Physics B3: Astrophysics
Stellar Structure and Evolution
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(www-astro.physics.ox.ac.uk/~podsi/lec_mm03.html)

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GENERAL TEXTBOOKS

• An Introduction to Modern Astrophysics, Carroll & Ostlie
• Introductory Astronomy and Astrophysics, Zeilik & Gregory
• An Introduction to the Theory of Stellar Structure and Evolution, Prialnik

ADVANCED TEXTBOOKS on Stellar Structure and Evolution

• Stellar Structure and Evolution, Kippenhahn & Weigert (1994)
• Black Holes, White Dwarfs, and Neutron Stars, Shapiro & Teukolsky (1983)

The Astrophysicist’s Approach

• the role of order-of-magnitude estimates
• astrophysicists’ versions of standard physics equations
• the role of astronomical observations as substitute for laboratory experiments

▷ search the sky for ‘experiments’ of interest, piece together time sequences (e.g. solar lifetime $10^{10}$ yr)
▷ continue to develop instruments (telescopes) to search the sky to ever higher precision and in different wavebands.
LECTURE SCHEDULE: Podsiadlowski
(Supplementary material in italics)

- Observable properties of stars: luminosity, surface temperature, radius, mass.


- The Sun: *helioseismology, neutrino astrophysics, the solar neutrino problem, solar neutrino experiments.*

- Structure of main-sequence stars. Qualitative account of star-formation


- Evolution of high-mass stars. Supernovae: core-collapse, thermonuclear explosions, classification, *SN 1987A*

- Compact stars: neutron stars/pulsars, black holes, Schwarzschild radius, orbits around black holes, *gamma-ray bursts.*

- Binary stars. Properties, mass function, Roche lobe, mass transfer, *eclipsing binaries, X-ray binaries, cataclysmic variables.*