Cosmic Connections: An Introduction to Astronomy and Maine's Magnificent Night Skies

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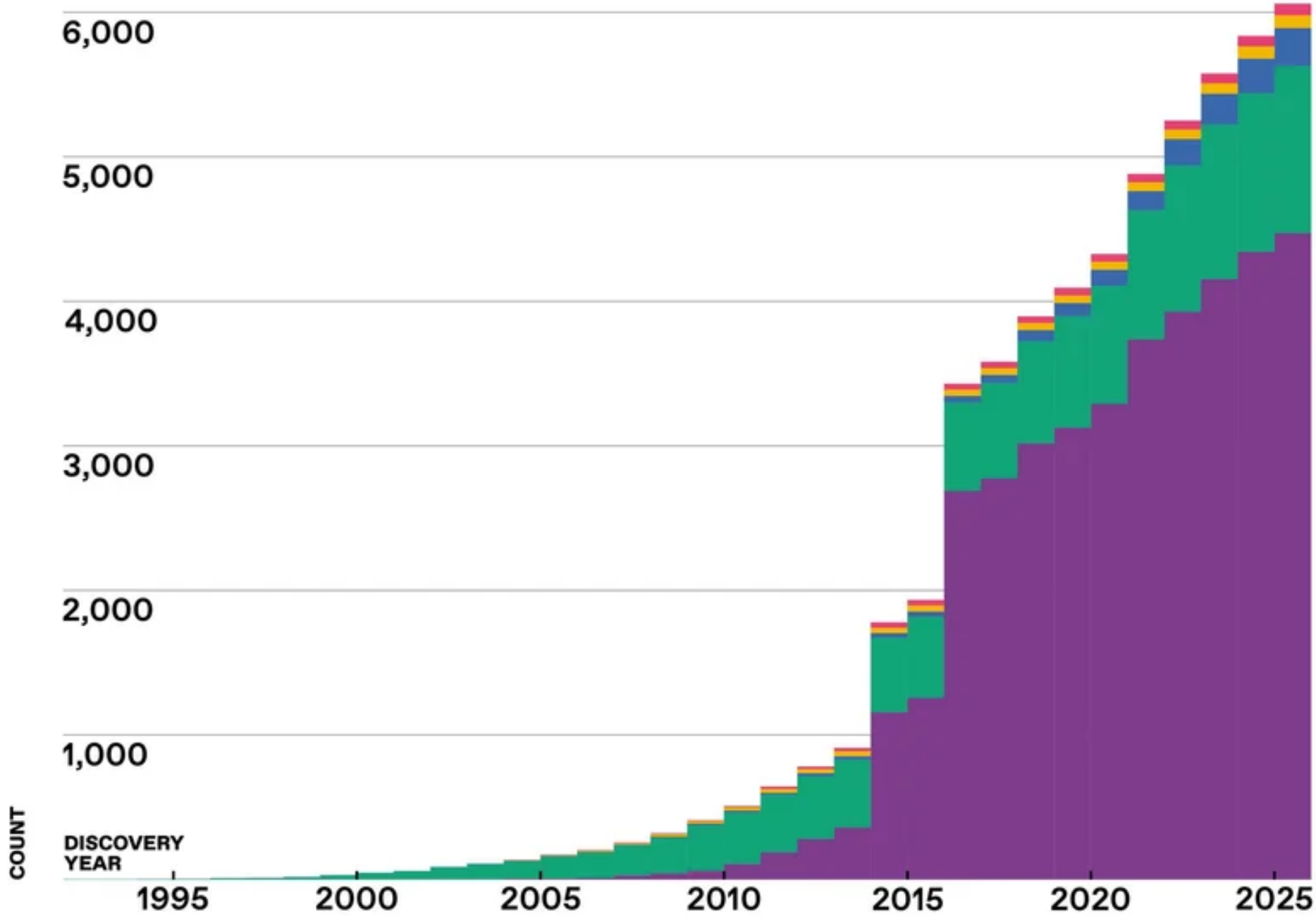
Unit 11

Exoplanets: The Search for New Worlds


An **exoplanet** or **extrasolar planet** is a planet outside of the Solar System.
As of 26 February 2026, there are 6,128 confirmed exoplanets in 4,560 planetary systems, with 1,038 systems having more than one planet.


6,000
5,000
4,000
3,000
2,000
1,000
COUNT
DISCOVERY YEAR
1995
2000
2005
2010
2015
2020
2025

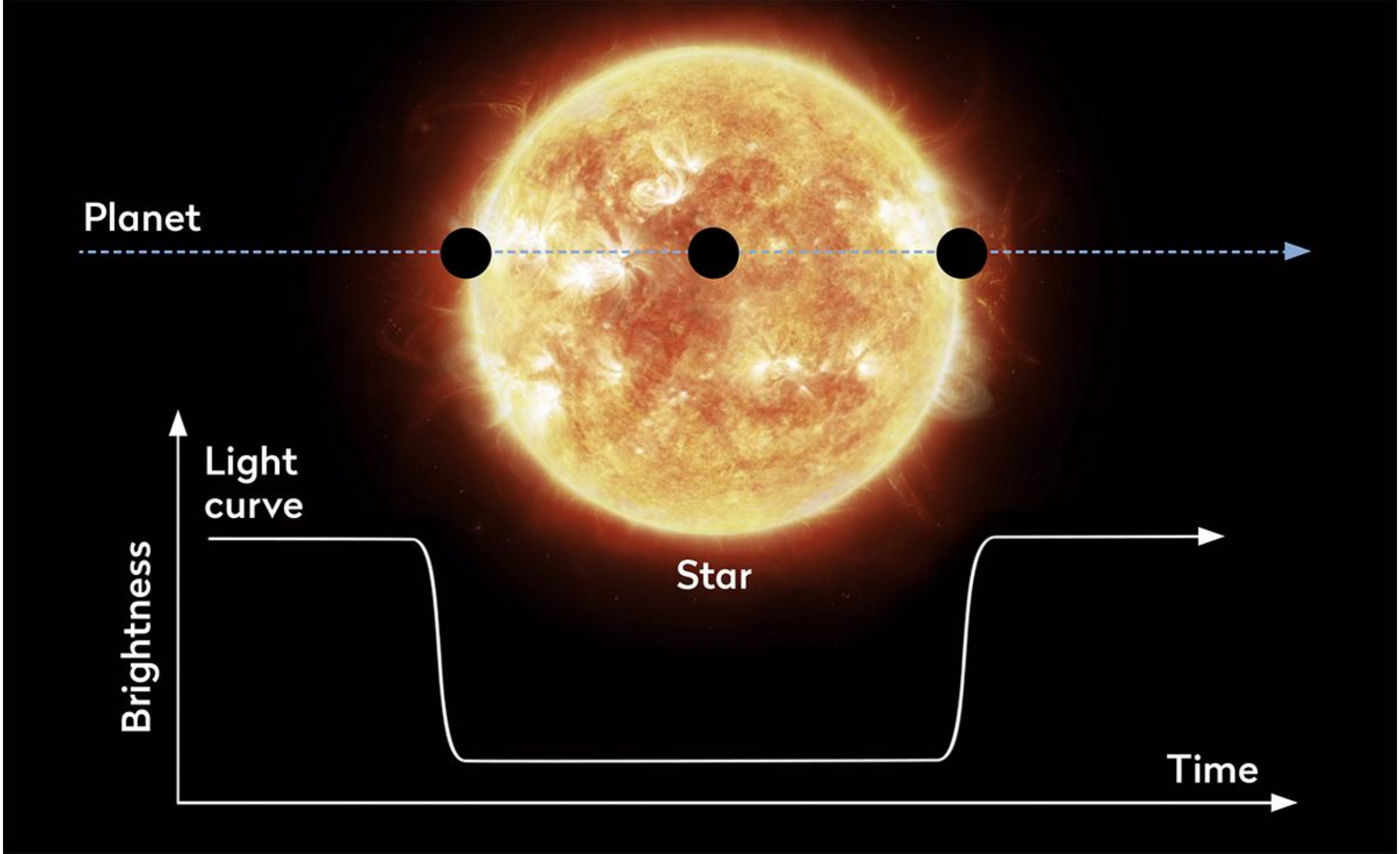
TRANSITS
Astronomers detect a planet when it passes in front of its star, causing a tiny, regular dip in the star's brightness. This method has found the vast majority of known exoplanets.

DIRECT IMAGING
Astronomers block out a star's light to capture faint images of planets orbiting nearby. It's rare, but it can reveal young, massive planets and allow direct study of their atmospheres.

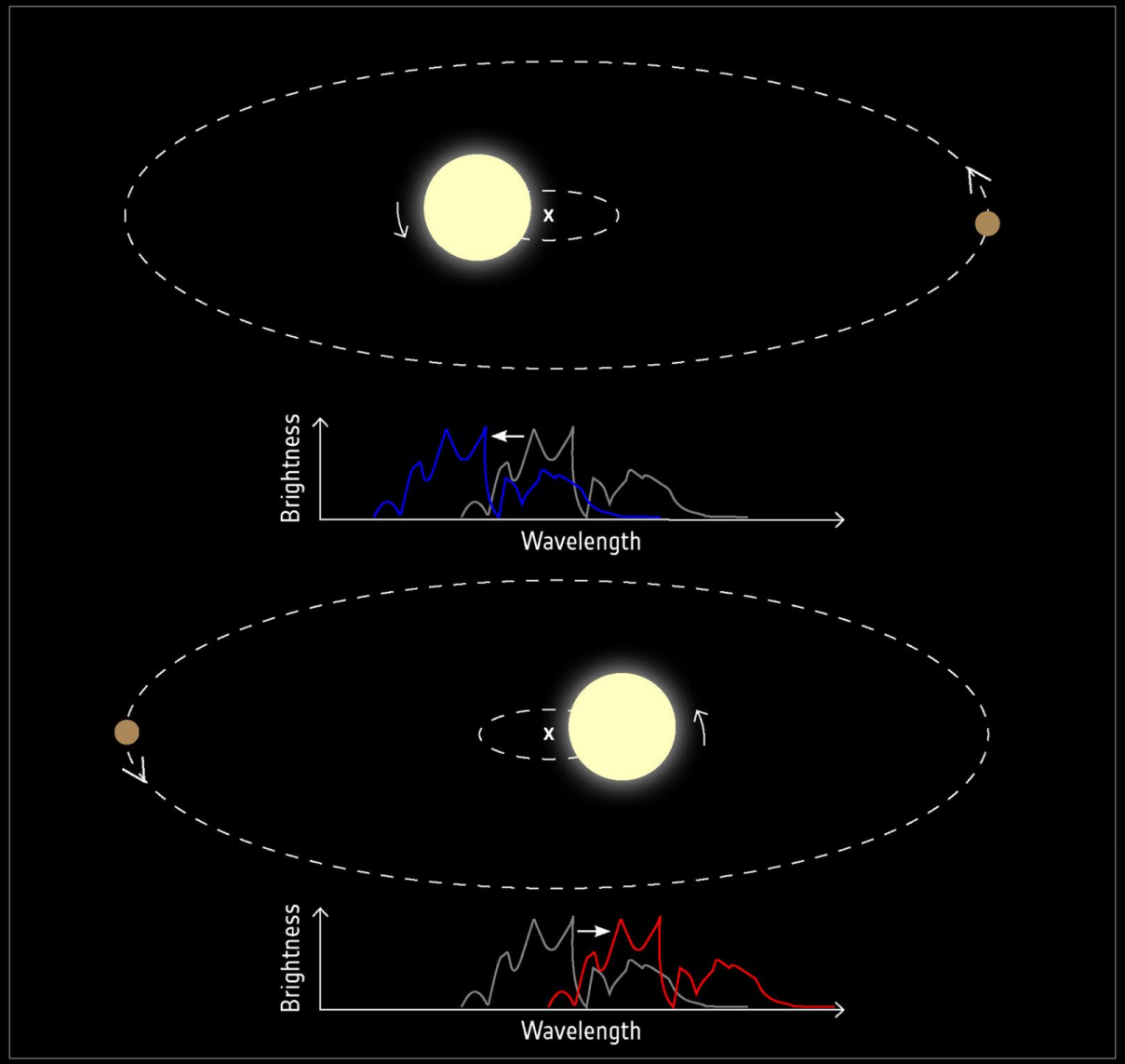
OTHER

RADIAL VELOCITY
A planet's gravity makes its star wobble slightly, shifting the star's light toward red and blue wavelengths. Measuring that wobble reveals a planet's minimum mass and orbit.

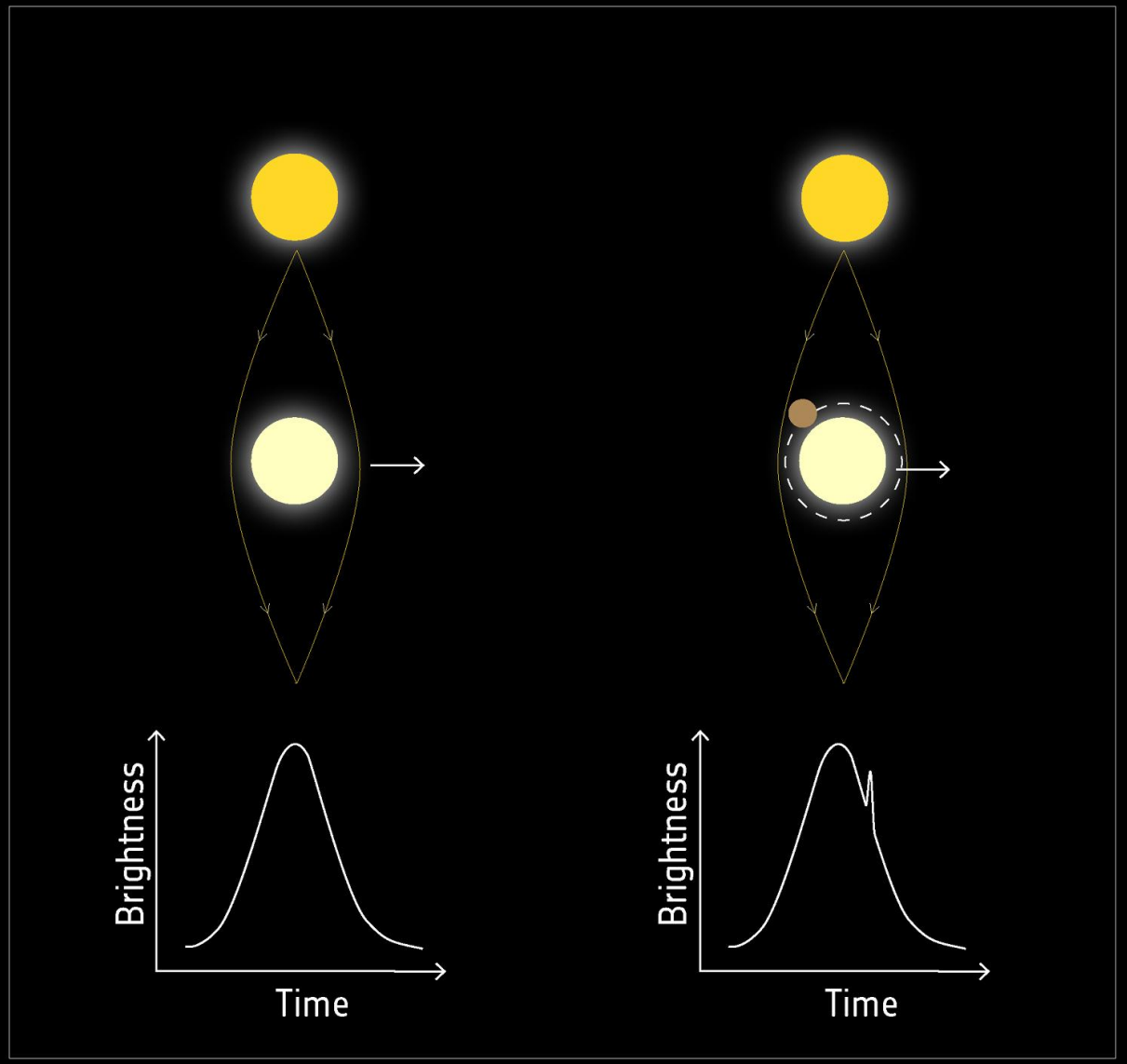
MICROLENSING
When a star passes in front of a more distant star, its gravity briefly magnifies the background light; an orbiting planet can create a telltale blip in that signal. The technique is especially good at finding cold planets far from their stars.

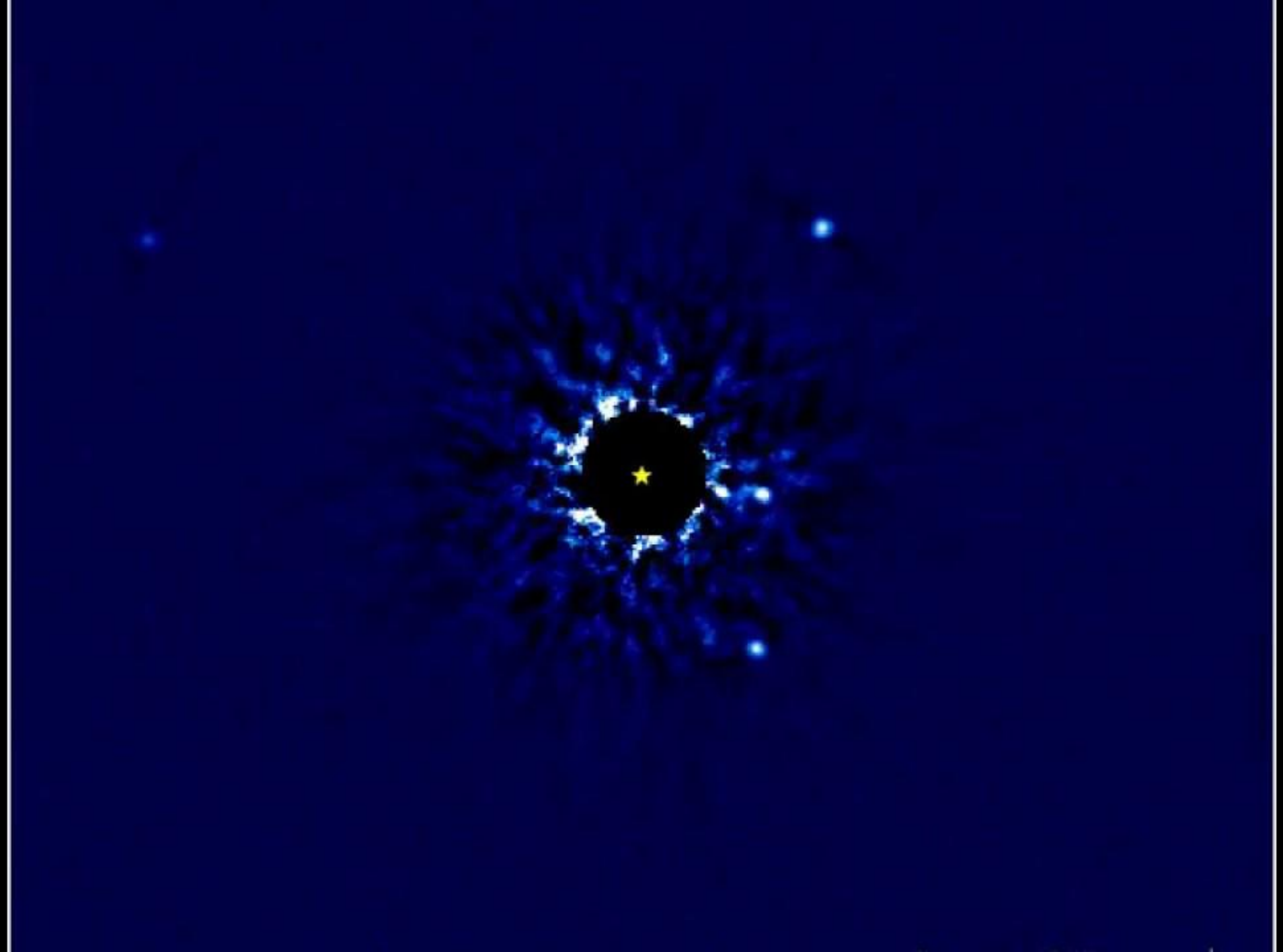

Planet
Light
curve
Brightness
Star
Time

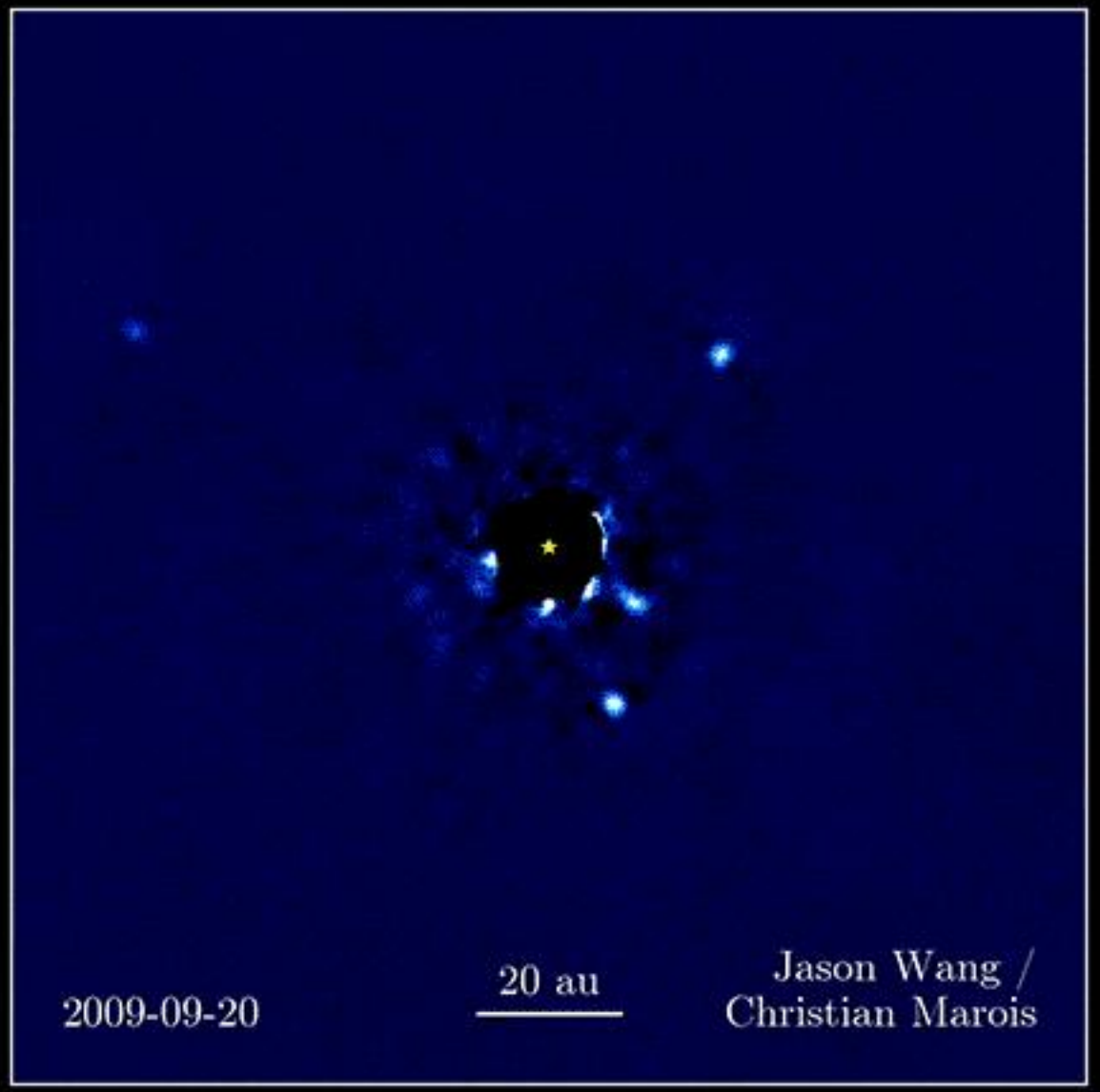
Radial velocity measurements



Microlensing



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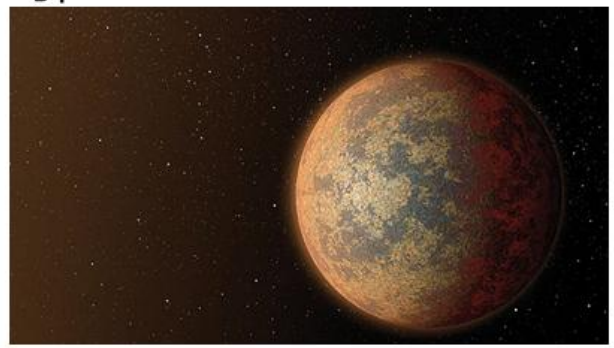
20 au
Jason Wang /
Christian Marois

Types of Planets Found



TERRESTRIAL

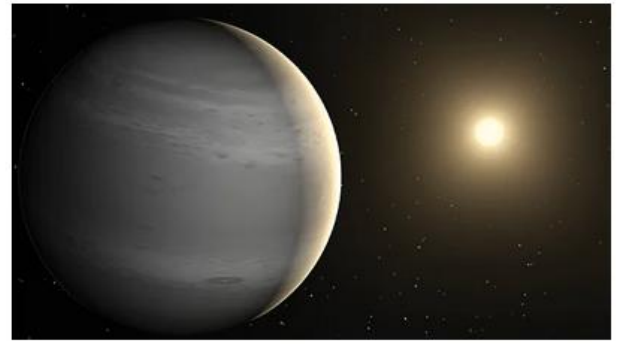
These small, dense worlds are made mostly of rock and metal and are comparable in size to Earth or Mars. They can have widely varying temperatures and atmospheres, and some may ultimately prove capable of hosting liquid water.

NEPTUNE-LIKE

These planets are similar in size to Neptune and have thick atmospheres rich in hydrogen and helium surrounding denser, ice-rich interiors. They are larger than super-Earths but far less massive than gas giants.

SUPER-EARTH

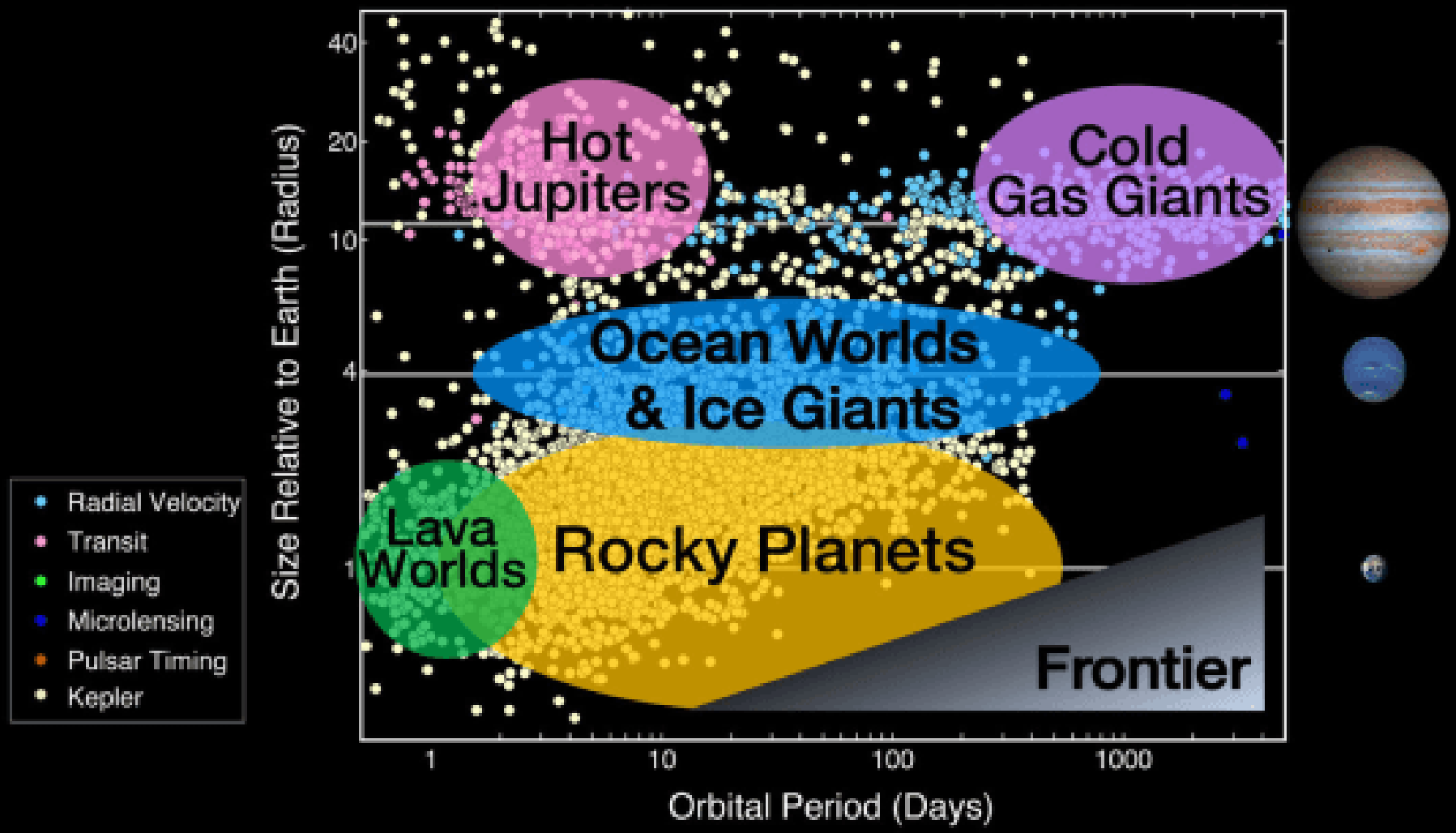
These planets are larger than Earth but smaller than Neptune and span a wide range of compositions, from rocky worlds with thick atmospheres to gas-rich planets. They are among the most common exoplanets and have no direct counterparts in our solar system.



GAS GIANT

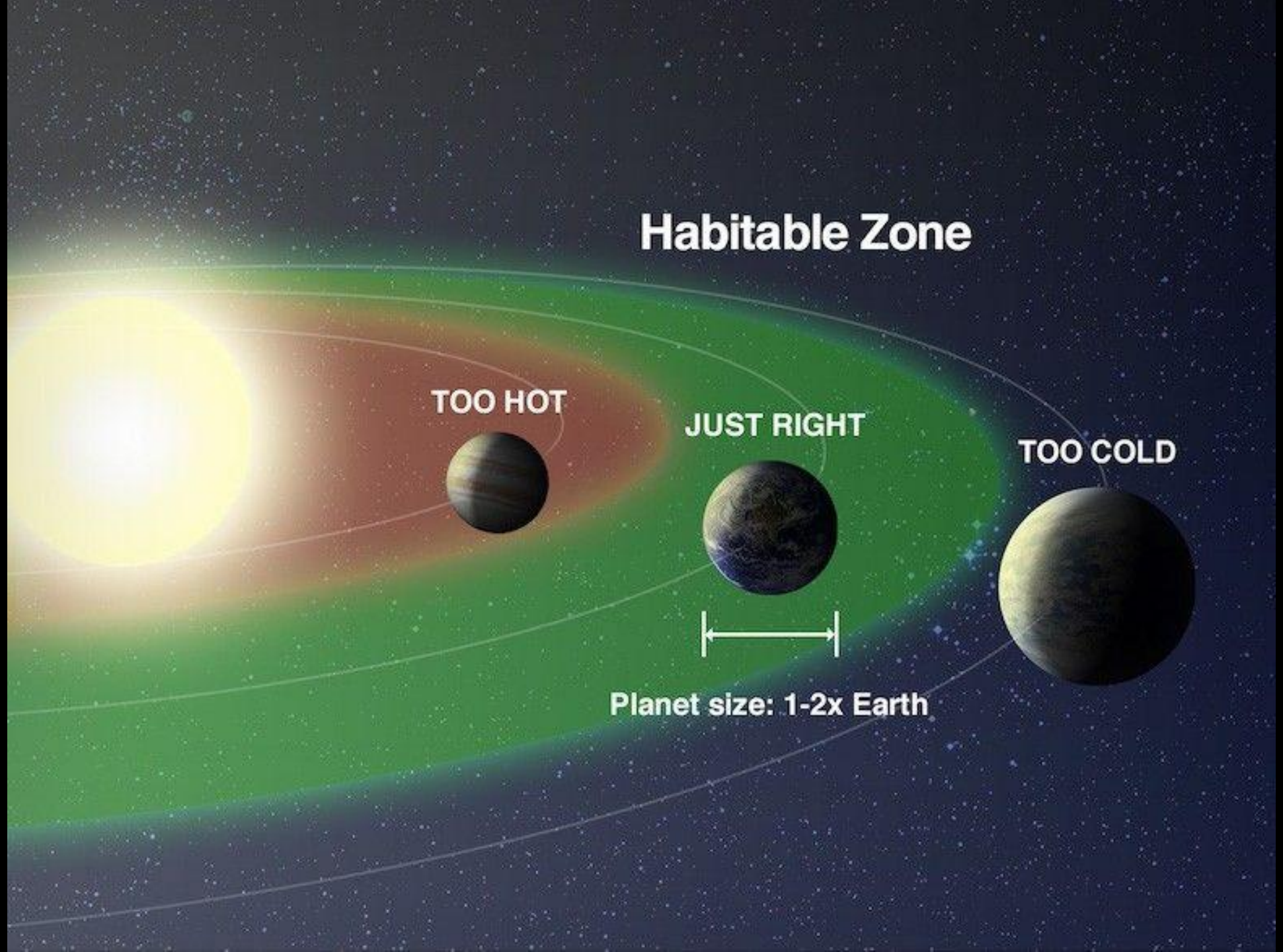
These massive planets are dominated by hydrogen and helium and lack a solid surface, like Jupiter and Saturn. Some orbit extremely close to their stars as “hot Jupiters,” while others circle at much greater distances.

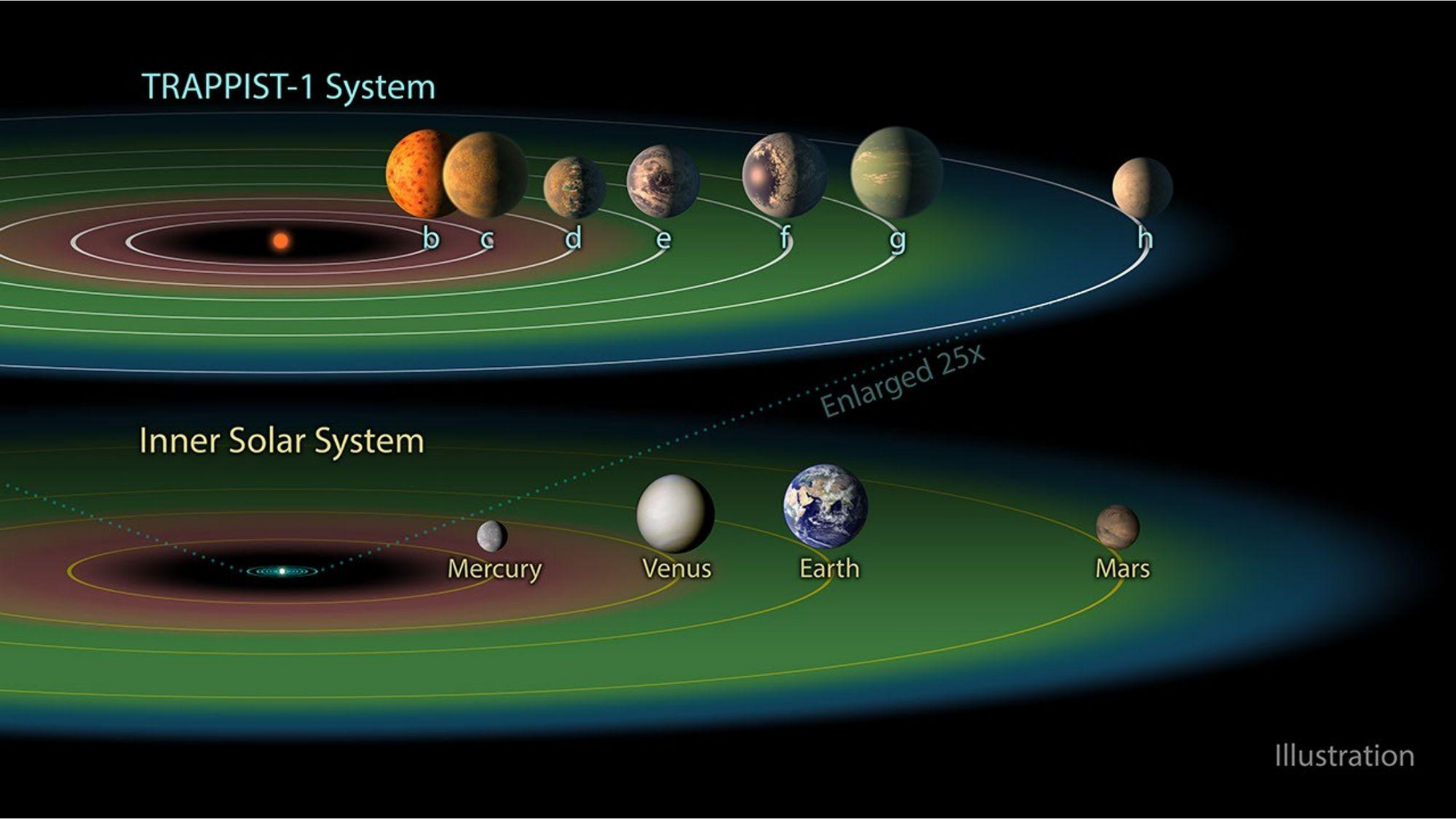
Exoplanet Populations

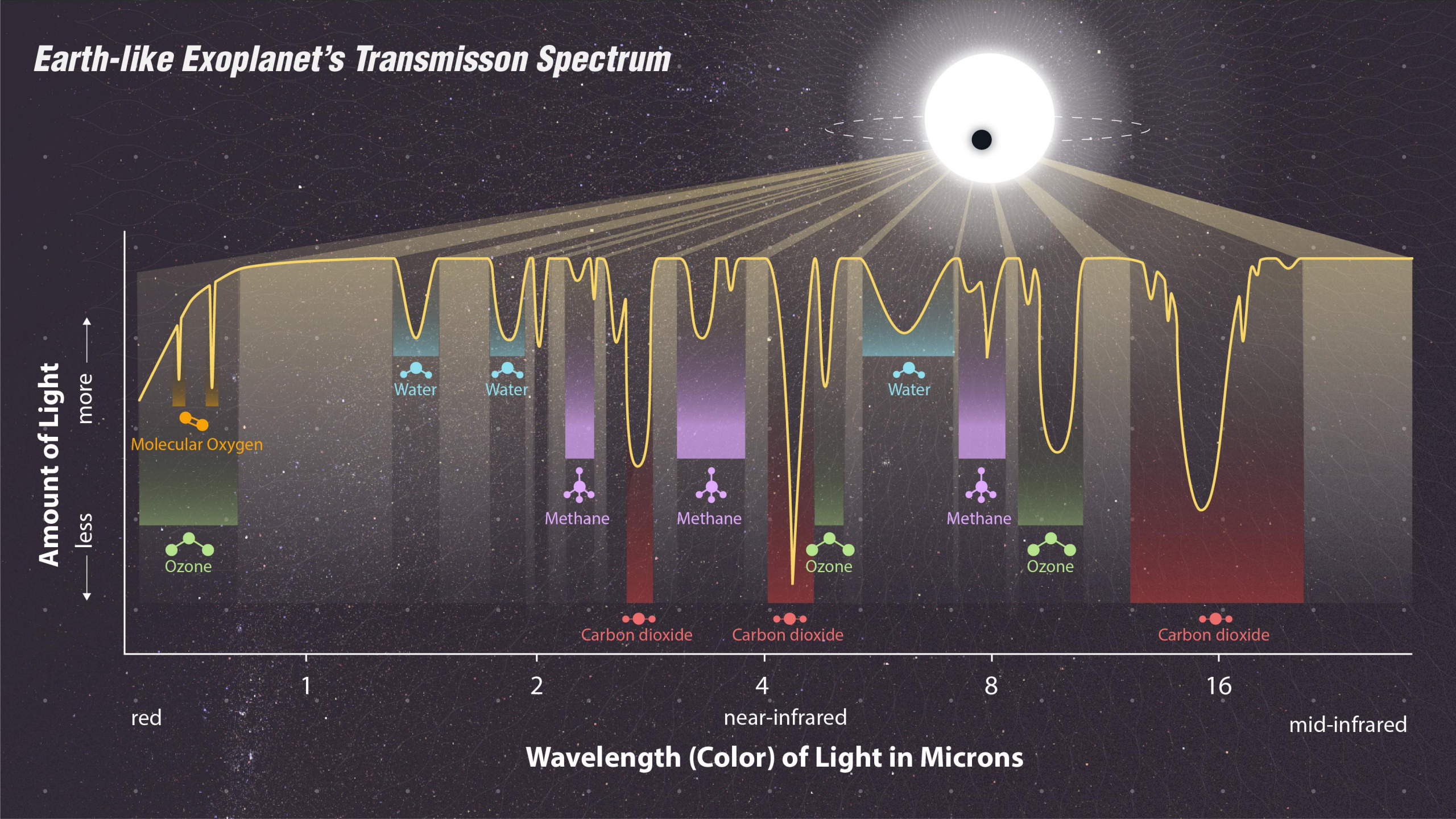


Kepler 422-b

Earth


Habitable Zone
TOO HOT
JUST RIGHT
TOO COLD
Planet size: 1-2x Earth


TRAPPIST-1 System
b
c
d
e
f
g
h
Enlarged 25x
Inner Solar System
Mercury
Venus
Earth
Mars
Illustration


Earth-like Exoplanet's Transmisson Spectrum
Amount of Light
more
less
Molecular Oxygen
Water
Water
Water
Methane
Methane
Methane
Ozone
Ozone
Ozone
Carbon dioxide
Carbon dioxide
Carbon dioxide
1
2
4
8
16
red
near-infrared
mid-infrared
Wavelength (Color) of Light in Microns

5 Stars You Can See Tonight That Have Planets

Pollux (Gemini)

Aldebaran (Taurus)

Regulus (Leo)

Hamal (Aries)

Gamma Cephei (Cepheus)