
Exoplanet Travel Bureau
51 Pegasi b
SINCE 1995
PSR
HD 114762 b
VISIT
Gamma Cephei Ab
GREETINGS FROM YOUR
FIRST EXOPLANET

Exoplanets

What is a exoplanet

A planet that that doesn’t orbit the sun.

Types of stars

Stars are classified by temperature of atmosphere

class	Temperature (Kelvin)
O	≥ 30,000
B	10,000–30,000
A	7,500–10,000
F	6,000–7,500
G	5,200–6,000
K	3,700–5,200
M	2,400–3,700

And a number 9 to 0 showing where they are in that group (lower is hotter). i.e. F4.6

Types of stars

… and also by luminosity i.e. F4.6IV

some other identifiers can also be added such as e for emission lines

class	Type
0 *or* Ia^{+}	hypergiants or extremely luminous supergiants
Ia	luminous supergiants
Iab	intermediate-size luminous supergiants
Ib	less luminous supergiants
II	bright giants
III	normal giants
IV	subgiants
V	main-sequence stars (dwarfs)
sd (prefix) or VI	subdwarfs
D (prefix) or VII	white dwarfs

Stars cont.

The sun is classified as G2V

76% of stars are M-type (the coolest) as they fuse fuel slower and take longer to run out. Larger stars have much shorter lifetimes.

Classifying exoplanets

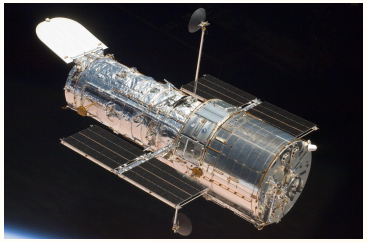
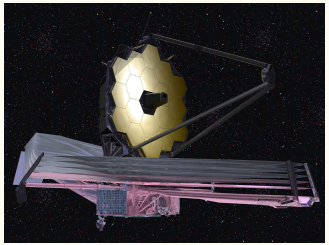
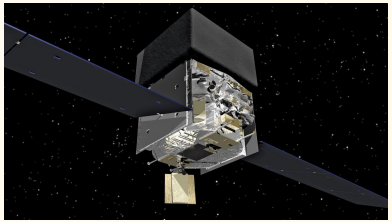
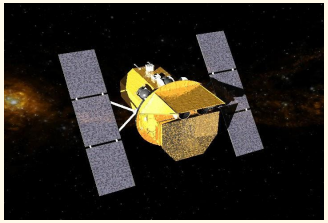
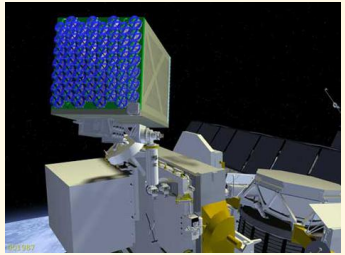
No single classification system has been officially agreed on, however this is one proposal:

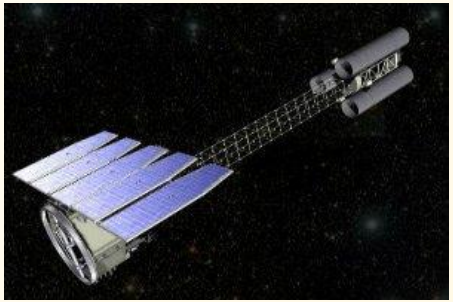
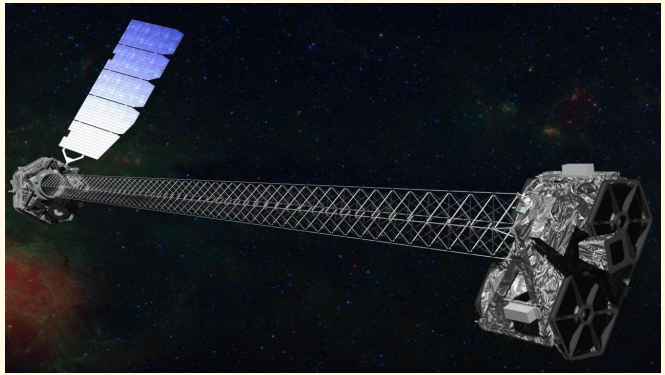
Classifying exoplanets by mass and composition

Mass (multiples of earth)	name
>0.00001	asteroidan
0.00001 to 0.1	mercurian
0.1 to 0.5	subterran
0.5 to 2	terran (Earths)
2 to 10	superterran (super-Earths)
<10	megaterra (mega-Earths)
>10	Gas dwarf
10 to 50	Neptunian (Neptunes)
50 to 5000	Jovian (Jupiters)

Space telescopes

- The atmosphere gets in the way of precise measurements of stars

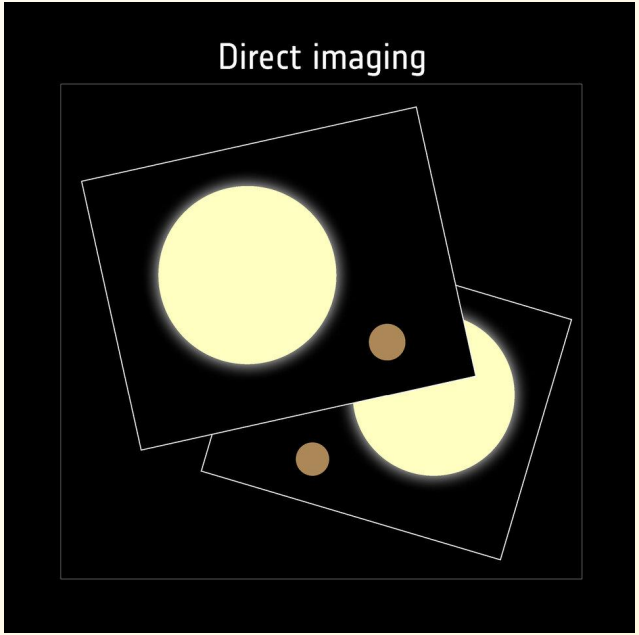






How do we find exoplanets

Direct imaging - taking a picture

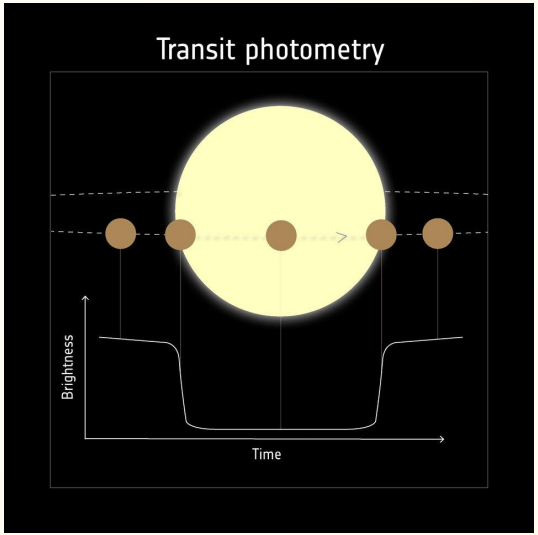
1.2%



How do we find exoplanets

Transit photometry - dip in light when the planet passes in front of the star

This method can lead to false positives, hence the high amount discovered

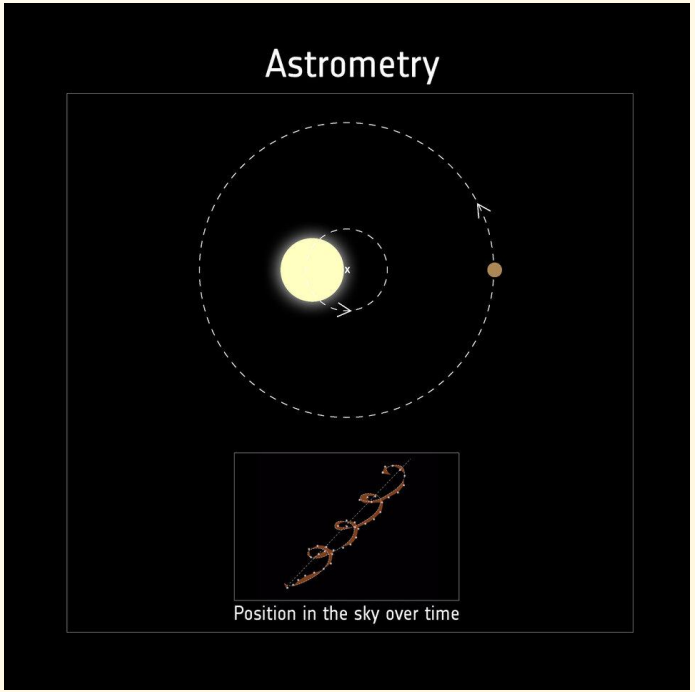


75%

How do we find exoplanets

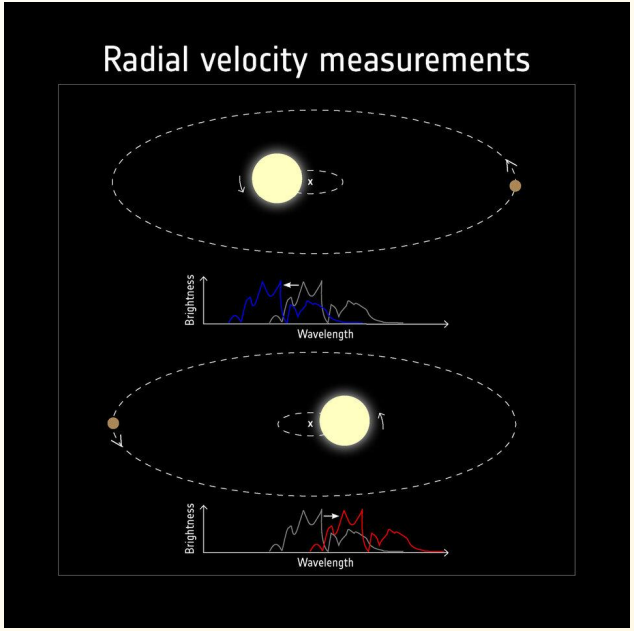
Astrometry - precise measurements of the ‘wobble’ of the star

0.05%



How do we find exoplanets

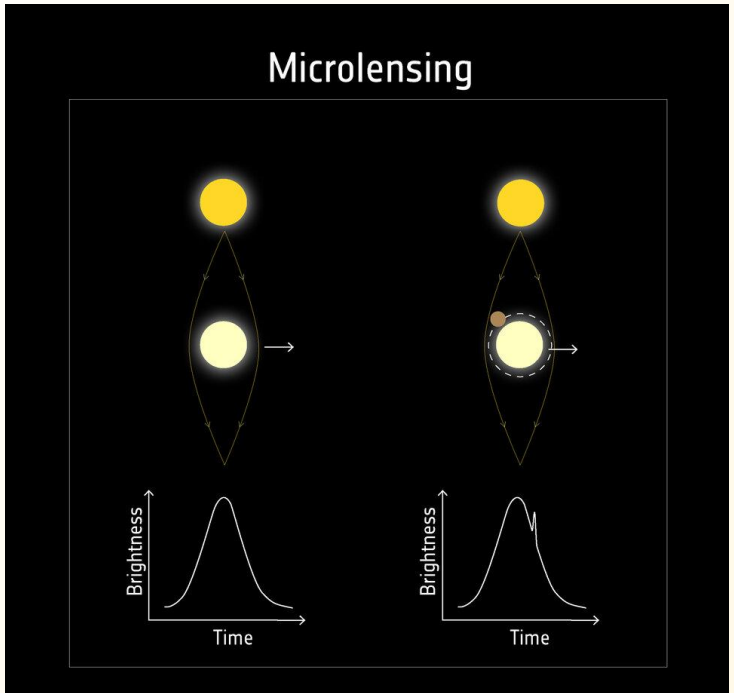
Radial velocity - the mass of the planet causes the star to ‘wobble’. This can be detected as a change in the color of the light due to redshift.



19%

How do we find exoplanets

Microlensing - when stars align, the light from the star behind is gravitationally lensed differently if there is a planet



3.8%

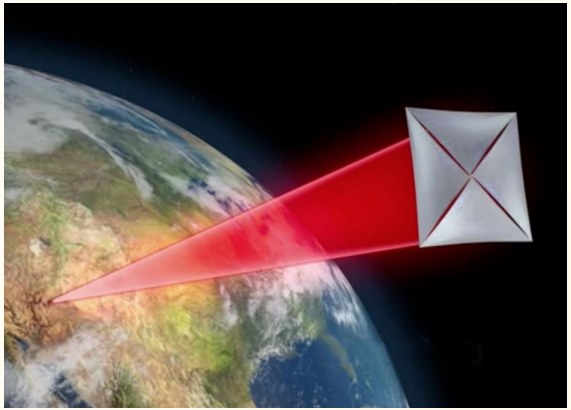
How many have been found

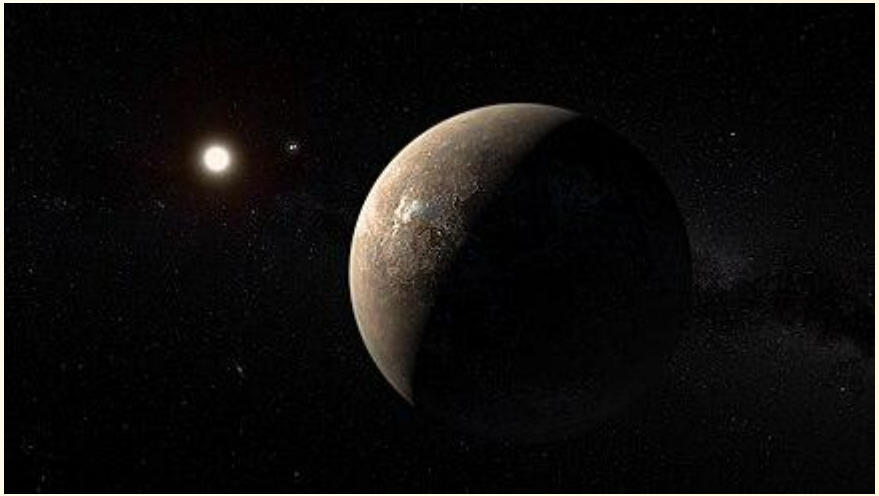
Only around 5,572 exoplanets are considered to be confirmed to exist, but there are over 10,000 candidates and many more are expected to exist.

The milky way has 100 to 400 billion stars and many of them are likely to have at least one planet so there are a lot of planets to be found.

Notable exoplanet - Proxima b

- Terran (earth sized) planet in the habitable zone of the M5.5Ve (red dwarf) star Proxima Centauri (otherwise known as Alpha Centauri C as it orbits the binary pair Alpha Centauri) which our closest star
- Breakthrough Starshot aims to send a probe powered by light past it



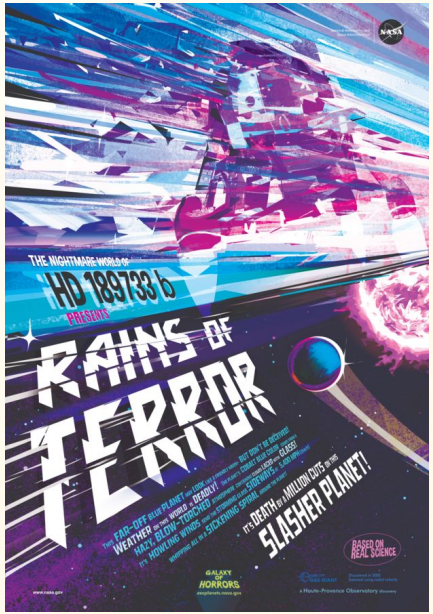


Notable exoplanet - GJ-887 b

- A superterran planet, 4x mass of the earth and 1.9x the size
- Discovered in 2023
- Orbits a unusually bright and stable M0.5V (red dwarf) 11 light years from earth

Notable exoplanet - HD-189733 b

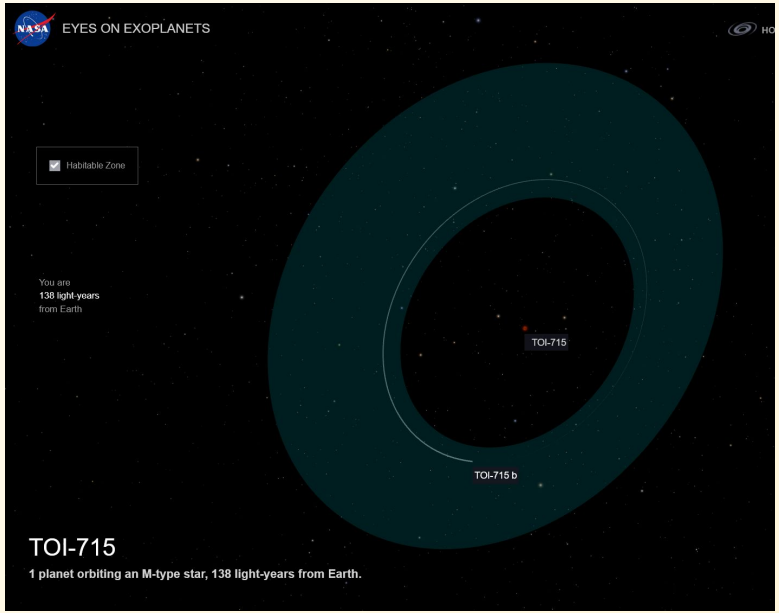
- Jovian planet where the atmosphere is full of small drops of glass and has 2000m/s winds.



Transit

Notable exoplanet - TOI-715 b

- A superterran, 3x mass of the earth and 1.5x the size
- Discovered in 2023
- Inside the ‘habitable zone’ of a M4 (red dwarf) star



Notable exoplanet - WASP-12 b

- A hot Jupiter that orbits its sun so close that it is being torn apart
- Orbits a G0 star (similar to the sun)

Notable exoplanet - 55 Cancri e

- Super-earth planet with a atmosphere of hydrogen cyanide and a core made of diamond (and other forms of carbon). Diamonds may also form in the atmosphere.
- It orbits its sun very closely and so is extremely hot