Exoplanets

Exoplanet is the term given to planets which orbit stars other than our sun. They are typically hard to see directly with telescopes. Astrophysicists have been using the phenomenon of planetary “transits” to capture information about other solar systems in the universe. These transits are viewed when a planet passes directly in front of its star. Whilst the planet makes this transit, the light the telescope captures from the star slightly dims, showing that there is "something" blocking a part of its brightness from reaching us on earth. This "something" is the exoplanet. Information about the planet’s speed, mass, radius and likely atmosphere can be inferred from the frequency of the transit and the light captured on earth.

Red Dwarf Stars

Red dwarf stars cover a group of stars including both K and M dwarfs. Our TRAPPIST-1a star is an M dwarf star. Red dwarf stars are the most common type in the universe, however they are generally too dim to be seen with the naked eye. They range from 7.5% to 50% the mass of the sun, and burn at a much lower temperature. Due to their coolness they burn through their supplies of hydrogen (fuel) far slower than the sun. So instead of existing for billions of years, they can exist for trillions of years, They are slow and steady, especially considering the universe is only around 14 billion years old itself.

TRAPPIST-1

Named after the telescope it was discovered with (Transiting Planets and Planetesimals Small Telescope – located in the Atacama desert in Chile) in 2016 the star TRAPPIST-1a was found 40 light-years away. In 2016 3 exoplanets of the system were discovered, expanding to 7 in 2017. All are roughly earth sized and they orbit in a repeating harmony. They are likely to be rocky and the system is possibly twice as old as our solar system. This pivotal discovery marked a change in perspective on red dwarfs, making them worthy of study due to the potentially habitable planets found in this system. Planet e (Pantele) is one of these and possibly the most likely to host life, with the right temperatures and the chance of water. It is tidally locked to the star meaning one side is always facing it and light, while the other is always facing outwards.

Tidal heating

Some red dwarf stars send out bursts of angry flares which would sterilise nearby planets with protonic bombardment and radiation. One defence against this would be a magnetic field, which could shield the planet’s surface and atmosphere from these powerful rays. In the Jupiter system (a close analogy to TRAPPIST-1) the moon Io is subject to a lot of gravitational pull from both Jupiter, and its neighbouring moons. The orbit of these moons are also in harmony meaning sometimes they will align and exert stronger gravitational forces on each other. This will affect the internal tides of the moon and cause it to be extremely volcanic in nature. A similar effect could happen to the planets around TRAPPIST 1. However, if they are far enough away from their star the tidal heating may be at the right level to not just cause a bulging and deformation but also to help generate a magnetic field around the planets through a dynamo effect. This may make them even more habitable.

Panspermia

This is the theory which suggests that life may be carried around the galaxy on interstellar objects. Biological material may be brought to planets through the collision with objects such as an exocomet. It is not only possible that the exocomet might carry molecules (like water) but also that the energy generated through the collision could spark the formation of life building molecules. It can promote the formation of gases, particularly Hydrogen Cyanide, which will transform into the pre-biotic molecule formaldehyde when irradiated by UV light (quite likely on TRAPPIST 1e).

The Flowering Desert

Produced by Infinite Opera
Music by Daniel Blanco Albert
Libretto by Roxanne Korda
Projections by Leon Trimble
Movement Direction and Costumes by Alexander Kaniewski
Designs by Amy Bradley, Niambi Robinson and Yuan Wang and Lina Mbaa
Planetarium Lead - Colin Hutcheson

Cast

Xoe - Hannah Flynn
Pantele – Roxanne Korda
Mother Star – Megan Artemova (Soprano), Dalma Sinka (Mezzo-Soprano), Ed Harrisson (Tenor), Teddy Woolgrove (Baritone)

Ensemble

Conductor - Daniel Blanco Albert
Violin – Ricardo Brown
Viola – Alicja Humeniuk
Cello – Lucy Samuels
Piano – Dominika Blatt
Percussion – Aidan Hammond
Clarinet – Will Hammond
Flute – Arjun Jethwa
French Horn – Jose Miguel Lluna,

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