Beyond the Sun: Planets Around Other Stars

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Planets Around Other Stars



Exoplanets

Exoplanet Discovery Through the Years



Exoplanet Discovery Through the Years



Exoplanet Discovery Through the Years



Almost every one of the 200 billion stars in our Galaxy has planets



The Habitable Zone



The **habitable zone** is the range of distances from a star where **water can exist in liquid form**







Transit measurements give the size of an exoplanet



Transit measurements give the size of an exoplanet





cartoon credit: Stephen Kane

Exoplanet Detection Techniques: Stellar Wobble

Stellar wobble measurements give the mass of an exoplanet

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Terrestrial Planets

Mercury takes the shortest time to travel around the Sun: 176 days



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Terrestrial Planets Neptune takes the longest time to travel around the Sun: 165 years

Hot Jupiters



Mercury

orbits the Sun in 176 days

Orbit of Mercury

• Orbit of TrES-3b

Mercury

orbits the Sun in 176 days

Hot Jupiter

orbits its star in 3 days!!!

Orbit of TrES-3b

Orbits of Morrows

Orbit of Mercury

Hot Jupiters are the easiest exoplanets to detect with both the transit and wobble methods







There are no planets **larger than Earth and smaller than Neptune** in our Solar System
Super-Earths



Neptune

Super-Earths



Neptune

Super-Earths Are Common Around Other Stars



PLANET SIZE (relative to Earth)









Super-Earths



Let's Go Hunt for Some Super-Earths!







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Microvariability and Oscillations in STars My Own Space Telescope The Humble Space Telescope



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HD 97658b: A New Transiting Super-Earth?



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MOST Investigates



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No transit at the expected time











Towards Other Earths



Towards Other Earths



Super-Earths are the smallest exoplanets we can study in detail with current telescopes

What's Next For Super-Earths?

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Transiting Exoplanet Survey Satellite (TESS)

What's Next For Super-Earths?



James Webb Space Telescope (JWST)

Transiting Exoplanet Survey Satellite (TESS)



Are We Alone?

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The answer could come as early as this decade...

Summary

- Planets are common around other stars
- Astronomers use different techniques to detect these exoplanets
- Super-Earths are missing from the Solar System, but they are the most common category of exoplanet in the Galaxy
- By studying super-Earths, we are taking a big step in the search for life outside the Solar System



Elliptical Orbits

HD 80606b:

Its orbit is one of the most elliptical (or eccentric) among known exoplanets

