

A Giant Meal Fit for a Dwarf: Symbiotic Binary Stars Beyond the Milky Way



SDSS



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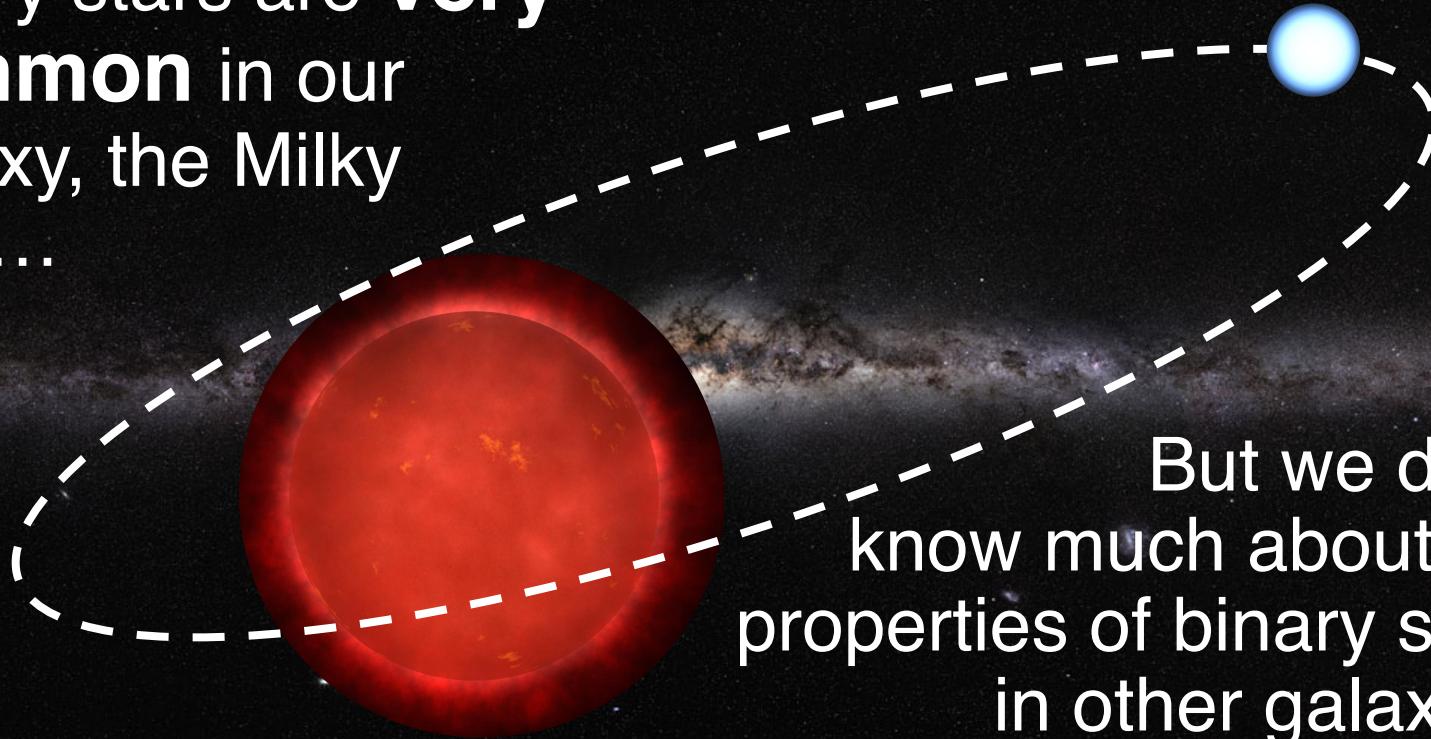
&

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In collaboration with Borja Anguiano, Steve Majewski, Keivan Stassun, et al.

Binary stars are **very common** in our Galaxy, the Milky Way...



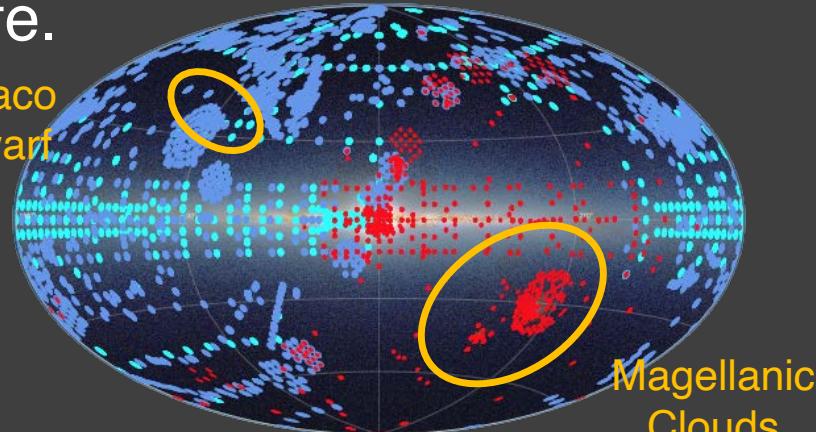
But we don't know much about the properties of binary stars in other galaxies.

(Image credit: NASA/ESA)

Apache Point Observatory Galactic Evolution Experiment



APOGEE provides many observations of the same stars over its decade long life.

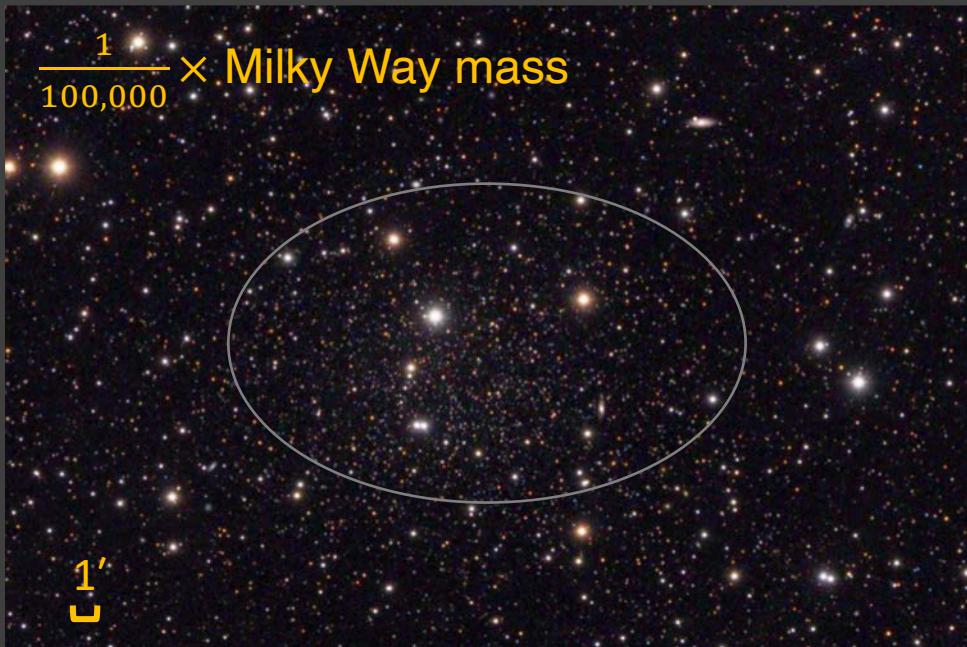


(Image credit: Christian Hayes)

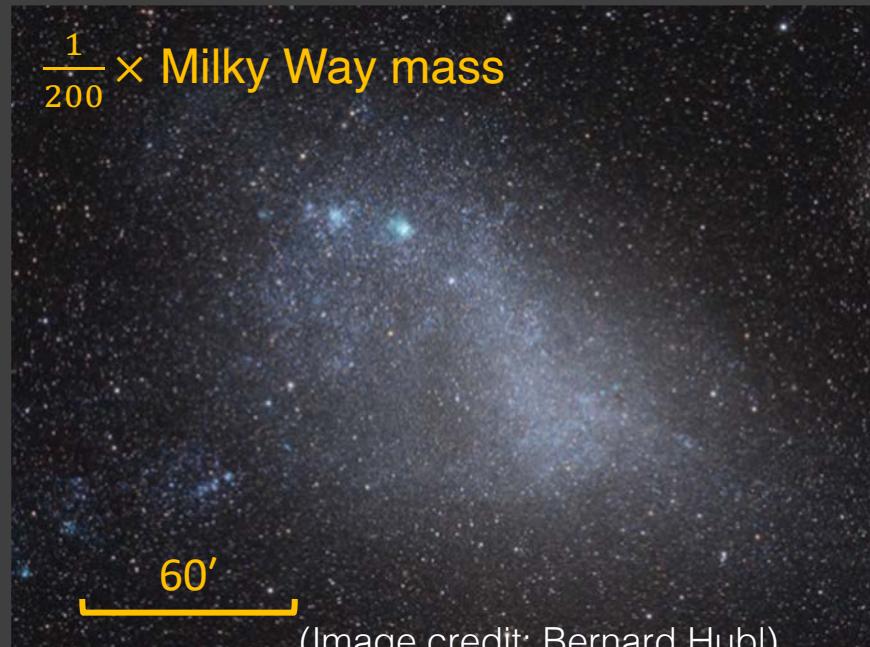
Apache Point Observatory Galactic Evolution Experiment



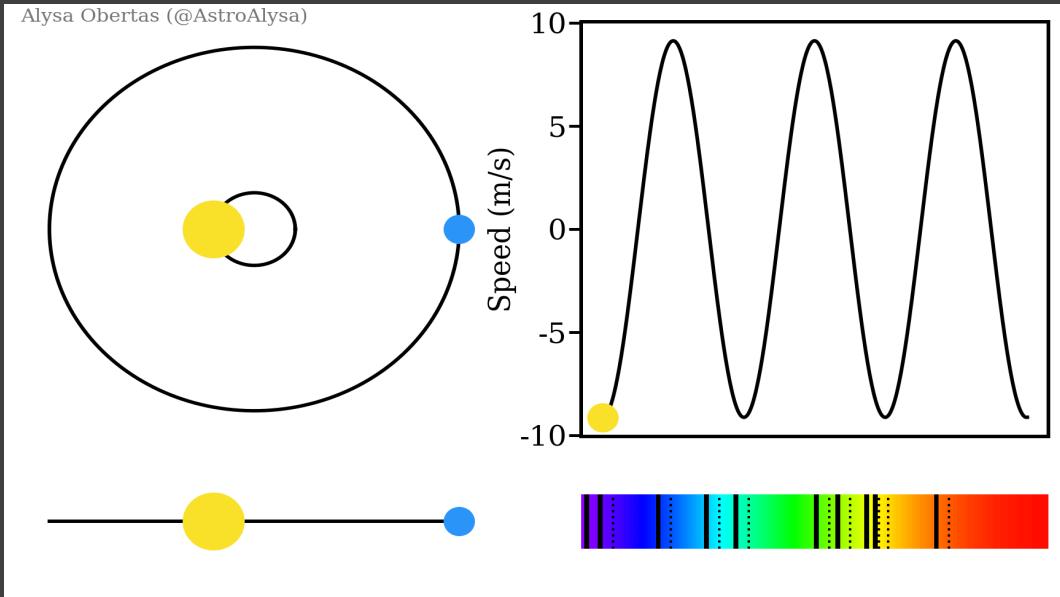
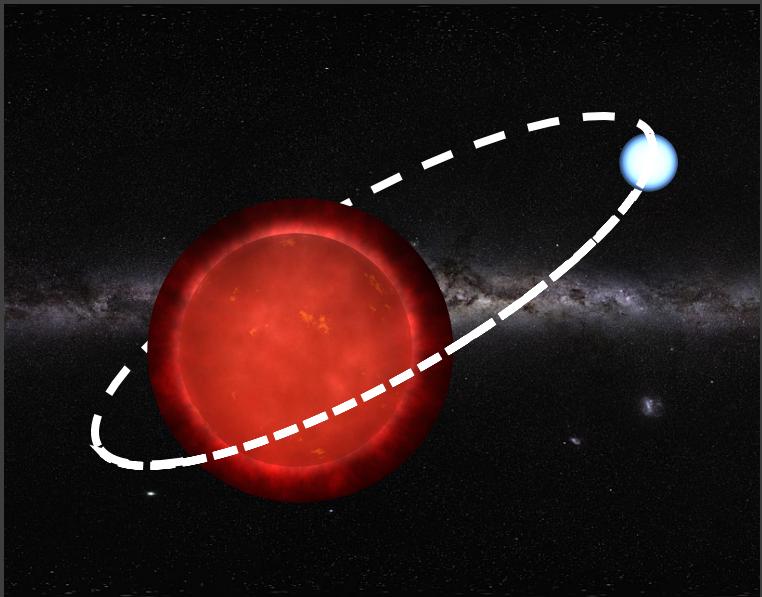
Draco dwarf spheroidal



Small Magellanic Cloud



Using the Doppler effect, we can map the orbits of binary stars outside of our Galaxy.

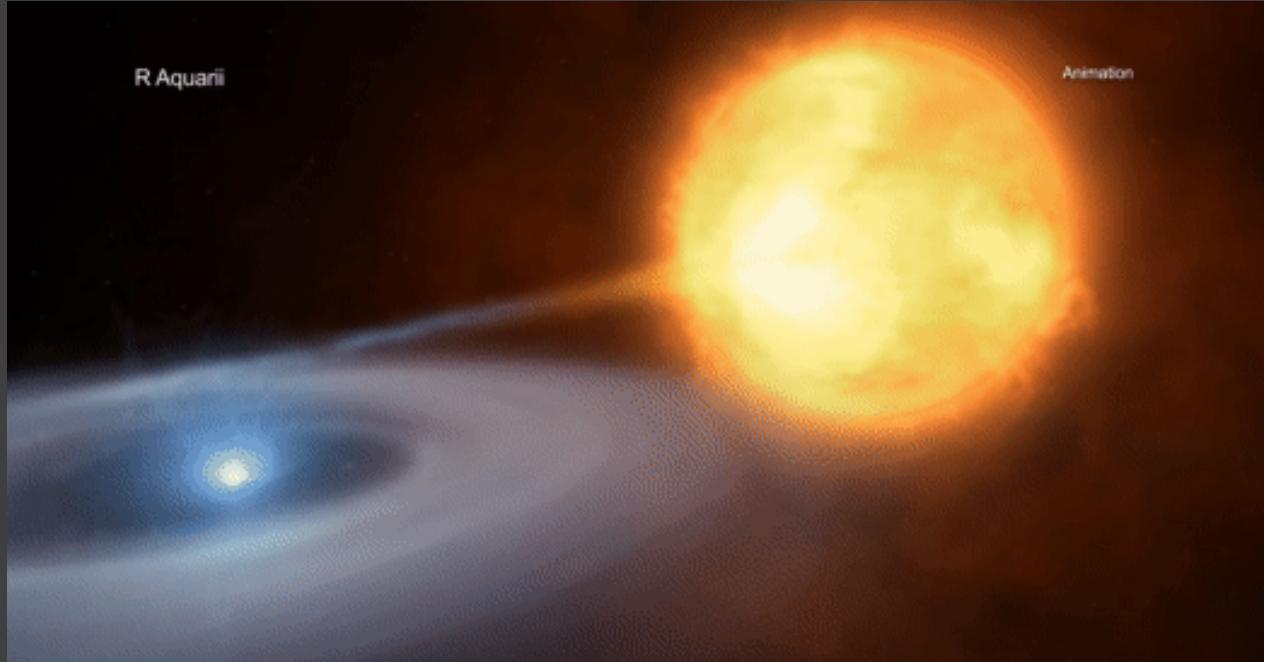


(Image credit: NASA/ESA)

(Image credit: A. Obertas)

Symbiotic stars are the ideal extragalactic binary for observers!

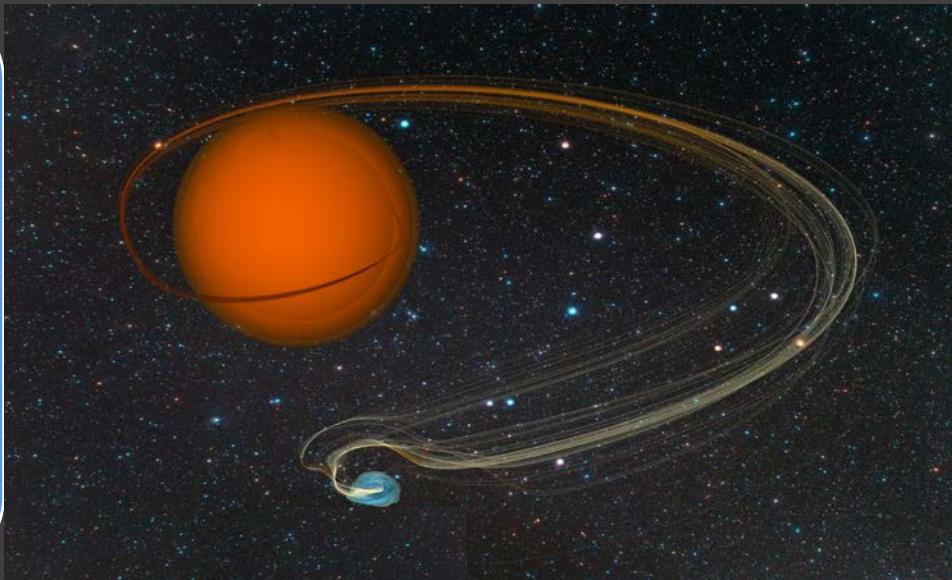
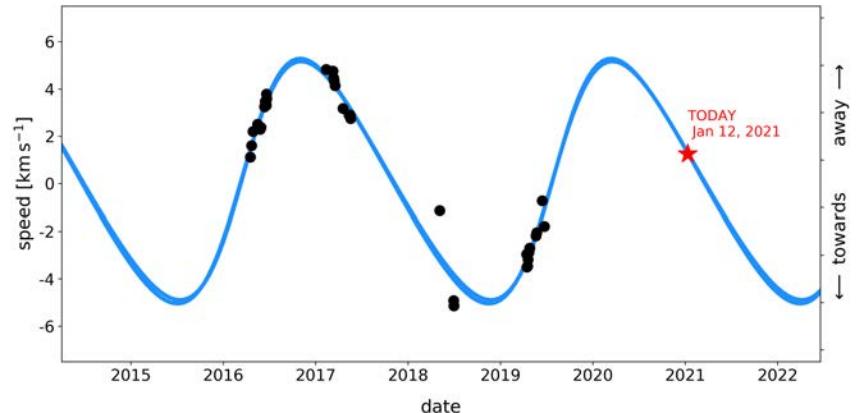
The stars in these binaries have a “**symbiotic**” relationship – the **white dwarf is consuming the outer atmosphere of its giant host**, indicated by bright emission lines.



Symbiotic stars are very rare, but both components of the binary are very bright, so these interacting systems can easily be observed outside of the Milky Way.

(Animation credit: NASA Chandra)

First extragalactic symbiotic with complete understanding of its architecture: Draco C1

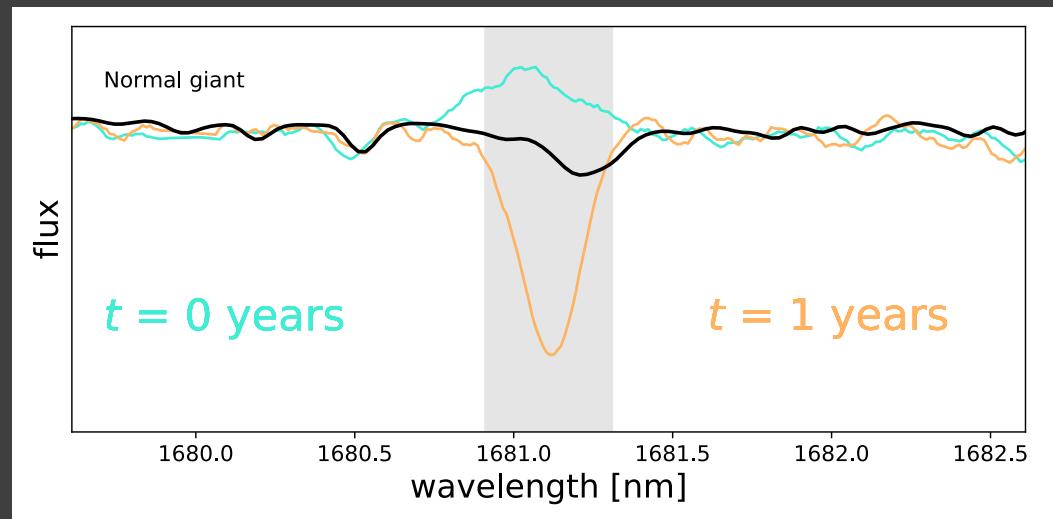


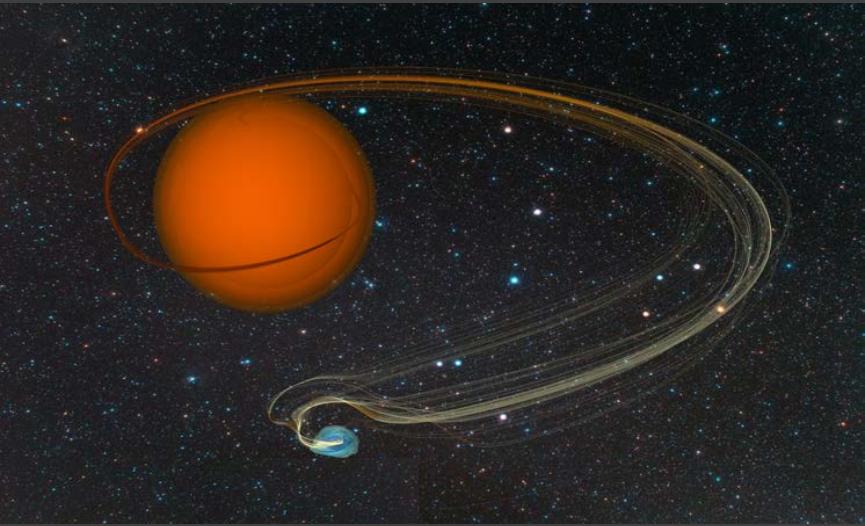
(Magnetohydrodynamical simulation: John Blondin)

Spectral variability suggests variable accretion rate: LIN 358

Hydrogen emission, a characteristic of symbiotic binaries, is observed in the APOGEE spectra of LIN 358...

- Strong hydrogen absorption is observed as well!
- Variability suggests elliptical orbit





- Symbiotic binaries are progenitors of Type Ia supernovae, which are important tools for measuring distances in our Universe.

(Image credit: John Blondin)

- APOGEE gives a window into binary star formation in environments vastly different from the Milky Way.



(Image credit: NASA APOD)

Summary



SDSS



- APOGEE provides a wealth of data for extragalactic (and galactic) binary stars
- First complete orbit derived for a symbiotic system outside of our galaxy

Thank you!

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SCAN TO READ
Lewis et al. 2020,
ApJL, 900 L43.
(results for Draco C1)



Washington et al. (results for LIN 358 and SMC N73) coming soon!