Don't expect ET to call home anytime soon

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On February 22nd, 2017, NASA announced the discovery of seven earth-sized planets orbiting a star. The discovery of these planets is of extreme importance and will go a long way in solving some of the mysteries of planet formation. Of course, the fact that all of these are at a distance (from their parent start) where liquid water can exist is what makes it even more important since liquid water is thought to be the most important ingredient for life, as we know it, to exist in the universe.

The planets were discovered in the constellation of Aquarius and are orbiting a relatively cool, dim star of the type known as M dwarfs. These are possibly the most common stars amongst the billions in our galaxy. The star is "close" by astronomical standards- a mere 40 light years (235 trillion miles) away. These exoplanets, so called since they are located outside our own solar system, add to the list of thousands that have been discovered since their first sighting in 1988.

Searching for exoplanets is challenging. Their size is typically too small for a direct sighting even with the biggest telescopes. However, astronomers use ingenious methods to infer their presence and to quantify their properties. Typically, when the exoplanet passes between its parent star and the earth, there is a dimming of the starlight and this can be used to detect the exoplanet. The fact that the changes in the starlight are extremely miniscule means that almost all the exoplanets discovered are in our own galaxy, the Milky Way.

Using the "The Transiting Planets and Planetesimals Small Telescope (TRAPPIST)" telescope in Chile, astronomers detected the presence of this exoplanet system which has been given the unimaginative moniker TRAPPIST-1. Then using the Spitzer space telescope for more detailed observations, they were able to determine the densities and sizes of the exoplanets. All of them turned out to be rocky blobs, having a mass very close to our own Blue Planet.

All the exoplanets are located fairly close to the star- all of them are closer to their star than Mercury is to the Sun. One would assume that the planets would be boiling hot at such a distance. However, the fact that the parent star is relatively cool, with a surface temperature of around 2500 C (compared to our Sun with 5600 C), makes these planets relatively balmy. And this means that water, the elixir of life could exist in its liquid form at least at some locations on them. The region around a star where water can exist in its liquid form is called the Habitable Zone. And this is the largest habitable zone found as yet with seven planets.

Their orbital periods are also modest with the closest one orbiting the star once in 2.4 days and the farthest in 12 days. However, like our own Moon which always has only one face towards the earth, they seem to be locked into the gravitational pull of their parent star and so only one side faces the star. One side is always day and the other night. This means that there would be extreme changes in temperature and hence weird weather patterns.

Fascination with discovering extra-terrestrial life is an old one. It is now generally agreed that given the immensity of the cosmos and the ordinariness of our own planet, life almost certainly exists in some form at many places in the universe. Of course finding it is another ball game altogether. SETI, the largest and the longest dedicated project to look for it has so far returned a naught. Furthermore, notwithstanding the PR hype surrounding this announcement, it is unlikely that these exoplanets are habitable. Yes, the possibility of finding liquid water on them is high. But the parent star emits as much X-rays and ultraviolet radiation as our Sun does and given that the planets are so close to their parent, the radiation would make life as we know it extremely improbable. Nevertheless, because the planetary system is relatively close, there is a lot that these planets could help us learn. Planet formation is one such area.

And any thought of sending missions to these planets or indeed even humans to explore them can only be hubris- at a distance of 40 light years, any signal sent today to or from the spacecraft would only reach after a generation and a half. Don't expect ET to call home anytime soon!

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