

dollar books is not a good solution. It is an interesting comment on our society that a modest extrapolation of present trends will allow all of us to buy sophisticated electronic calculators, but no individuals and only the richest libraries will be able to afford books of this type.

M. DERRICK
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Astronomy: Fundamentals and Frontiers, 2nd edition

R. Jastrow, M. H. Thompson
518 pp. Wiley, New York, 1974. \$14.50

Concepts of Contemporary Astronomy

P. W. Hodge
547 pp. McGraw-Hill, New York, 1974.
\$9.95

Principles of Astronomy: A Short Version

S. P. Wyatt, J. B. Kaler
487 pp. Allyn and Bacon, Boston, 1974.
\$10.95

The Science of Astronomy

H. Crull, W. Kaufmann
466 pp. Harper & Row, New York, 1974.
\$8.50

In recent years astronomy has become possibly the most mind-boggling adventure of the human mind. The nation's professional astronomers, consisting of fewer than 2000 persons, now oversee an annual budget of several hundred million dollars, making the field virtually the *per capita* giant of modern big science. Yet this flow of dollars scarcely keeps pace with the flood of knowledge. If every discipline has its epoch, this surely must be the Age of Astronomy.

The electronics and space eras have opened the entire electromagnetic spectrum to observation and have facilitated *in situ* studies of the greater terrestrial environment; detectors vary from a neutrino counter in a mine shaft (studying processes in the Sun's core) to Pioneer 10 (soon to depart the solar system). The phenomena investigated range from the cataclysmic birth of the cosmos to the frenetic death of stars, largely in tranquil near-emptiness.

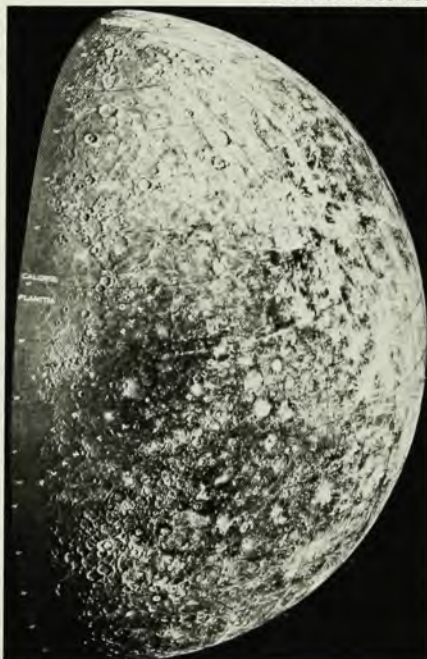
While observational astronomy has moved apace, theoretical astrophysics has likewise matured from its recent infancy into possibly science's most profoundly productive field: The enigmatic quasars, pulsars, black holes, and the like may soon lead to breakthroughs not

only in astronomy but also in basic physics. And astronomy increasingly offers to all sciences the ultimate lab: the universe. From curvature of space to structure of nucleons, from intergalactic void to stellar core, from gamma ray to lunar rock—modern astronomy weds the sciences into an inextricably multidisciplinary endeavor.

Along with the flux of astronomical findings and conjectures has come an inpouring of new astronomers; since the late 1950's the annual growth rate of their population has been about 18 percent compared with 7 percent in other fields. Similarly, enrollments by college nonscience students in general education courses in astronomy have risen at comparable exponential rates. The books under review, along with scores of other competitors, are responses to this market.

A decade ago, astronomy courses for nonscience majors often were two terms long, but with the liberalization of requirements and with the growth of junior colleges, the two-term market shrank while the one-term rose. Most of the recent texts consequently aim at the latter market. Regrettably, the similarity among them is even greater than among their counterparts in physics. Certain features today are virtually *de rigueur*: photos from NASA and the Hale, Lick and Yerkes Observatories; a qualitative narrative, involving no math beyond rudimentary algebra; and usually a single column format with

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wide page-edge margins to accommodate diagrams. In such ubiquitous respects, these four texts resemble each other; yet on more fundamental grounds, they differ markedly.

The most routine of the group is the book by H. Crull and W. Kaufmann, both distinguished planetarium educators. It appears like a composite of a dozen existing texts, presenting traditional material traditionally. Although it eschews expensive color plates, it contains the usual black and white photographs; and for text and diagrams, it uses red and a visually displeasing violet on white paper. Its conventional layout harks back to early editions of Baker's classic *Astronomy*: relatively mundane topics such as calendars come early and the general flow is from the near and familiar to the remote and esoteric. Again in routine fashion, most topics in modern basic astronomy are mentioned, albeit sometimes briefly, while avant-garde ones like exobiology are omitted entirely. With an information density substantially below that of the other three books, with trite student questions, and with an uninspiring pedagogy, this book nevertheless may have value for some lay readers—as a college text, however, it is superfluous.

The other three books, each of which has a well-known astronomer or space scientist as a senior author, are educationally bolder. The book by S. P. Wyatt and J. B. Kaler is a short, updated version of Wyatt's successful larger volume, first published in the 1960's. In style and sophistication it scores high—from lucid prose to provocative questions—nevertheless it remains wholly conventional and sometimes disappointing, with often unrelated chapters encyclopedically reciting facts. In it, pure astronomy dominates while modern astrophysics, with such heuristic riches as the death phase of stars, never quite excites the reader.

The Hodge book groups its material into four contiguous sections: why and how astronomers work, evolution of the solar system, evolution of stars and the structure of the universe. Without a glossary, appendices, or color plates, it still is handsomely produced and pedagogically innovative, with references to auxiliary teaching aids, suggested observations, good black and white photographs, and simple, yet superb diagrams depicting phenomena that cannot be explained succinctly with words, such as the distribution of neutral hydrogen in M31 and how a protostar acquires angular momentum.

The most unusual of these four books, however, is the one by R. Jastrow and M. H. Thompson. Here the ordering is into the broad topics of stars, then galaxies, and finally solar system. Even though this scheme possesses a defensible logic, mirroring the impact of

the Copernican Revolution on the history of astronomy, it introduces new problems. It is contrary to Man's actual discovery of the cosmos, it introduces certain basic physical concepts in the section on stars and relegates several fundamental astronomical techniques to an appendix, and it places Newton's universal law of gravitation under "Laws of the Solar System." The positive features, however, are stunning, including especially exciting and up-to-date chapters on the Earth, moon, planetary exploration, the Sun and life in the cosmos. Aside from numerous color plates, this book is replete with unconventional photographs and multi-color figures. But Jastrow and Thompson's idiosyncratic treatment will attract some professors while repelling others.

Irrespective of the book chosen, astronomy can give a perspective that is worth having and teaching, for one of mankind's most ennobling achievements is its ability to comprehend a system far vaster than itself. We are now peering back to the beginning of the universe and reconstructing the entire saga of cosmic evolution. Without astronomy we could not understand this epic, and without education we could not understand astronomy.

RICHARD BERENDZEN
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new books

Elementary Particles and Fields

Dual Resonance Models. P. H. Frampton. 451 pp. W. A. Benjamin, Reading, Mass., 1974. \$22.50 hardcover. \$14.50 paperback

Formulae and Results in Weak Interactions. H. Pietschmann. 64 pp. Springer-Verlag, New York, 1974. \$18.00

Introduction to Particle Production in Hadron Physics. S. Humble. 253 pp. Academic, New York, 1974. \$17.50

Neutrinos—1974. (AIP Conf. Proc., Philadelphia, 26–28 April 1974). C. Baltay, ed. 328 pp. American Institute of Physics, New York, 1974. \$16.00

Nuclei, Nuclear Physics

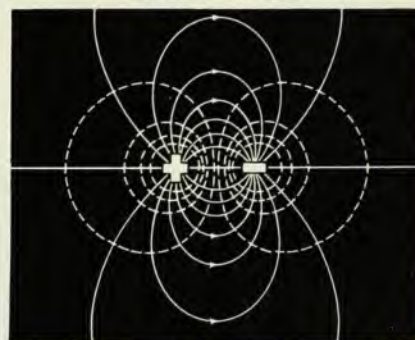
High-Energy Physics and Nuclear Structure. (Proc., Int. Conf. on High-Energy Physics and Nuclear Structure, Uppsala, Sweden, 18–22 June 1973). G. Tibell, ed. 459 pp. Elsevier, New York, 1974. \$61.50

Nuclear Forces: Introduction to Theoretical Nuclear Physics. G. Eder. 349 pp. MIT Press, Cambridge, Mass., 1974. \$5.95

Nuclear Spectroscopy and Reactions Parts A and B. J. Cerny, ed. 518 pp, 711 pp. Academic, New York, 1974. Part A, \$44.50; Part B, \$49.50

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