



EXOPLANETS



Background:

- Our Solar System consists of 8 (or 9) planets, hundreds of moons, thousands of comets, and hundreds of thousands of asteroids.
- The first exoplanets orbiting around another star were discovered in 1992.
- As of today, astronomers have detected over 4,050 exoplanets orbiting over 3,020 stars
- Because they are so small, it was once believed that red dwarf stars could not have planetary systems—now we know of many such systems
- Important because nearly 75% of all stars are red dwarfs

What we are modeling here:

- Scale models of two exoplanet systems: Proxima Centauri and TRAPPIST-1 compared with
 - Jupiter and its largest moons, Io, Europa, Ganymede, and Callisto
 - The Sun and Mercury
- Two ways of presenting the TRAPPIST-1 and Jupiter systems: with strings and with a model representing how they orbit their primaries. The Proxima Centauri and Sun/Mercury distances are too large to do on paper, so just used strings.
- In all cases, the sizes of the stars/Jupiter are to scale with respect to their distances and with string model the planets are close to scale with respect to their distances

Why these exoplanet systems:

- The star Proxima Centauri is the closest star (other than the Sun) to Earth, 4.2 light-years from us. Proxima Centauri b confirmed in August 2016 and may be only a few times larger than Earth. In the habitable zone of the star.
- TRAPPIST-1 (40 light-years away): three exoplanets discovered in 2015 and four more in 2017, one of the largest-known planetary systems. At least three of these exoplanets are within the star's habitable zone.
 - All planets are Earth-sized
 - All planets have densities close to Earth though one may be less dense (Icy? A thick atmosphere that makes it look bigger than it really is?)

Could there be life?

- While the temperatures are “just right” for life as we know it, red dwarf stars are known to have strong solar winds that could strip off any atmospheres. More study needed.

