Introductory Astronomy

Week 7: Galaxies

Clip 9: Dark Matters

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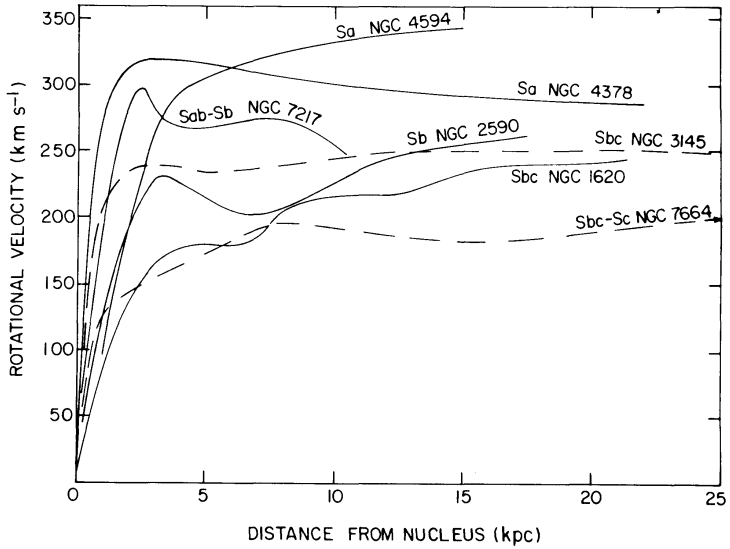
It's Not Just Us

- Rotation Curves for Spiral Galaxies show constant rotational velocity at largest distances
- Orbits of satellite galaxies continue trend
- 95% of the mass is not luminous or absorbing



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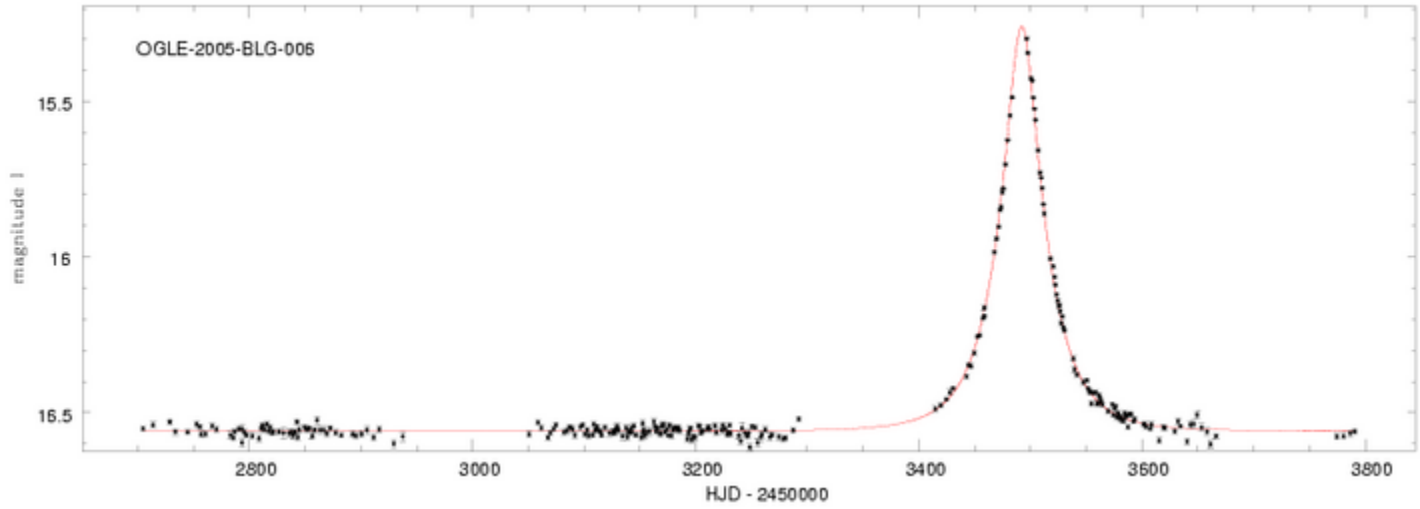
Dark Matter

- Dark Matter in spherical halo with radius 200-300 kpc and mass 2×10^{12} $M_{\odot}$
- Nearly meets halo of M31
- No optical activity
- Dominates galactic mass and crucial in scenarios for galaxy formation

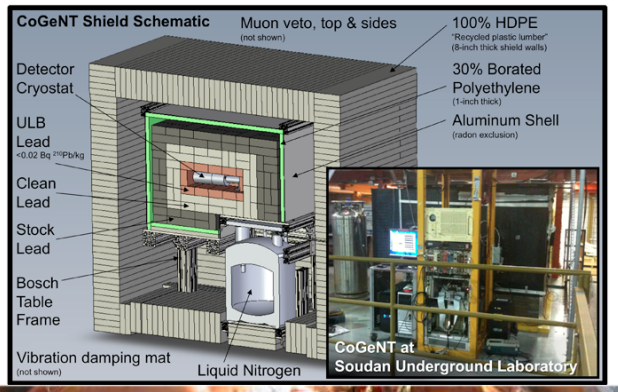
MACHOS

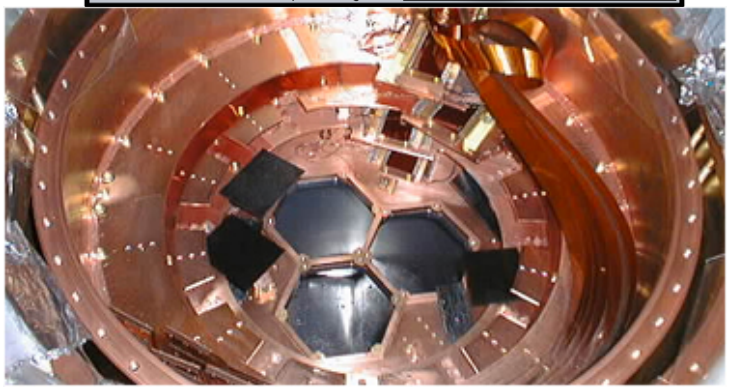
- MAssive Compact Halo ObjectS: Brown/Red/White Dwarfs or other dim compact object
- Search for gravitational microlensing
- Statistics: Can not account for significant fraction of mass



WIMPS

- Weakly Interacting Massive ParticleS
- Interact weakly so do not collapse to form dark stars
- Massive so clump gravitationally on galactic and larger scales
- Theoretical models suggest candidates
- Experimental searches ongoing





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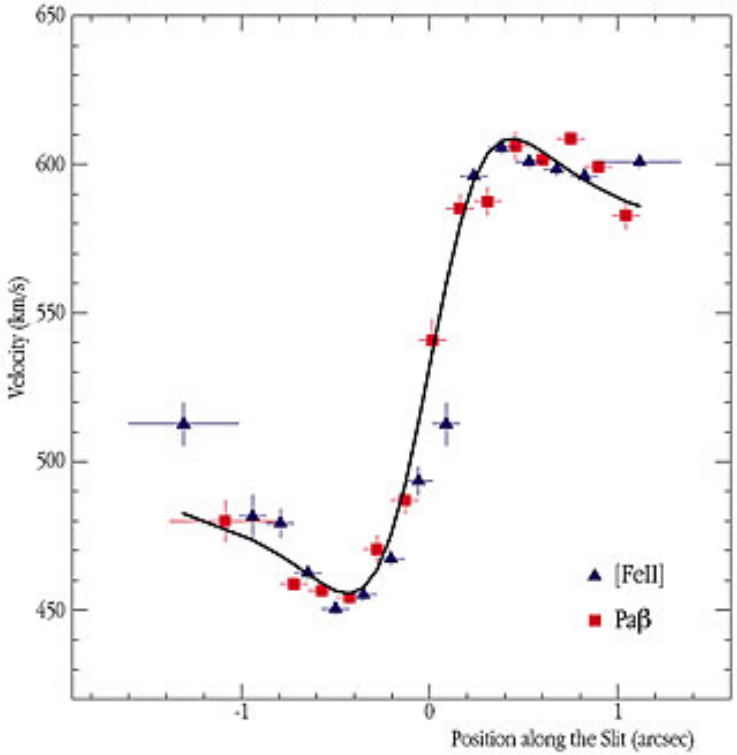
In the Center

- Easier to see core of other galaxies
- Rotation curve shows supermassive black holes are ubiquitous
- Mass to $10^9 M_\odot$
- Correlates with galactic parameters (bulge luminosity, number of globular clusters).



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Credits

- Spiral Rotation Curves: Rubin, V. C.; Thonnard, N.; Ford, W. K., Jr., Astrophysical Journal, Part 2 - Letters to the Editor, vol. 225, Nov. 1, 1978, p. L107-L111. http://adsabs.harvard.edu/abs/1978ApJ...225L.107R
- Microlensing Light Curve: Wikimedia Commons/Jan Skowron http://en.wikipedia.org/wiki/File:Gravitational.Microlensing.Light.Curve.OGLE-2005-BLG-006.png
- Centaurus A Rotation Curve: ESO http://www.eso.org/public/images/eso0109c/