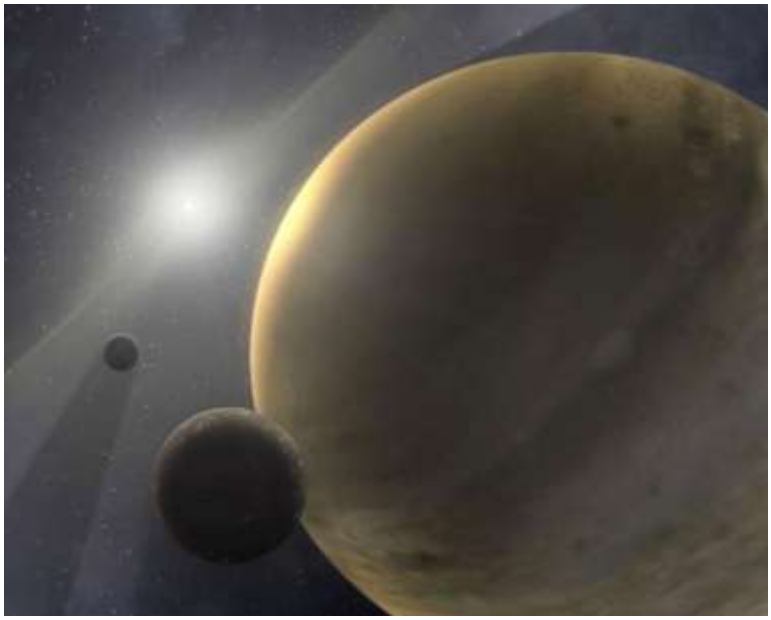
Exoplanets
Beyond our solar system
Beyond your imagination



Artist's concept of an exoplanet. Illustration courtesy NASA/JPL

At the time of this writing (2015) there are 1,922 confirmed exoplanets out there. So what's an exoplanet? Simply put it's a planet orbiting a distant star. Yes boys and girls, those twinkling stars you see at night are the same as our Sun. They are made of the same stuff as dear old Sol and they produce heat and light for the same reason – nuclear fusion.

The big difference is that stars are much further away. Our Sun is a scant 1.4 million kilometres from Earth. The closest star after our Sun is Centauri Proxima which is over 43 billion kilometres away. In astronomical terminology that's 4.3 light years or 4.3 Ly. A single light year is equal to 10 billion km. So our Sun is a next-door neighbour.

The most distant exoplanet known to date is 21,000 Ly from Earth. Multiply that by 10 billion and you'll have the distance in kilometres…plus a big headache.

Some astronomers think that there may be a solar system's worth of exoplanets orbiting every star. And they could be right. Thus far astronomers have discovered 1,236 cases of multiple exoplanets orbiting the same star. So is there life out there?

Considering that there are billions of stars in our own galaxy – yes. Add to that the billions of galaxies in the universe and chances are very good that we are not alone.

Contacting extraterrestrial life is the prime goal of SETI (the Search for Extraterrestrial Intelligence). So far we haven't made contact, but for now let's get back to the exoplanets we do know.

If you're looking for orbital oddballs, some exoplanets are orbiting their host star closer than Mercury does our Sun. One of these star-huggers has an orbital period that's only 5.8 hours. Imagine yourself having three birthday parties per Earth day!

They're also a wild bunch. Some are estimated to be up to 2.4 times larger than Jupiter. The smallest yet discovered is about the size of our Moon. Then there are some that orbit their host star in the opposite direction that it is rotating.

Those seeking riches might be interested the carbon rich exoplanet which could harbour an interior made of diamonds. Some may also be iron-rich and ripe for mining.

Some exoplanets are so close to their host star that its gravitational pull has locked them so that one side is constantly facing the star. In these cases the star-ward side can be as hot as lava while the side facing away from the star is constantly in a deepfreeze. Studying exoplanets has already shown us that not every solar system is like ours.

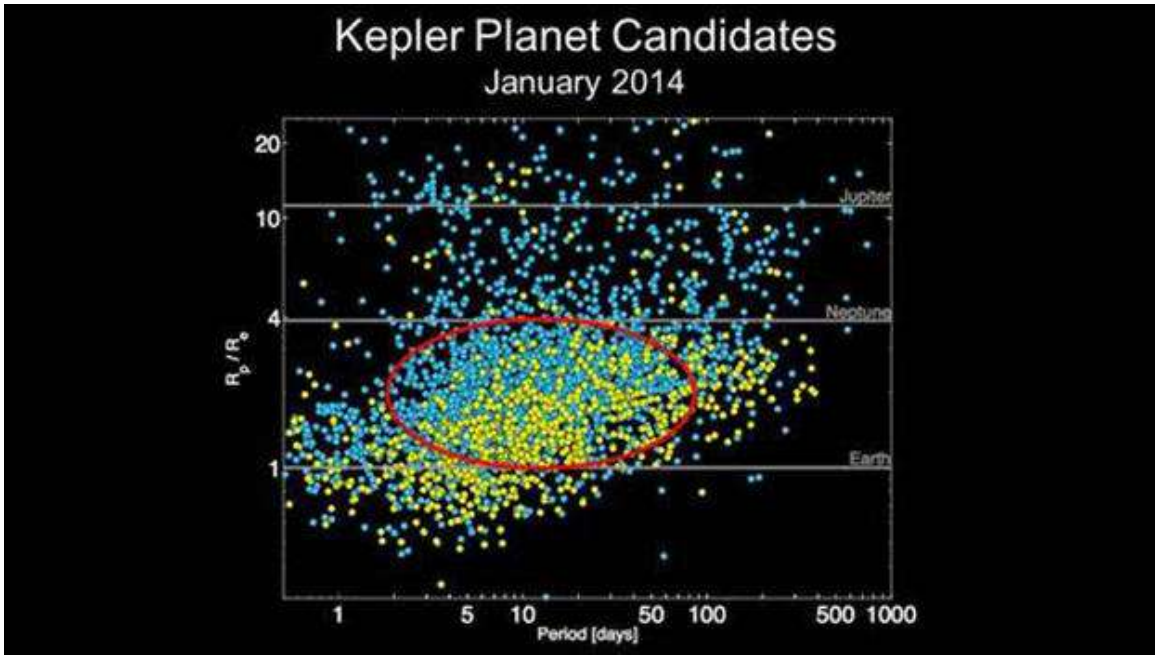
Some smaller worlds have been discovered orbiting red dwarf stars. In fact one of the candidates for being a possible "Earth 2" is orbiting red dwarf star. This brings us to one key reason exoplanets have become such a hot topic in the world of astronomy.

Earth is running out of crop-producing land. At the same time the population is exploding. Top that off with the fact that global warming is wreaking havoc with our established weather systems and we're going to need a new home. Anyone who has seen the film *Interstellar* knows the issues.

So how do we go about finding these far-flung worlds? There are a number of ways, but the two most currently popular (and easiest to understand) are looking for fluctuations in the star's luminance and by measuring a tiny wobble in the star that might indicate that an orbiting exoplanet is tugging on it.

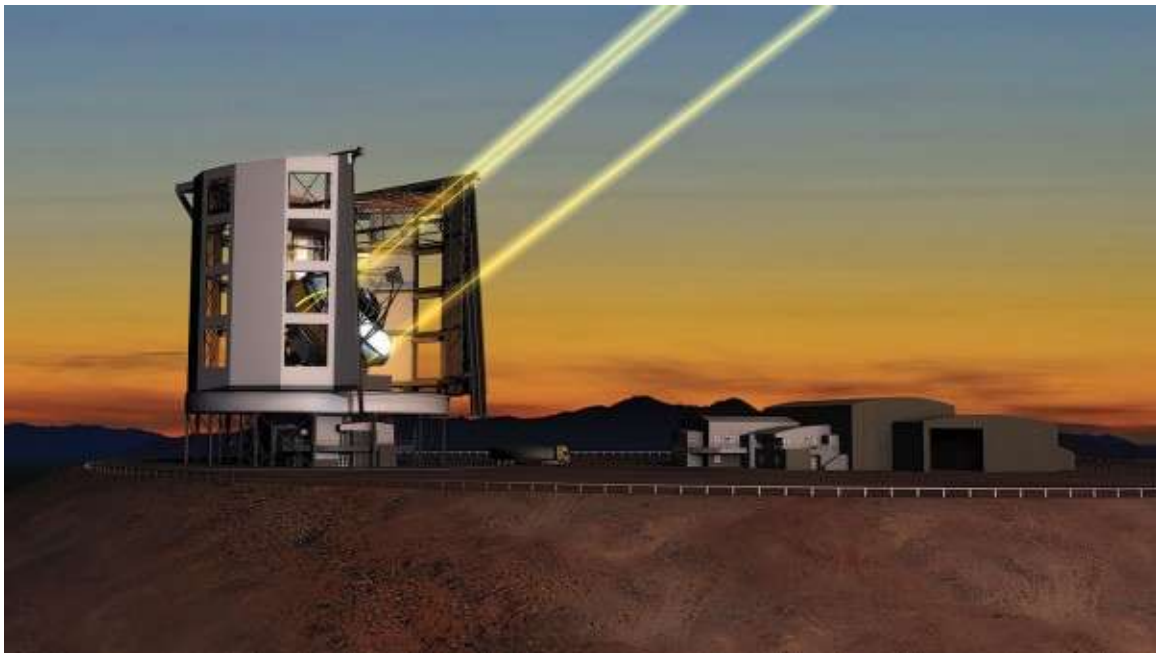
Today's telescopes can be equipped with light-sensing devices that can detect the tiniest fluctuation in a star's brightness. This could be caused by an exoplanet crossing in front of it.

The wobble method simply looks for a tiny wobble in the star. This is probably caused by an exoplanet tugging on it during its orbit. In both cases months of surveillance are required before the presence of an exoplanet can be confirmed.



The Kepler space telescope is dedicated to detecting slight fluctuations in a star's brightness. It is aimed at a tiny section of sky in the constellation Cygnus the Swan. Despite its small target area Kepler is credited with 200 confirmed finds. But there's more to come – much more.

On the drawing boards are ground-based telescopes with mirrors as large as 40 metres across. These behemoths are also equipped with adaptive optics systems that cancel out the wobble induced by Earth's tumultuous atmosphere. It's this turmoil that causes stars to twinkle and astronomers to grind their teeth. As of this writing construction on one has already begun in Chilli.



A new generation of giant telescopes are coming. Their potential is beyond imagination.

Finding distant worlds is just the first step. Finding one that is habitable is quite another thing. The planet has to be in what is often called the *Goldilocks* Zone. It can't be so far from its host star that any water is frozen, or so close that it boils away. Of course it has to have the elixir of life (water) in the first place.

Happily one of the developing technologies allows astronomers to study an exoplanet's atmosphere. They're looking for life-friendly oxygen and nitrogen. Methane is also on their hit list. Methane is a by-product of living creatures. If you've ever farted, you know all about methane.

Could this be your home-sweet-home for 81,000 years?

Yet another headache is getting to an inhabitable exoplanet. Even the closest of known exoplanets is over 40 billion km away. Using an ion propulsion system the travel time from Earth would be 81,000 years. It's highly efficient, but very slow. So our spaceship would have to be self - sufficient and a comfortable home for generations of human beings.

Perhaps the best alternative for now would be to colonize Mars. That's NASA's immediate future goal. But beyond that, they're experimenting with new and highly advanced propulsion systems. It's the kind of "warp drive-like" propulsion that could turn us into an interstellar race. After all it only took 50 years to go from the Wright brother's flight of 120 feet to walking on the Moon. Where will we be 50 years from now? The dream has just begun.