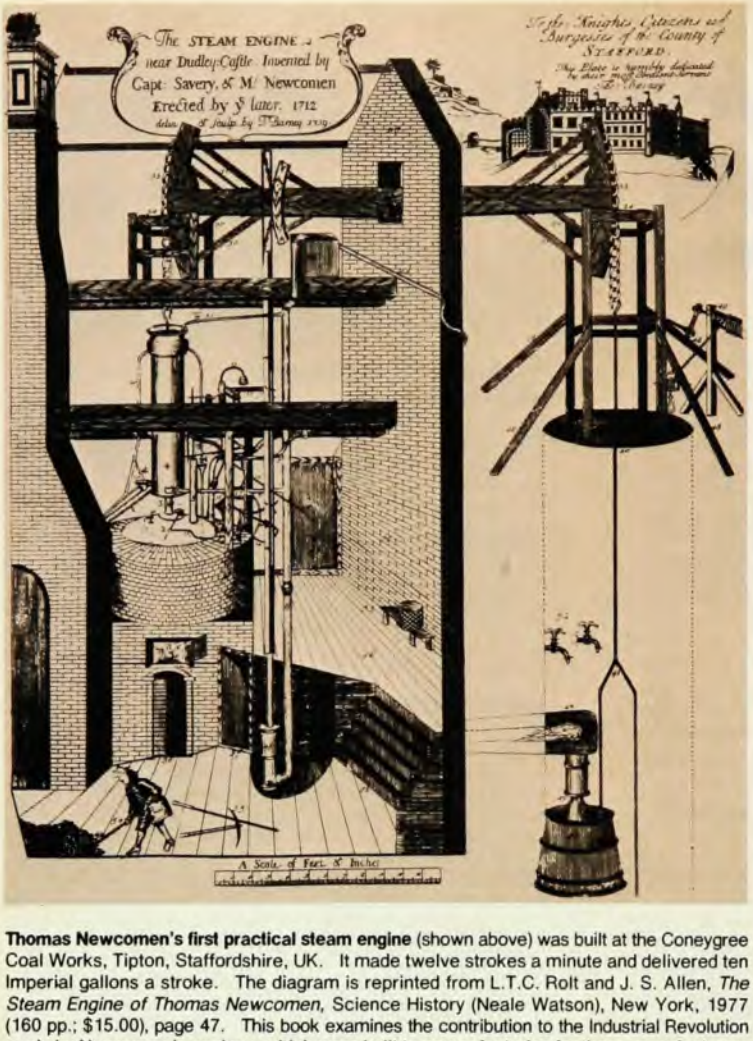

Thomas Newcomen's first practical steam engine (shown above) was built at the Coneygree Coal Works, Tipton, Staffordshire, UK. It made twelve strokes a minute and delivered ten Imperial gallons a stroke. The diagram is reprinted from L.T.C. Rolt and J. S. Allen, *The Steam Engine of Thomas Newcomen*, Science History (Neale Watson), New York, 1977 (160 pp.; $15.00), page 47. This book examines the contribution to the Industrial Revolution made by Newcomen's engines, which were built to power factories for those manufacturers who could not pay the very high charges for James Watt's more sophisticated engines.

traces to the present the methods of determining distances within the galaxy and concludes with the "Great Debate" in 1920 between Harlow Shapley and Heber Curtis on the scale of the universe. In this debate the nature of the spiral nebulae was crucial to the arguments. The authors discuss this epochal debate critically and correct some widespread misconceptions of the actual debate as compared with the published version.

In the second part, "Galactic Astronomy," the exploration of our galaxy is described. In particular the Kapteyn and Shapley models, based on star counts and on globular clusters respectively, are presented. The galactic rotation studies of Bertil Lindblad and Jan Oort follow and finally the discovery of general galactic absorption by Robert Trumpler. A consistent picture of the galaxy as a spiral nebula emerges.

"Extragalactic Nebulae," a term now superseded by "galaxies," is the title of the third section. This portion of the book emphasizes the work of Edwin Hubble in firmly establishing the spirals as galaxies similar to our own, in measuring their distances, and in his discovery of the redshift law. The pioneer contributions of Vesto Slipher, Curtis and K. Lundmark are given proper recognition. A most interesting part of the story has to do with the illusory rotational measures by Adriaan van Maanen for which no satisfactory explanation has ever been offered. The remarkable consistency of these measures was convincing to many astronomers and this evidence retarded the acceptance of spirals as galaxies. The authors review the question in great detail.

The fourth section, titled "The Birth of Modern Cosmology," begins with Newton's studies and Olbers's paradox and traces concepts of the universe through Einstein's ideas and the several relativistic models growing out of his theory. The static and expanding models are described, including the steady-state and the big-bang theories. The discovery of the 3 K background radiation and its support of the Big-Bang theory are briefly mentioned. Finally the question of the "open" versus the "closed" universe is discussed.

The reader is apt to be left with the impression that about 1920 Curtis and Lundmark were almost alone in supporting the island-universe theory. In 1917 R. F. Sanford published a very persuasive article in its support and in the same year W. W. Campbell made a very strong case for it in his presidential address to the AAAS. One important omission in the book is the fundamental work of Walter Baade in correcting the intergalactic distance scale. This correction made the sizes of the spiral nebulae much more nearly comparable to that of our own galaxy, and also gave an age of the universe from the start of the expansion in much closer agreement with the accepted ages of the stars.

On the whole the treatment by the authors is accurate and well balanced and the material is presented in an attractive style. The book can be read with profit and pleasure by anyone with a serious interest in our place in the universe.

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book notes

The Historical Supernovae. D. H. Clark, F. R. Stephenson. 233 pp. Pergamon, Elmsford, N.Y., 1977. $15.00 clothbound, $7.50 paperbound

Supernova explosions have been linked in recent years with important astrophysical phenomena such as pulsars, black holes and x-ray binaries, and thus the authors are justified in claiming that historical records of such explosions are "among the most valuable legacies which the ancient world has bequeathed to modern science." Four long-duration "new stars" of extreme brilliance have been recognized as supernovae within our galaxy; these were seen in AD 1006, AD 1054, AD 1572 and AD 1604. Clark and Stephenson discuss the recorded observations of each in detail, as well as those of four other "new stars" seen in AD 185, AD 386, AD 393 and AD 1181 that may have been supernova explosions. Several historically observed "new stars" have been identified with supernova remnants (such as the star of AD 1054 with the Crab Nebula), and the evolution of these remnants is discussed in the final chapter of the book. —CBW

Perspectives on the Energy Crisis, Vol. I. H. Gordon, R. Meador, eds. 517 pp. Ann Arbor Science Publishers, Ann Arbor, Mich., 1977.

According to editors Howard Gordon and Roy Meador this book "makes a valuable reference source for anyone concerned about future energy decisions ... The numerous energy data tables are important in understanding energy resources and projecting future availability ... [and] the book supplies a large number of papers, reports and articles on the energy crisis." Primarily a reference work, the book consists largely of graphs and tables drawn from US government sources. Emphasis is on fossil-fuel resources and forecasts, with but a few pages, in a RANN-symposium report, commenting on alternative sources such as geothermal and solar energy. (Volume 2, currently in preparation, is to include more on alternative sources.) Surprisingly, the book lacks an adequate index to the wealth of data it presents; given the disparate nature of the sixteen or so original sources, one could have difficulty finding specific items in this large book.

General Circulation Models of the Atmosphere (Methods in Computational Physics, Vol. 17). J. Chang, ed. 337 pp. Academic, New York, 1977. $35.50

For this volume Julius Chang has brought together contributions from 12 mathematical meteorologists on numerical models for weather prediction and climate simulation, including the five-level general circulation model at the UK Meteorological Office, the NCAR models, the UCLA model and global modeling by spectral methods. —JTS

new books

Particles, Nuclei and High-Energy Physics

Fundamentals of Quark Models (Proc. of the Seventeenth Scottish Universities Summer School in Physics, St. Andrews, Scotland, August 1976). I. M. Barbour, A. T. Davies, eds. 588 pp. SUSSP, Edinburgh, 1977. £12.00

Proc. of the International Neutrino Conference, Aachen 1976. H. Faissner, H. Reithler, P. Zerwas, eds. 748 pp. Vieweg, Braunschweig, W. Germany, 1977. DM 168.00

Photonuclear Reactions I and II (Lecture Notes in Physics, Vols. 61 and 62). S. Costa, C. Schaerf, eds. 650 and 301 pp., respectively. Springer-Verlag, New York, 1977. $21.60 and $13.70, respectively

Weak Interactions/Interactions faibles (Textbook on Elementary Particle Physics, Vol. 1). M. K. Gaillard, M. Nikolic, eds. 374 pp. Institut National de Physique Nucléaire et de Physique des Particules, Paris, 1977. FF 40.00 (individuals), FF 60.00 (libraries)

Fields, Particles and Currents (Lecture Notes in Physics, Vol. 66). A. H. Völkel. 354 pp. Springer-Verlag, New York, 1977. $14.30

Weak Interaction Physics—1977 (Proc. of a conf., Bloomington, Indiana, May 1977). D. B. Lichtenberg, ed. 152 pp. AIP, New York, 1977. $13.00

Atomic, Molecular and Chemical Physics

Contemporary Quantum Chemistry: An Introduction. J. Goodisman. 376 pp. Plenum, New York, 1977. $32.50

Infrared, Correlation, and Fourier Transform Spectroscopy (Computers in Chemistry and Instrumentation, Vol. 7). J. S. Mattson, H. B. Mark Jr, H. C. MacDonald Jr, eds. 233 pp. Dekker, New York, 1977. $27.50

Introduction to Liquid State Chemistry. Y. Marcus. 357 pp. Wiley-Interscience, New York, 1977. (price not stated)

Liquid Semiconductors. M. Cutler. 226 pp. Academic, New York, 1977. $19.50

Theory of Ionization of Atoms by Electron Impact. R. K. Peterkop. 263 pp. Colorado Associated U.P., Boulder, Colo., 1977. $10.95