

Starry lectures

NUCLEAR ASTROPHYSICS. By William A. Fowler. 109 pp. American Philosophical Society, Philadelphia, 1967. \$3.00

by *Malvin A. Ruderman*

Except for familiar regions on the surface of the earth, more is probably known about the central region of the sun than about any other place in the universe. Although 19 separate nuclear reactions can contribute to the fusion of hydrogen to helium in the solar core, careful experiment and refined theory have developed nuclear physics to the state where it can confidently and quantitatively be applied to the deep interior of any hydrogen burning star and to subsequent states in stellar evolution. Together with modern computers and hydrodynamics these studies have led to a reasonably detailed description of the life and death of stars and to very plausible models for the origin of the elements. The structure of a star can be predicted as it exhausts its central hydrogen and its core temperature and density increase until helium ignites and burns to carbon and oxygen. Later the burning of these elements gives still heavier elements and finally iron, when fusion ceases at about 4×10^9 °K. An enormous neutrino lu-

minosity (over 10^{12} times the photon luminosity of the sun) and the photodisintegration of the iron core then cause the star to become unstable. Some of the nuclear ashes from the earlier burning, a small part of which has been converted to heavy elements by neutron fluxes, are forcibly injected back into space to be incorporated into later generations of stars and planets. It is a most attractive story that has support from isotope-abundance measurements, astronomical observations and estimates of times scales for various astronomical events.

In this delightful book, Fowler, who has himself contributed so brilliantly to the application of nuclear physics to processes within stars, presents these achievements of nuclear astrophysics in lectures presented before

the American Philosophical Society in 1965. These four lectures discuss the origin of the elements, nuclear reactions in stars and their consequences, the ages of the elements and the universe and some early results and notions on galactic explosions and quasars. This readable, untechnical survey is intended to enrich the understanding of the enlightened layman and beginning student and also to report more widely what has been accomplished by expenditure of public funds on these studies. The results are a pleasure both for the reader and the taxpayer.

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A stairway to . . .

THE EARLY TYPE STARS. By Anne B. Underhill. 269 pp. Gordon and Breach, New York, 1966. \$19.50

by *Martin F. McCarthy*

Here is a book astronomers can recommend to their physics colleagues who ask "What do you people really do when you are not tracking satellites or observing quasars?" This book describes the constitution and evolution of the early type stars, those hot (surface temperatures: $15,000^\circ$ C to $50,000^\circ$ C) blue stars that are larger and more brilliant than our sun and that, by reason of their prodigious rate of energy generation, run through their life cycles in a short 10^7 or 10^8 years. Thus they provide us with an unparalleled view of what the author calls a stellar population in change. Through studies of the positions and

motions of the early type stars and their close involvement with the dust and gas of interstellar space, we can trace the spiral structures of the galaxy.

Anne Underhill is well qualified to sum up our knowledge and prospects for further knowledge of the early type stars. For many years a re-

search astronomer at the Dominion Astrophysical Observatory in Victoria, British Columbia, she is now a professor at the Sonneberg Observatory in Utrecht, Holland. She discusses with accuracy and authority the fields of atomic spectroscopy, spectral classification, spectrophotometry, stellar distribution, galactic structure and dy-

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