Introductory Astronomy

Week 7: Galaxies

Clip 10: Spirals

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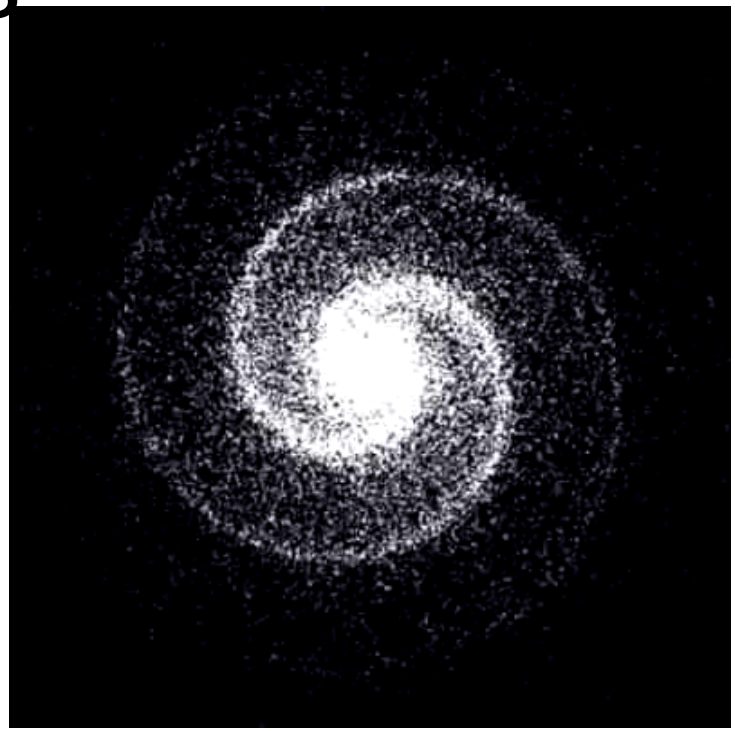
The Winding Problem

- Spirals cannot be made of stars – differential rotation destroys them quickly
- Spiral Arms are regions of star formation moving through disk



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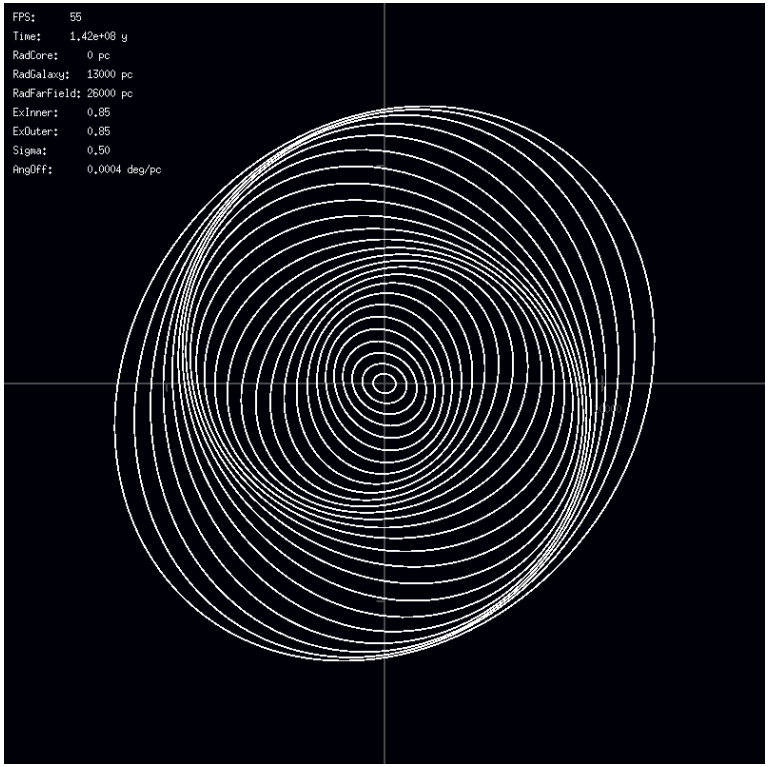
Density Wave Model

- Spirals are quasistatic density waves where density increases by 10-20%
- Increased density spurs star formation : this is where OB stars and HII regions are found
- Result of resonance between orbital period and oscillation period about orbit



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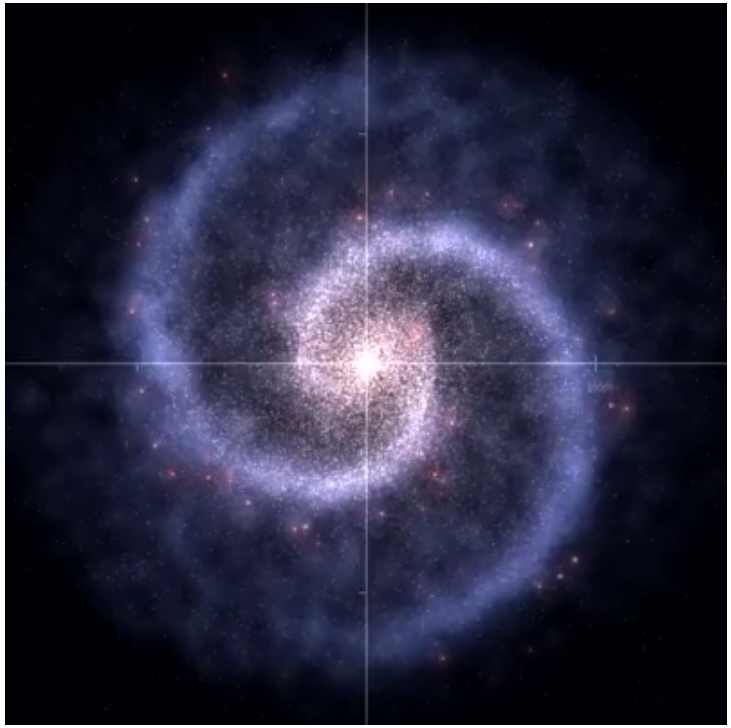
Grand Design Spiral



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Flocculent Spiral

- Stochastic Self-Propagating Star Formation:
- Star formation begins randomly
- OB supernovae shock waves suppress further star formation by dispersing cloud
- Shock waves trigger star formation further out
- Differential rotation pulls new stars into trailing arms

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Credits

- Density Wave Simulations: Ingo Berg http://beltoforion.de/galaxy/galaxy_en.html
- M81: Hubble data: NASA, ESA, and A. Zezas (Harvard-Smithsonian Center for Astrophysics); GALEX data: NASA, JPL-Caltech, GALEX Team, J. Huchra et al. (Harvard-Smithsonian Center for Astrophysics); Spitzer data: NASA/ JPL/Caltech/Harvard-Smithsonian Center for Astrophysics http://hubblesite.org/gallery/album/pr2007019j/
- NGC 4414: The Hubble Heritage Team (AURA/STScI/NASA) http://hubblesite.org/gallery/album/pr1999025a/