India in Exo-planetary Research

What is the issue?

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- In a feat that is critical for India and science, Ahmadabad based lab discovered a planet orbiting a star 600 light years away.
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- This is a 1st for Indian scientists and is a vindication of India's space potency.
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What the metrics of Exo-planet studies?

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- **Why -** Exo-planets are those celestial bodies that orbit stars outside our solar system in clearly defined elliptical paths.
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- We need to understand how planets form around stars, to understand our solar system better, for which study of exo-planets are key.
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- Habitability of exo-planets is a keenly studied area, which is mainly based on its distance from its star (the planet should be neither too hot nor too cold).
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- Indian scientists have been trying to track exo-planets since 2012, but it was only recently that PRL, Ahmadabad became the 1st to achieve the feat.
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- **What -** The 1st thing is to understand about exo-planets are their characteristics and fundamental parameters - mass, radius, and atmosphere.
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- With mass and radius, it is easy to get the density, which will help in making a rough estimate of the planet's composition.
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- **The challenge -** Detecting an exo-planet is very difficult as it is a dull object that will invariably be roaming around the bright spot of its star.

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- Direct imaging of exo-planets is almost impossible, although new techniques are being evolved by NASA and others.
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- There are only 5-6 spectrographs around the world that can measure the mass of exo-planets at high precision (radial velocity less than 2 m/s).
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- India counts itself as one of the few countries that has the instruments to discover and analyse such difficult worlds.
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Then, how are exo-planets studied?

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- **How -** The presence of a planet will make its star wobble, which can be measured using a precise spectrograph.
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- This spectrographic reading will help in measuring the mass of the planet.
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- When the planet passes between its star and Earth, the intensity of light from that star (which reaches the earth) gets minutely dim.
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- This dip in star's flux is measured, and this is subsequently employed to estimate the radius of the planet.
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What are the observed results of the newly detected exo-planet?

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- A suspected planet (now been coded as "K2-236b"), was under the observation of the Ahmadabad based lab over 1½ years.
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- In Jan 2018, scientists conclusively stated that their object of observation was a planet, which was then confirmed by "Mount Abu Space Observatory".
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- The planet is said to be composed of 70% iron, ice or silicates and 30% is gas, with about 27 Earth-masses and 6 Earth-radii.
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- In terms of mass and radius, the planet is akin to Neptune, and it is just one-seventh of the distance away from its star as compared to 'Sun-Earth

distance’.
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- One year on that planet is about 19.5 Earth-days and surface temperatures average to about 600°C, which thereby makes it uninhabitable.
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How does the future of exo-planetary studies in India look?

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- Indian space scientists have set out with the ultimate aim of detecting planets of close-to-Earth mass (2 to 10 Earth masses).
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- A new 2.5-m telescope at “Mount Abu Observatory” with a bigger spectrograph is likely to be installed by 2020, and it will be called “PARAS-2”.
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- PARAS-2 is slated to have the capacity to even measure smaller exo-planets that are just about 2 or 4 times Earth’s mass.
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- It is also hoped that ISRO will launch some space missions relating to exo-planet studies.
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Source: Indian Express

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