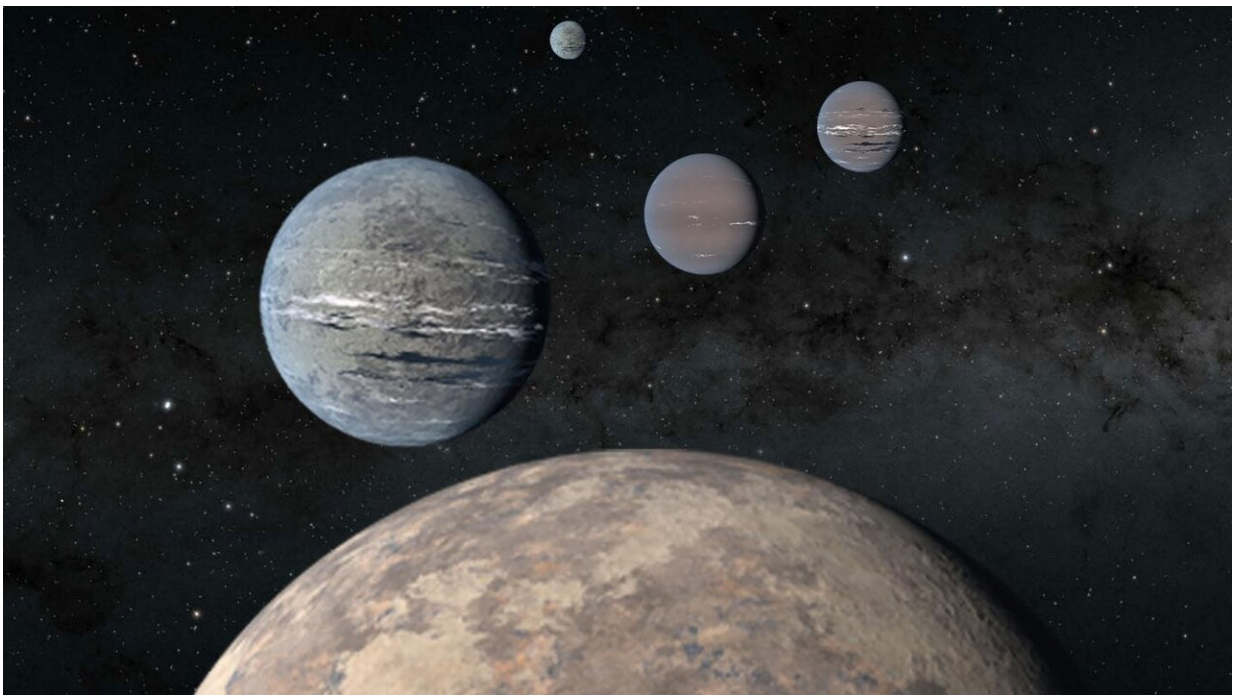


High schoolers discover four exoplanets through Harvard and Smithsonian mentorship program

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A five-planet system around TOI-1233 includes a super-Earth (foreground) that could help solve mysteries of planet formation. The four innermost planets were discovered by high schoolers Kartik Pinglé and Jasmine Wright alongside researcher Tansu Daylan. The fifth outermost planet pictured was recently discovered by a separate team of astronomers. Artist rendering. Credit: NASA/JPL-Caltech

They may be the youngest astronomers to make a discovery yet.

This week, 16-year-old Kartik Pingle and 18-year-old Jasmine Wright have co-authored a peer-reviewed paper in *The Astronomical Journal* describing the discovery of four new exoplanets about 200-light-years away from Earth.

The high schoolers participated in the research through the Student Research Mentoring Program (SRMP) at the Center for Astrophysics | Harvard & Smithsonian. Directed by astrochemist Clara Sousa-Silva, the SRMP connects local high schoolers who are interested in research with real-world scientists at Harvard and MIT. The students then work with their mentors on a year-long research project.

"It's a steep learning curve," says Sousa-Silva, but it's worth it. "By the end of the program, the students can say they've done active, state-of-the-art research in astrophysics."

Pingle and Wright's particular achievement is rare. High schoolers seldom publish research, Sousa-Silva says. "Although that is one of the goals of the SRMP, it is highly unusual for [high-schoolers](#) to be co-authors on journal papers."

With guidance from mentor Tansu Daylan, a postdoc at the MIT Kavli Institute for Astrophysics and Space Research, the students studied and analyzed data from the Transiting Exoplanet Survey Satellite (TESS). TESS is a space-based satellite that orbits around Earth and surveys nearby [bright stars](#) with the ultimate goal of discovering [new planets](#).

The team focused on TESS Object of Interest (TOI) 1233, a nearby, bright Sun-like star. To perceive if planets were orbiting around the star, they narrowed in on TOI-1233's light.

"We were looking to see changes in light over time," Pínglé explains. "The idea being that if the planet transits the star, or passes in front of it, it would [periodically] cover up the star and decrease its brightness."

To the team's surprise, they discovered not one but four planets orbiting around TOI-1233.

"I was very excited and very shocked," Wright says. "We knew this was the goal of Daylan's research, but to actually find a multiplanetary system, and be part of the discovering team, was really cool."

Three of the planets are considered "sub-Neptunes," gaseous planets that are smaller than, but similar to our own solar system's Neptune. It takes between 6 and 19.5 days for each of them to orbit around TOI-1233. The fourth planet is labeled a "super-Earth" for its large size and rockiness; it orbits around the star in just under four days.

Daylan hopes to study the planets even closer in the coming year.

"Our species has long been contemplating planets beyond our solar system and with multi-planetary systems, you're kind of hitting the jackpot," he says. "The planets originated from the same disk of matter around the same star, but they ended up being different [planets](#) with different atmospheres and different climates due to their different orbits. So, we would like to understand the fundamental processes of planet formation and evolution using this planetary system."

Daylan adds that it was a "win-win" to work with Pínglé and Wright on the study.

"As a researcher, I really enjoy interacting with young brains that are open to experimentation and learning and have minimal bias," he says. "I also think it is very beneficial to [high school students](#), since they get

exposure to cutting-edge research and this prepares them quickly for a research career."

The SRMP was established in 2016 by Or Graur, a former postdoctoral fellow at the Center for Astrophysics, Harvard & Smithsonian. The program accepts about a dozen students per year with priority given to underrepresented minorities.

Thanks to a partnership with the City of Cambridge, the students are paid four hours per week for the research they complete.

"They are salaried scientists," Sousa-Silva says. "We want to encourage them that pursuing an academic career is enjoyable and rewarding—no matter what they end up pursuing in life."

More information: Tansu Daylan et al. TESS Discovery of a Super-Earth and Three Sub-Neptunes Hosted by the Bright, Sun-like Star HD 108236 *The Astronomical Journal*, Published 2021 January 25 Volume 161, Number 2 [DOI: 10.3847/1538-3881/abd73e](https://doi.org/10.3847/1538-3881/abd73e)

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