

The Ursa Minor Report



Newsletter of the Kutztown University Planetarium &
C. R. Chambliss Astronomical Observatory

Volume 7, Issue 1

Fall 2025

In This Issue:

Exoplanet Discoveries at KU	1
Cosmic Classroom Outreach Program	3
New Planetarium System	4
Community Planetarium Show Schedule	4

Exoplanet Discoveries

The Carlson R. Chambliss Astronomical Observatory (CRCAO) at KU continues to discover new exoplanets as a member of the Transiting Exoplanet Survey Satellite (TESS) Follow-up Observing Program (TFOP). See *The Ursa Minor Report* Volume 5 Issue 1 page 3 (Fall 2023) for details about our role in this NASA mission.

KU astrophysicist Dr. Phill Reed recently completed a multi-year exoplanet project funded by a \$243,985.00 research grant from the National Science Foundation (NSF). The project was titled Planet-hunting Around the World with Students (PAWS), and the final project report is as follows:

Background: Are we alone in the universe? One of humanity's most enduring questions is whether life exists beyond Earth. Answering this will require time, persistence, and extensive observations. Thousands of exoplanets must be discovered, and their atmospheres must be analyzed. As of today, about 6,000 exoplanets have been identified, and instruments like the James Webb Space Telescope (JWST) are now beginning to examine their atmospheres for the signatures of life.

A key step in this process is the identifica-

tion of exoplanet candidates, many of which are discovered by NASA's Transiting Exoplanet Survey Satellite (TESS). Often referred to as JWST's "finder scope," TESS scans wide areas of the sky for periodic dips in stellar brightness caused by planets passing in front of their host stars. TESS relies on a global network of ground-based observatories to confirm and characterize these candidate systems.

This project engaged undergraduate students at Kutztown University of Pennsylvania (KU) in this global effort. Participants used telescopes at KU's Carlson R. Chambliss Astronomical Observatory (CRCAO) and the MINERVA-Australis observatory in Australia to contribute to TESS's Follow-up Observing Program (TFOP). Their work included photometric monitoring, radial velocity measurements, and spectroscopic classification – all supporting the discovery and analysis of new exoplanets. The international component of this work was made possible by support from the NSF's International Research Experiences for Students (IRES) program.

Intellectual Merit: This project contributed directly to the discovery, confirmation, and analysis of new exoplanetary systems, resulting in seven peer-reviewed publications in leading as-

tronomy journals. These papers report the confirmation and initial characterization of 27 new exoplanets, spanning a diverse range of planetary systems – including hot Jupiters, subgiants, and young gas giants – and include high-priority targets for future atmospheric studies with JWST. Students contributed to the validation of planets such as TOI-1181b, TOI-1516b, TOI-2025b, and TOI-1135b through photometric follow-up observations acquired at CRCAO. These ground-based light curves were incorporated into formal discovery and characterization analyses conducted as part of the TESS mission’s broader follow-up efforts.

Undergraduate participants engaged in all stages of exoplanet confirmation and characterization: obtaining and analyzing follow-up photometry, performing spectroscopic classification of host stars, and refining planetary orbits. One publication focused specifically on identifying the top TESS targets for JWST atmospheric follow-up, underscoring the project’s alignment with next-generation observational goals. In addition to the confirmed exoplanets, students helped refine transit timings for 64 known systems to support future atmospheric observations. They also contributed to the preliminary confirmation of nine additional TESS planet candidates, which are currently awaiting final validation. These candidates have been presented by students at regional and national astronomy conferences, demonstrating the project’s emphasis on student-led dissemination and engagement with the professional scientific community.

Broader Impacts: The project produced a range of educational, technical, and outreach impacts beyond exoplanet science. One student developed a polarimeter for use with CRCAO’s telescope, and another created a catalog of stellar spectra for over 200 stars observed with MINERVA-Australis – laying the groundwork for future research.

Project activities were regularly incorporated into a sophomore-level Exoplanets course at KU, embedding authentic research into the undergraduate curriculum. KU’s planetarium served as a key outreach tool, showcasing project results to thousands of campus visitors and K-12 students annually.

In addition to preparing students for graduate study, the project also supported workforce development by cultivating a broad set of technical and professional skills. Participants gained experience with scientific computing, data analysis, instrumentation, and collaborative research – skills that are directly applicable to careers in astronomy, aerospace, software development, and other STEM fields. Through international collaboration and public outreach, students also strengthened their communication, project management, and cross-cultural competencies, further enhancing their readiness for the 21st-century STEM workforce.

This four-year project engaged at least 36 undergraduate students, approximately two-thirds of whom identified as members of underrepresented or historically marginalized groups in STEM. All students selected for international research demonstrated exceptional academic achievement and potential for continued success in science and engineering careers.

Conclusion: By engaging students in cutting-edge research and fostering international collaboration, this project advanced both exoplanet science and STEM education. It contributed to the global search for habitable worlds while training the next generation of scientists and professionals to carry that search forward.



Pictured above are NSF-PAWS participants (KU faculty, students, and alumni) at the January 2025 meeting of the American Astronomical Society (AAS) in National Harbor, MD. From left to right: Zach Raup, Phill Reed, Lauren Murphy, Fatima Kamara, Sohayla Emam, Evan Curtin, Alex Schroll, Philip Jahn.

Cosmic Classroom

at the

KU Planetarium

Cosmic Classroom - Outreach Program for Schools

Cosmic Classroom is a new educational outreach program for schools. Our modern high-resolution projection system, comfortable seating, and years of professional experience make the Kutztown University Planetarium an ideal destination for local and regional schools' field trips. We have educational programs suitable for students of all ages, from elementary through high school. While the KU Planetarium outreach program has been serving schools in the local community for decades, the new Cosmic Classroom program aims to expand its reach, enhance its educational outcomes, and strengthen its role in new student recruitment.

Membership provides the following:

- Preferred scheduling of annual visits to the KU Planetarium.
- Up-to-date educational & entertaining planetarium shows.
- Question & Answer time with a professional astrophysicist.
- Programming to complement the school's educational goals.
- Introduction to our on-campus research observatory.
- Optional campus tours for interested high school groups.

Cosmic Classroom visits are now being scheduled for Spring 2026. Schools can use this online form to apply for the Cosmic Classroom program: <https://forms.gle/ZNUZUi18NLfpSk2HA>



New Planetarium

The planetarium at Kutztown University is approaching its 60th anniversary. Built in 1967, it originally housed a Spitz A-3-P prime-sky projector, which was cutting-edge for its time. [For a complete description of the original planetarium and observatory, see *The Ursa Minor Report* Volume 4 Issue 1 (Spring 2018).]

By the early 2000s, advances in digital technology offered new possibilities for immersive planetarium experiences. In 2009, the university installed a Digitalis Epsilon full-dome digital system, replacing the aging Spitz projector. This system used a single fisheye-lens projector to cover the 35-foot dome, projecting a 1200-pixel-wide image. Though a major leap forward at the time, the Epsilon relied on lamp-based illumination and had a limited resolution compared to modern standards. After more than 15 years of service, the system reached the end of its lifespan in 2023, with no further updates possible.

Thanks to a generous donor, the university invested in a full upgrade of the planetarium's projection and lighting systems in 2024. The new system, the Digitalis AEthos, represents a ma-

jor technological advancement. It features programmable LED cove lighting, professional planetarium software, an extensive media library, and—most notably—dual high-resolution (4K) projectors. These projectors use laser phosphor illumination, eliminating the need for traditional lamps while providing consistent brightness, improved color contrast, and an image with more than 16 times the total pixel count of the Epsilon system.

The installation required precise calibration, including careful alignment of the two projectors and sophisticated warping and blending algorithms to seamlessly merge their projections into a single hemispherical image.

After a long wait, the KU Planetarium is sailing the cosmos again!



Community Planetarium Shows: Fall 2025 Schedule

Everyone is welcome to join us for these planetarium shows this Fall! Admission is free. Tickets are not required, and seating is on a first-come-first-served basis. Doors open at 6:00 pm.

The planetarium is located on the ground floor of the Grim Science Building.

Date	Time	Title	Cost
Thu. Nov. 20	6:30 pm	<i>The Pretty COOL SPACE Movie</i> Planetarium Show	FREE
Thu. Dec. 4	6:30 pm	<i>Planet Nine</i> Planetarium Show	FREE

Prepared by: Phill Reed (Planetarium & Observatory Director)

More Information: <https://www.kutztown.edu/planetarium> & <https://www.kutztown.edu/observatory>