

## Stellar Formation and Evolution --- Syllabus

This course deals with the time variations of the structure of a star's interior and atmosphere. We will discuss the important physical processes governing the life of a star --- from its birth out of dense, cold molecular clouds, to shining with the star's own thermonuclear fuels, to rapid changes in structure when these fuels are no longer available, to the end of a star's life, with matter in extremely compact states.

What a star may take billions of years, will take us one semester to cover the following subjects:

- Molecular Clouds and the Interstellar Medium
- Cloud Collapse and Fragmentation
- Stars and Statistical Physics
- Protostars and Jets
- Circumstellar Disks and Planet Formation
- Evolution onto the Main Sequence
- Binaries and Star Clusters
- On the Main Sequence --- Nuclear Reactions
- Stellar rotation
- Instabilities --- Thermally, Dynamically and Convectively
- Post-MS Evolution of Low-Mass Stars --- RG, AGB, HB, PNe)
- Post-MS Evolution of Massive Stars --- SN and SNR
- Mass Loss
- Stellar Pulsation and Cepheid Variables
- Compact Objects --- White Dwarfs, Neutron Stars, Black holes

**Text:**

*“An Introduction to the Theory of Stellar Structure and Evolution”*, by Dina Prialnik, Cambridge, 2000

### References

All the references you have found useful for the course Stellar Atmosphere and Structure will be also of use in this course. The following are the ones I have been using or published in recent years.

- ✓ ***The Physics of Stars***, by A.C. Phillips, 1994, John Wiley & Sons
- ✓ ***Physics of Stellar Evolution and Cosmology***, by H. Goldberg & Michael Scadron, 1982, Gordon and Breach,
- ✓ ***The Stars*** --- Their Structure and Evolution, R. J. Tayler, 1994, Cambridge
- ✓ ***Stellar Structure and Evolution***, by R. Kippenhahn & W. Weigert, 1990, Springer-Verlag,
- ✓ ***Introduction to Stellar Astrophysics***, Vol 3 --- Stellar Structure and Evolution, by Erika Bohm-Vitense, 1992, Cambridge
- ✓ ***Stellar Structure and Evolution***, by Huang, R.Q. 黃潤乾, Guoshin, 1990  
This book, originally in Chinese, has an English version
- ✓ ***Evolution of Stars and Stellar Populations***, by Maurizio Salaris and Santi, Cassisi, 2005, Wiley
- ✓ ***Stellar Evolution***, by Amos Harpaz, A K Peters, 1994
- ✓ ***The Formation of Stars***, by Steven W. Stahler & Francesco Palla, 2004, Wiley
- ✓ ***From Dust to Stars***, by Norbert S. Schulz, 2005, Springer

For star formation, the book "***Molecular Clouds and Star Formation***", edited by Chi Yuan (袁旂) & Junhan You (尤峻漢) and published by World Scientific in 1993, should be a good reference. Unfortunately this book is currently out of print, but Prof Yuan kindly donated his editor copy.

A rather extensive listing of books regarding stars can be found at <http://www.ericweisstein.com/encyclopedias/books/Stars.html>