN 0-939950-41-3. Reviews in Mineralogy, vol. 33.

**Comet Hale-Bopp**. Find and Enjoy the Great Comet. Robert Burnham. Cambridge University Press, New York, 1997. iv, 60 pp., illus. Paper, $12.95. ISBN 0-521-58636-4.

**Communicable Disease Epidemiology and Control**. Roger Webber. CAB International, Oxford, UK, 1996. xiv, 352 pp., illus. Paper, $35. ISBN 0-85199-138-6.

**Constitutions of Matter**. Mathematically Modeling the Most Everyday of Physical Phenomena. Martin H. Krieger. University of Chicago Press, Chicago, 1997. xxii, 343 pp., illus. $65 or £51.95. ISBN 0-226-45304-9.

**Developmental Biology**. Werner A. Müller. Springer-Verlag, New York, 1996. x, 382 pp., illus. $39.95. ISBN 0-387-94718-3. Translation of the German edition (1995).

**A Guide to Fossils**. Helmut Mayr. Princeton University Press, Princeton, NJ, 1997. 256 pp., illus. Paper, $18.95. ISBN 0-691-02922-9. Translated from the German edition (Munich, 1985) by D. Dineley and G. Windsor.

**An Introduction to the Biology of Vision**. James T. McIlwain. Cambridge University Press, New York, 1996. x, 222 pp., illus. $60.95, ISBN 0-521-49548-2; paper, $24.95, ISBN 0-521-49890-2.

**Introduction to the Theory of Ferromagnetism**. Amikam Aharoni. Clarendon (Oxford University Press), New York, 1996. xii, 315 pp., illus. $70. ISBN 0-19-851791-2. International Series of Monographs on Physics, 93.

**Molecular Basis of NK Cell Recognition and Function**. L. Moretta, Ed. Karger, Farmington, CT, 1996. xii, 184 pp., illus. $86.25 or CHF 99 or DEM 119. ISBN 3-8055-6332-9. Chemical Immunology, vol. 64.

**Nanotechnology**. Integrated Processing Systems for Ultra-precision and Ultra-fine Products. Norio Taniguchi, Ed. Oxford University Press, New York, 1996. xvi, 406 pp., illus. $165. ISBN 0-19-856283-7.

**Protein Targeting**. Stella Hurtley, Ed. IRL (Oxford University Press), New York, 1996. xx, 214 pp., illus. $110. ISBN 0-19-963562-5. Frontiers in Molecular Biology, 16.

**Quantum Field Theory and Critical Phenomena**. Jean Zinn-Justin. 3rd ed. Oxford University Press, New York, 1996. xxii, 1008 pp. $90. ISBN 0-19-851882-x. International Series of Monographs on Physics, 92.

**Restless Genius**. Robert Hooke and His Earthly Thoughts. Ellen Tan Drake. Oxford University Press, New York, 1996. xiv, 386 pp., illus. $55. ISBN 0-19-506695-2.

**Schrödinger's Philosophy of Quantum Mechanics**. Michel Bitbol. Kluwer, Norwell, MA, 1996. xii, 285 pp. $117 or £52 or Dfl. 180. ISBN 0-7923-4266-6. Boston Studies in the Philosophy of Science, vol. 188.

**Tropical Deforestation**. The Human Dimension. Leslie E. Sponsel, Thomas N. Headland, and Robert C. Bailey, Eds. Columbia University Press, New York, 1996. xxx, 365 pp., illus. $49.50, ISBN 0-231-08480-3; paper, $19.50, ISBN 0-231-08481-1. Methods and Cases in Conservation Science.

**Venomous Snakes**. Ecology, Evolution and Snakebite. R. S. Thorpe, W. Wüster, and Anita Malhotra, Eds. Published for the Zoological Society of London by Clarendon (Oxford University Press), New York, 1996. xx, 276 pp., illus. $145. ISBN 0-19-854986-5. Symposia of the Zoological Society of London, no. 70. Based on a symposium, London, April 1995.

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## Correction

The title of a recent book by Walter Alvarez was garbled in the Browsings section in the issue of 23 May (p. 1210). The title of the book as it should have appeared is ***T. rex* and the Crater of Doom**.