Stellar Explosions

Supernovae. ALBERT G. PETSCHEK, Ed. Springer-Verlag, New York, 1990. xiv, 293 pp., illus. $59. Astronomy and Astrophysics Library.

This book, which contains contributions from many of the leaders in the field, gives an up-to-date summary of modern ideas on supernovae, their explosion mechanisms, their spectra, and their lightcurves.

The first two chapters, by Harkness and Wheeler and by Branch, give an authoritative overview of spectral classification of supernovae. These authors discuss the differences between supernovae of type Ia, problems related to the origin of supernovae of type Ib, and possible interpretations for the differences between "linear" and "plateau" supernovae of type II. A particularly thorough discussion is given of the "missing link" supernova 1987K, which initially had a type II spectrum but later evolved into an object of type Ib. Branch's tabulation of all spectroscopically determined supernova types is particularly useful. (Note, however, that Z Centauri is actually SN1895B, not SN1895A.) Supernova light curves and their possible use as cosmological probes are discussed by Kirshner. The radio emission of supernovae is reviewed by Sramek and Weiler. Their results show that we are still profoundly ignorant about how radio emission changes as a supernova develops into a supernova remnant. Another century of observations should begin to answer this question.

Chevalier presents an authoritative review of our current understanding of the interaction of supernovae with their environment and the earliest phase of the evolution of supernova remnants. Sutherland shows how x-rays and γ-rays provide powerful diagnostic tools for the study of the nuclear evolution of supernovae. Observations of the 847-keV and 1238-keV lines of ^{56}Co provide confirmation of the $^{56}\text{Ni} \rightarrow {}^{56}\text{Co} \rightarrow {}^{56}\text{Fe}$ nuclear decay model for core collapse of supernovae of type II, give an estimate for the amount of iron formed, and show that the onion-like layering of supernova progenitors is destroyed by mixing after the supernova explodes.

Burrows provides a thorough discussion of neutrino processes, which dominate the energy production in core collapse supernovae. Including the energy of neutrinos, a single supernova will, for a few seconds after its collapse, be as "bright" as the entire observable universe. Burrows discusses the 19 or 20 neutrinos produced by SN1987A that were observed by the Kamiokande and IMB detectors and their implications for the theory of the collapse of supernovae of type II. (Perhaps never before in the history of science has so much depended on so few objects with so little mass.)

An up-to-date review of the deflagration of supernovae of type I, which are believed to be due to the detonation of CO white dwarfs that are pushed over the Chandrasekhar limit by mass transfer, is given by Woosley. Cooperstein and Baron discuss the remaining problems in understanding the actual mechanism of core collapse. Among the most serious of these is how to prevent energy losses resulting from the reaction $^{56}\text{Fe} \rightarrow 13\alpha + 4n$ from sapping the energy of the core collapse detonation wave. Finally Mayle discusses the critical role played by neutrino heating during, and immediately after, the collapse of the core of a supernova of type II.

Advanced graduate students will find this book an excellent introduction to both the theory and the observation of supernovae.

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Books Received

AIDS. The Second Decade. Heather G. Miller, Charles F. Turner, and Lincoln E. Moses, Eds. National Academy Press, Washington, DC, 1990. xiv, 495 pp. illus. $30; paper, $24.95. From the Committee on AIDS Research and the Behavioral, Social, and Statistical Sciences.

Analytical Biotechnology. Capillary Electrophoresis and Chromatography. Csaba Horváth and John G. Nikelly, Eds. American Chemical Society, Washington, DC, 1990. x, 213 pp., illus. $49.95. ACS Symposium Series, 434. From a symposium, Los Angeles, CA, Sept. 1988.

Anatomy of a Controversy. The Question of a "Language" Among Bees. Adrian M. Wenner and Patrick H. Wells. Columbia University Press, New York, 1990. xvi, 399 pp., illus. $55.

The Anthropology of War. Jonathan Haas, Ed. Cambridge University Press, New York, 1990. xiv, 242 pp., illus. $49.50. School of American Research Advanced Seminar Series. From a seminar, March 1986.

Archaeological Geology of North America. Norman P. Lasca and Jack Donahue, Eds. Geological Society of America, Boulder, CO, 1990. x, 633 pp., illus. $62.50. GSA Centennial Special Volume 4.

Argillaceous Rock Atlas. Neal R. O'Brien and Roger M. Slatt. Springer-Verlag, New York, 1990. xvi, 141 pp., illus. $59.

The Arithmetic and Spectral Analysis of Poincare Series. James W. Cogdell and Ilya Piatetski-Shapiro. Academic Press, San Diego, CA, 1990. vi, 182 pp. $24.95. Perspectives in Mathematics, vol. 13.

Artificial Intelligence and the Future of Testing. Roy Freedle, Ed. Erlbaum, Hillsdale, NJ, 1990. xiv, 329 pp., illus. $39.95. From a conference.

Astrophysics. Recent Progress and Future Possibilities. B. Gustafsson and P. E. Nissen, Eds. Munksgaard, Copenhagen, 1990. 220 pp., illus. Paper, DKK 400. Matematisk-fysiske Meddelelser, 42:4. From a symposium, Copenhagen, May 1988.

Atoms in Strong Fields. Cleanthes A. Nicolaides, Charles W. Clark, and Munir H. Nayfeh, Eds. Plenum, New York, 1990. xii, 540 pp., illus. $115. NATO Advanced Science Series, vol. 212. From a meeting, Kos, Greece, Oct. 1988.

Australian Tropical Rainforests. Science—Values—Meaning. L. J. Webb and J. Kikkawa, Eds. CSIRO, East Melbourne, Australia, 1990 (U.S. distributor, International Specialized Book Services, Portland, OR). x, 185 pp., illus. $70. From a symposium, Townsville, Australia, Aug. 1987.