

# Acting Out the Life Cycle of Stars

As a class, we acted out the life cycle of stars. Figure 1 shows the 6 stages of stellar evolution that we acted out. Figure 2 shows actual astronomical images representing the 6 stages.

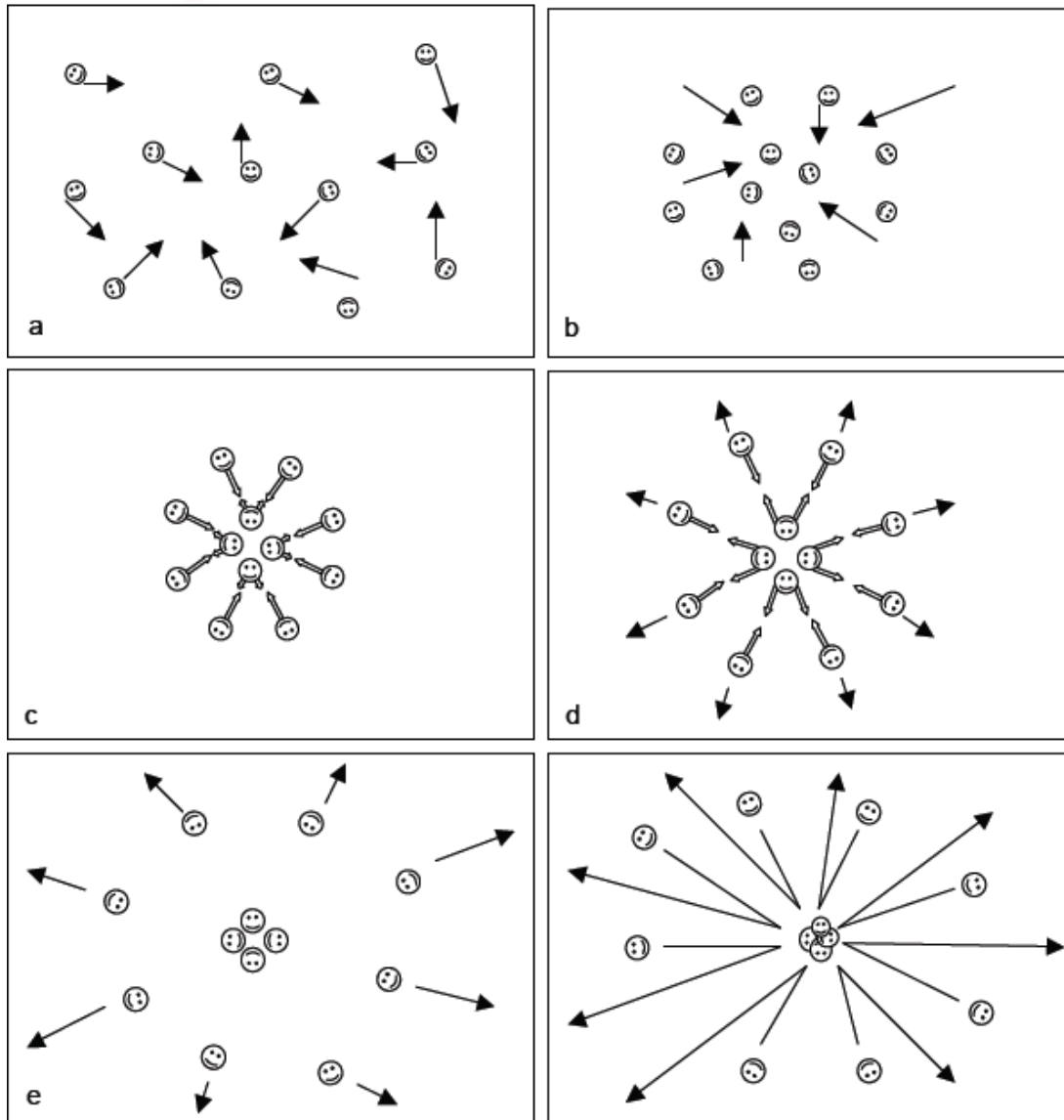


Figure 1: Acting out the stages of stellar evolution.

- Interstellar Medium (ISM) and Star-Forming Nebula: random motion
- Protostar: clumping, motion toward the center, stellar core and envelope start to form
- Core Hydrogen Fusion and Hydrostatic Equilibrium: core and envelope pushing in balance
- Red Giant: core pushing harder, motion outward, envelope expands some
- Planetary Nebula and White Dwarf (stars with masses  $< 8M_{\text{Sun}}$ ): core contracts, envelope expands and gradually floats away
- (Core-Collapse) Supernova (stars with masses  $> 8M_{\text{Sun}}$ ): core collapses, envelope falls inward then bounces outward in a supernova explosion

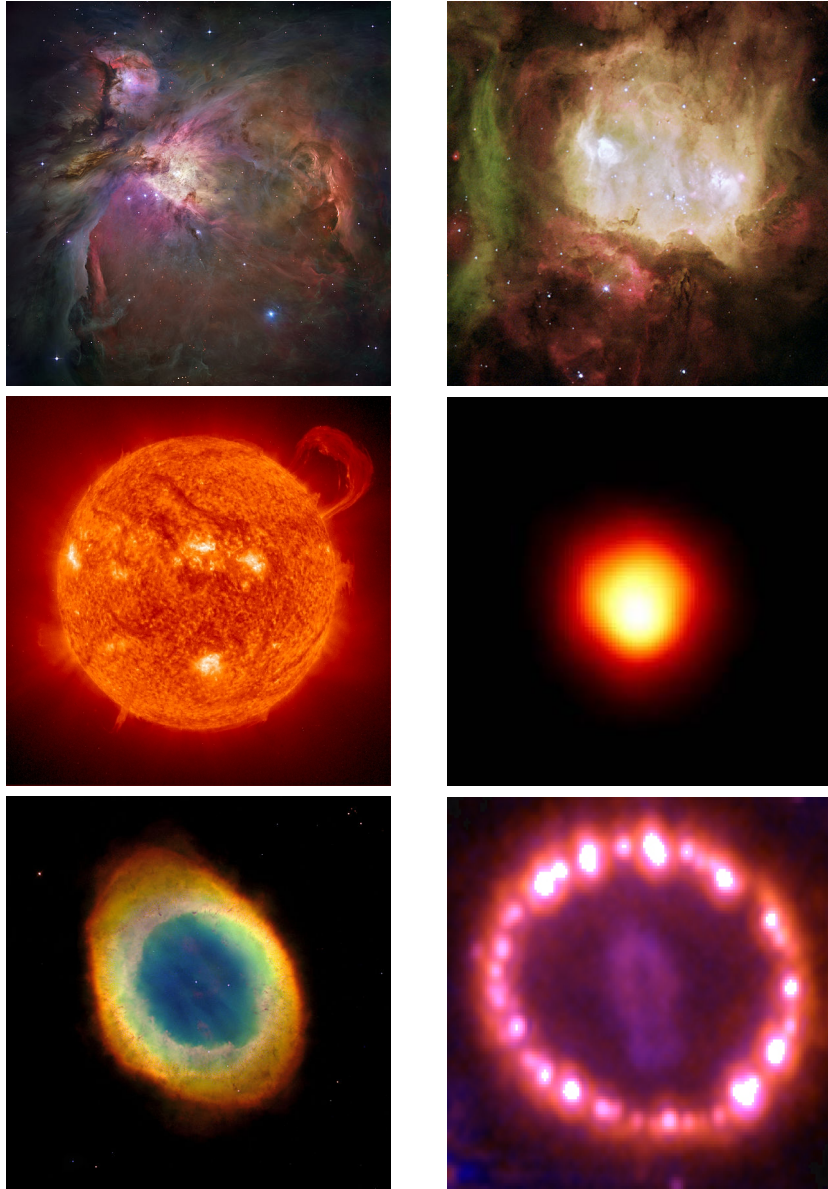


Figure 2: Actual images of various stages of stellar evolution.

- a. (upper-left) The Orion Star-Forming Nebula (M42), in the middle of Orion's sword (Hubble Space Telescope [HST]; optical light; NASA/ESA)
- b. (upper-right) The Ghost Head Star-Forming Nebula (NGC 2080) with protostars, in the southern constellation Dorado (HST; optical light; NASA/ESA)
- c. (middle-left) The Sun (in hydrostatic equilibrium) on September 14, 1999, showing gas at about 60,000 degrees C (Solar and Heliospheric Observatory [SOHO]; ultraviolet light; NASA)
- d. (middle-right) Betelgeuse, a red giant star; it can easily be seen during winter nights as the bright red/orange star in the shoulder of Orion (HST; ultraviolet+optical light; NASA/ESA)
- e. (bottom-left) The Ring Planetary Nebula (M57), in the constellation Lyra, with a relatively bright white dwarf at its center (HST; optical light; NASA/ESA)
- f. (bottom-right) The blob in the center is Supernova 1987A, a massive star in the nearby galaxy known as the Large Magellanic Cloud that collapsed on itself and exploded as a supernova; the ring of bright spots is some of the gas it ejected (HST; optical light; NASA/ESA)