Stars IV
The Beginning of the End
Chapter 17
End of Main Sequence Life
• No major changes to the star during this time period
• The Sun has done this for about 4.6 billion years
  – It has about another 5.4 billion years to go
  – The core of the Sun has shrunk and gotten hotter, so the atmosphere has expanded slightly

How Do We Know?
Expanding Sun

The End of Hydrogen Burning
• Eventually all stars will run out of hydrogen in their cores
• Which stars will run out of H first?

Main Sequence Life-Time
• Cloud, Protostar, PMS Star, MS Star

Core Burn Out
• Without energy generation the core pressure drops
• The core begins to collapse
• In the Sun
  – it will reach 1/3 its original radius
  – temperature increases from 15 million to about 100 million K

Hydrogen Shell Burning
• The increased core temperature and collapse of the core cause a shell of hydrogen to start burning
• This increase in energy output pushes the upper layers of the stars outward

For the Sun
• The atmosphere will expand to about 1 A.U.
• The surface temperature will drop to 3500 K
• Net Result: The Sun will be much more luminous
• It will become a Red Giant