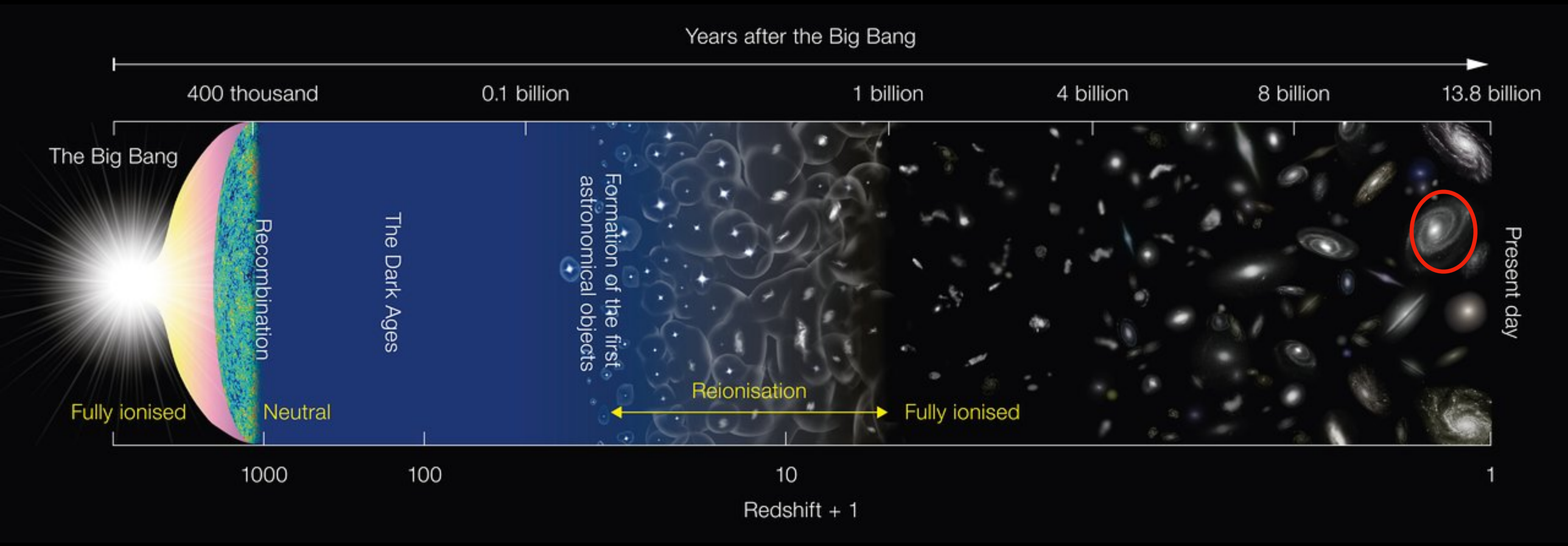


Image: National Observatory of Japan /EOS

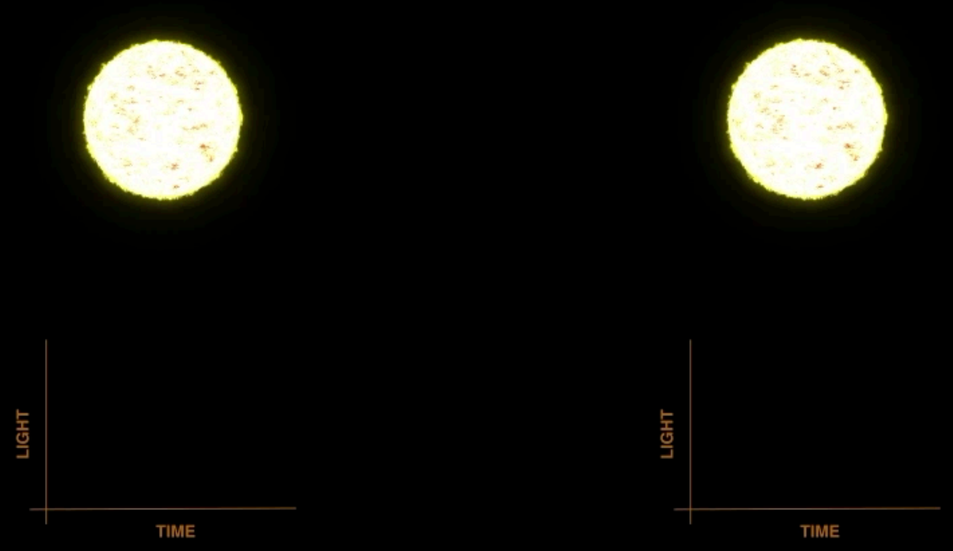
Exoplanet Detection Methods

Exoplanet Detection Methods

The Transit Method

4000+ planets discovered

Slight dimming of a star's brightness as a planet in orbit crosses directly in front of our line of sight to the star.



Gif: NASA

Exoplanet Detection Methods

The Transit Method

4000+ planets discovered

The amount of stellar flux lost depends on the surface area that is blocked by the planet.

We can derive:

- Size of the planet (ratio of planet/star)
- Orbital velocity of the planet
- Planet's orbital period
- Semi-major axis

Gif: NASA

Exoplanet Detection Methods

The Transit Method

4000+ planets discovered

Multi-planet system

Gif: NASA

Exoplanet Detection Methods

Radial Velocity Method

1000+ planets discovered

Orbiting planets cause the star to “wobble” back and forth in our line of sight.

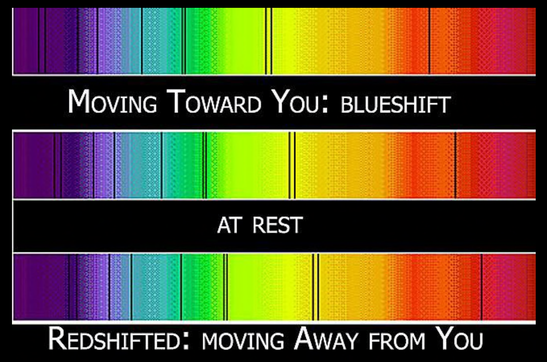
Gif: NASA

Exoplanet Detection Methods

Radial Velocity Method

1000+ planets discovered

This causes a Doppler shift in the absorption spectra of the star.



$$\frac{\Delta\lambda}{\lambda_{\text{emit}}} = \frac{v_{\text{rot}}}{c}$$

Gif: NASA

Exoplanet Detection Methods

Radial Velocity Method

1000+ planets discovered

This causes a Doppler shift in the absorption spectra of the star.

We can derive:

- Mass of the planet
- Orbital period
- Orbital velocity

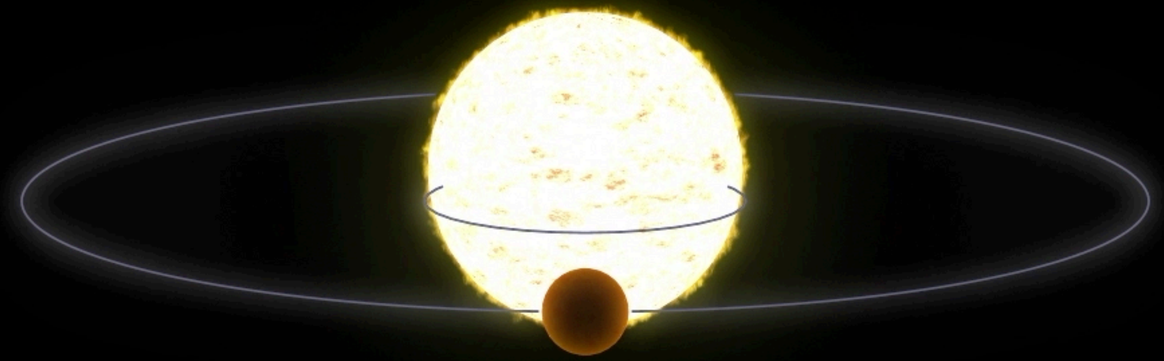
Gif: NASA

Exoplanet Detection Methods

Astrometry

3 planets discovered

Rarely, the minuscule wobble of a star due to an orbiting planet can be *seen*.



Gif: NASA

Exoplanet Detection Methods

Gravitational Microlensing

200+ planets discovered

Light from a distant star can be bent, and focused, toward Earth by a passing star. If the passing star has an orbiting planet, this will be detected in the flux measurement.

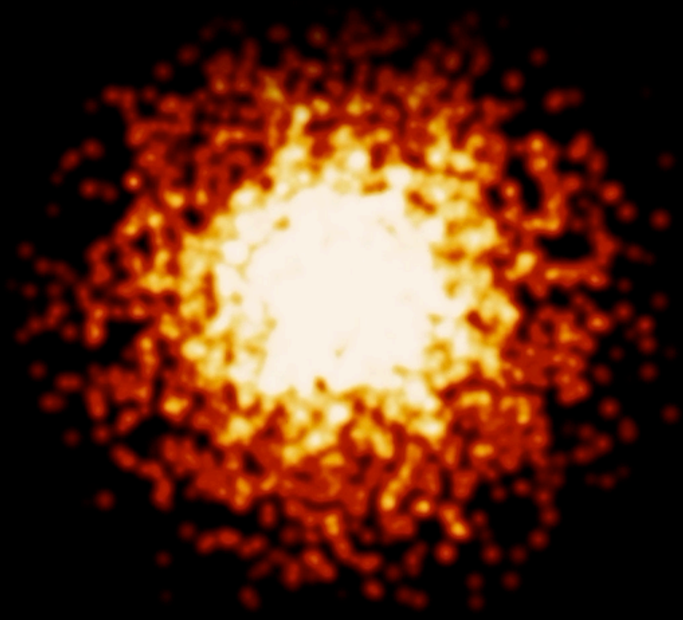
Gif: NASA

Exoplanet Detection Methods

Direct Imaging

80+ planets discovered

Using solar “star shades” and/or coronographs (light blockers) to block out the overwhelming brightness of a star, we can sometimes directly image a planet.



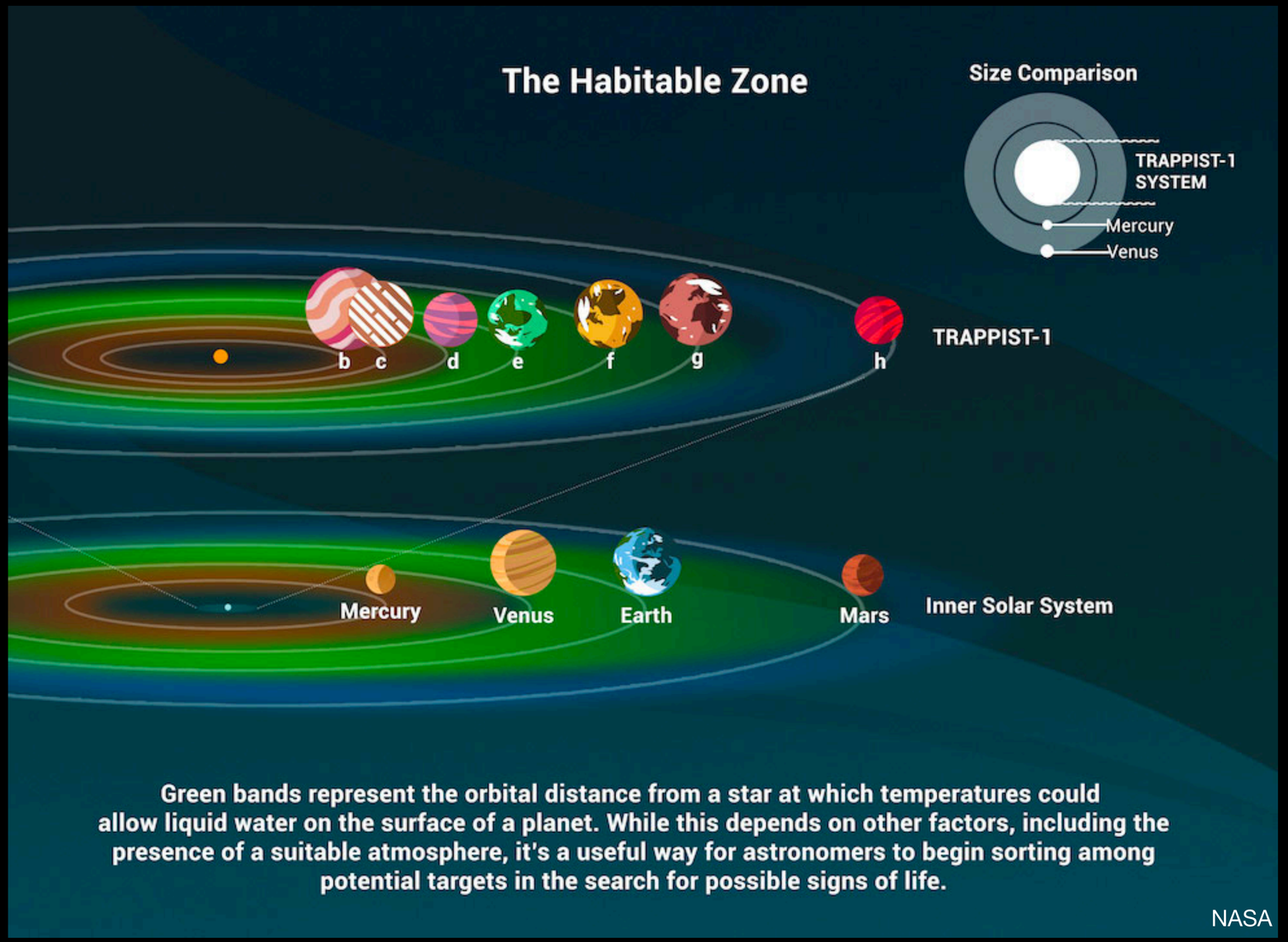
Gif: NASA

The Habitable Zone

The Habitable Zone

The “habitable zone” is a region around a star that would allow for liquid water to exist.

In other words:
Planets with temperatures between 273 K to 373 K



The Habitable Zone

Habitability of the planet itself may also depend on:

- Mass of host star
- Distance from star
- Period of the planet
- Atmosphere of planet