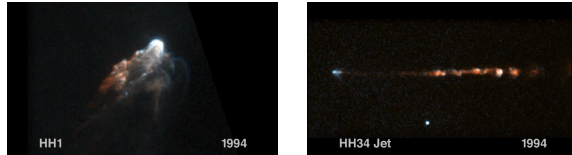


Introductory Astronomy

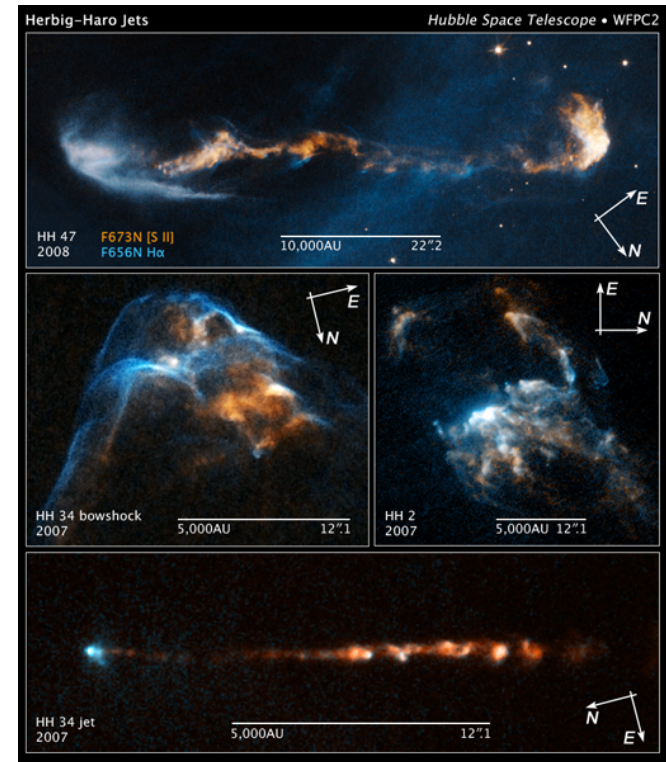
Week 5: Stellar Evolution

Clip 3: Wild Youth



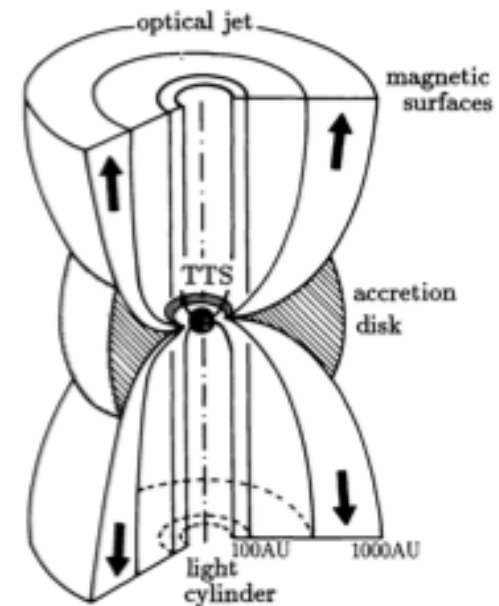
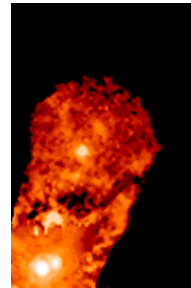
Bipolar Flow

- Star formation accompanied by energetic **bipolar flow** and collimated **jets**
- Carry off **angular momentum** enabling collapse
- **Mechanism** unknown
- Observed as **shockwave** in surrounding envelope: **Herbig-Haro object**



T-Tauri Stars

- Medium-mass young stars exhibit rapid, irregular **variability** and high rates of **mass loss** $10^{-8} M_{\odot}/\text{yr}$
- Can last up to 10^7 yr
- **Shockwave** when collapse stops? Magnetospheric Accretion Model
- Related type: **FU Orionis**, **Ae/Be**, **Of**



Credits

- HH Image: NASA, ESA, and P. Haritgan (Rice University)
<http://hubblesite.org/newscenter/archive/releases/2011/20/fastfacts/>
- HH-1 Video: NASA, ESA, P. Hartigan (Rice University), and G. Bacon (STScI)
<http://hubblesite.org/newscenter/archive/releases/2011/20/video/l/>
<http://hubblesite.org/newscenter/archive/releases/2011/20/video/f/>
- T-Tauri Flow figure: M. Camenzind, Reviews in Modern Astronomy, v. 3, (1990), p. 234-265 <http://adsabs.harvard.edu/abs/1990RvMA....3..234C>
- XZ-Tauri video: John Krist (STScI), Karl Stapelfeldt (NASA Jet Propulsion Laboratory), Jeff Hester (Arizona State University), Chris Burrows (ESA/STScI)
<http://hubblesite.org/newscenter/archive/releases/2000/32/video/a/>