The discovery of exoplanets

Literature, Russian Literature

When was the first exoplanet discovered? It is rather quite complex to find out when was the first exoplanet found but I will recite the major breakthroughs in the field of discovering exoplanets. The first indication of an exoplanet's existence originated around the late 1920s but at the time exoplanet's existence couldn't be established with certainty.[1] Later in the late 1980s, the principal logical identification of an exoplanet occurred but due to similar complications and lack of evidence, the discovery couldn't be confirmed. At last in 1992, foremost affirmed identification of HD 114762-b exoplanet was observed marking an event in the history.[2]

How many exoplanets have scientists confirmed and what instrument has been used to discover them? Around thirty-eight hundred exoplanets have been successfully discovered and have been named. Moreover, the basic idea of observing an exoplanet is to image the star and then deduct all the light from the star with help of computer algorithms. This leads to an observation of a star with much faint brightness. While much of instruments used in finding exoplanets are computers, astronomers have to use spectrographs to check for the Doppler shift. Spectrographs are used to observe component of light instigating from the star. With help of spectrographs, transit spectroscopy method can be executed.

Tools like Gemini planet imager (a highly precise imaging tool), Wide-field Infrared Survey Telescope (WFIRST), Subaru Telescope, and Hubble telescopes have been used in the search for exoplanets as well.[3]In addition, instruments like HARPS spectrograph at the European Southern Observatory's La Silla 3. 6-meter telescope in Chile is delineated to look at wobbles in a planet's orbit. HARPS has successfully discovered over

hundreds of exoplanets and provides a confirmation on Kepler’s observations. Other operations like COROT- convection rotation and planetary transit- operated for six years, contributed by finding exoplanets made primarily of rocks and metals.

Microvariability and Oscillations of Stars telescope have been observing star’s oscillation and their rotation. Additionally, telescopes like Hubble and Spitzer Space telescopes are well equipped to observe planets in visible and thermal infrared wavelengths. Especially in infrared wavelength much more information and data about a planet is discovered. Moreover, NASA’s enduring James Webb Space Telescope, expected to launch in 2020, will enable us to take a closer look at the atmospheric composition of planets [5].

Likewise, ESA’s Ariel(Atmospheric Remote-sensing Infrared Exoplanet Large-survey) mission is due to launch in the late 2020s. With primary objectives to observe more than a thousand of exoplanets, Ariel will investigate the biochemical composition of a planet’s atmosphere in search of life on exoplanets.[5]Are most of the exoplanet solar systems similar to the solar system we live in? Earlier scientists use to think that most of the star system in the milky way galaxy has the same structure as that of our solar system, but one spacecraft has changed our view on this topic. Although many space exploration mission has provided invaluable insight into our universe in search of exoplanets one mission which stands out is The Kepler Mission.

Kepler has accelerated the number of discoveries of exoplanets by a huge margin. Through Kepler, astronomers have been able to observe other planetary systems which have concluded some differences between other

systems to ours. The geometry of our solar system is such that terrestrial planet(smaller planets) are closer to the sun(host star) while biggest planets(Jovian planets) are further away from the sun. Moreover, inner planets are composed of solid rocks but Jovian planets are made up of gases. In addition, terrestrial planets are much denser as compared to Jovian planets [6][7].

Observing over three thousand exoplanets, astronomers have concluded our solar system is structure is hardly quintessential. Planets characterized as ‘ hot Jupiter’(size of Jupiter with a temperature of 1000 degrees) have been found with an orbital radius of less than that of mercury. In addition, most of the solar systems are very small as compared to our solar system. For instance, the TRAPPIST-1 system has seven planets within a distance of six million miles that is even smaller than the distance between sun and mercury. Other than this, the orbital trajectory of all the planets in our solar is system is circularly symmetrical. Yet, most exoplanets have elliptical trajectory with a further variation in eccentricities.

Lastly, our host star is moderately aged, generally hot, and fits in the yellow dwarf category. However, the majority of host stars are red dwarfs, much more advanced in years, and frosty. More to this is that many of the stars are born in pairs, but our sun formed alone. These findings are very unusual and at the same time, they are intriguing and interesting.[8] Describe a faraway solar system and how it differs from ours. The solar system I have chosen to discuss is the TRAPPIST-1 system. Almost 39 light years away lies

supercool host star TRAPPIST-1. TRAPPIST-1 is one captivating solar system due to the presence of seven earth-like planets capable of hosting life.

Out of seven, three of the planets have liquid water, icy later beneath the surface, or an atmosphere composed of water vapors on them. While the observations from Spitzer space telescope and Kepler spacecraft shows that all the TRAPPIST-1 planets are primarily composed of rocks.[9] Adding to this, it is found that TRAPPIST-1 system can be as old as twice of our solar system. Alternatively, the orbit of the most extreme TRAPPIST-1 planet is almost one-fifth of Mercury’s orbit. The compactness of the star system shows a vast variance on comparison with our solar system [10].

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