

ARTEMIS 1 MOON TREE PLANTED NEAR LPL AND APOLLO MOON TREE



The **Artemis I Moon Tree** was planted during a ceremony on Nov. 4. Pictured from left: LPL Director **Mark Marley**; **Kellee Campbell**, Flandrau Science Center & Planetarium Director; **Dolores Hill**, LPL Senior Research Specialist; **Carmala Garzione**, Dean of the College of Science; **Chris Stebe**, University Landscape Architect; **Betsy Arnold**, Interim Director of the School of Plant Sciences; and **Tanya Quist**, Director of the Campus Arboretum.

By Daniel Stolte, University Communications

The cardboard shipping box delivered on May 30 to the **Kuiper Space Sciences building**, home to LPL, was about as tall as a person and skinny. It was plastered with shipping labels and stickers advising its carriers to pay attention to the "top" and "bottom" of the "live tree inside" and to "handle it with care."

As it turned out, the trip inside a truck from a nursery in Halsey, Nebraska, to Tucson was nothing compared with the journey the young tree – or rather, the seed from which it grew – had already been on: the **Artemis I Moon Tree**, a sweetgum, was grown from a seed that orbited the Moon during the late 2022 mission.

The Artemis I Moon Tree is the second such tree to take root on the U of A campus, joining an American sycamore known as the **Bicentennial Moon Tree**, planted on campus in 1976. That tree was grown from seeds taken to the Moon during the Apollo 14 mission in 1971 by astronaut **Stuart Roosa**. The Artemis I tree was grown at the **USDA Forest Service Bessey Tree Nursery** during the 2023 growing season. According to LPL Senior Research Specialist **Dolores Hill**, who initiated the project and led the application process, the tree traveled 1.4 million miles in 25 days on the uncrewed spacecraft, farther than any spacecraft made for humans has ever gone.

For as long as she can remember, Hill said, she has loved how U of A's first Moon Tree has inspired thousands of school groups visiting campus over the years and how it now attracts faculty and students in search of a shady spot to relax, eat lunch or chat. When she saw NASA's call for applications, she immediately jumped on the opportunity. The **Artemis I Moon Tree**, says Hill, shows the extension of the U of A's lunar exploration legacy from the Apollo missions to today, with LPL researchers developing scientific instruments to be deployed by astronauts of the Artemis III mission, which will follow the same path as the robotic Artemis I. Artemis II and Artemis III will send humans to the Moon for the first time in more than a half century.

Seeds from five species of trees were aboard Artemis I as part of a national STEM engagement and conservation education initiative resulting from a partnership between **NASA's Office**

of STEM Engagement and the **U.S. Dept. of Agriculture Forest Services**. The U of A was selected to receive one of only 148 trees from a pool of 1,300 applicants.

On Nov. 4, the Artemis I Moon Tree was planted in a carefully selected location on campus, in front of the north façade of **Flandrau Science Center and Planetarium**. The two Moon Trees are the only ones known to exist in the state, said Hill, who has done extensive research on the topic. To protect the young tree from the scorching summer heat, it was not planted outside right away. Instead, Hill handed it over to the **Campus Arboretum**, which tended the plant in the campus greenhouses until cooler planting days arrived. Placing the tree on the north side of the building helps protect it from the afternoon heat, according to Campus Arboretum Director **Tanya Quist**, who said she could not be more excited about this latest addition to the university's "living collection of plants and trees. On the surface, it may appear that plant and planetary sciences are worlds apart," Quist said. "Yet, trees are foundational to life on Earth, and each of these disciplines provides insights and perspectives that highlight and contrast the other."

Read the complete article: <https://bit.ly/ArtemisMoonTree>

Watch the video: <https://youtu.be/ejpuZ7oD-UM>



Upon the tree's arrival on May 30, arboretum curator **Brian Rasmussen** carefully unboxed the tree in the greenhouse.



WELCOME TO THE LPL NEWSLETTER

Mark S. Marley, Ph.D.
Department Head and Laboratory Director

Welcome to the **Fall 2024 LPL Newsletter!**

Our **Artemis Moon Tree** planting ceremony was certainly a highlight of the fall semester and we are excited to see the sapling grow over the coming years. See the text below for more about our new Moon tree and an opportunity to support the purchase of a bench to provide respite and shade for future generations of lunar arboreal explorers.

The fall LPL field trip was a little different this year. Instead of the usual four- or five-day excursion, a group of our more planetary geosciences oriented students joined Regents Professor **Vic Baker** on a week-long visit to the **Channeled Scablands** of eastern Washington state and Idaho. Vic is a world expert on these landforms, which provide crucial context for understanding the giant outflow channels on Mars. LPL professors **Jack Holt**, course instructor, and **Lynn Carter** also joined the trip and brought along some of their geophysical instrumentation to provide the students with opportunities to do some real science. Thanks to the **Wilkening-Sill endowment**, we have been able to continue support for the LPL field trip tradition despite recent challenges.

We are proud to highlight in this semesterly newsletter the accomplishments of our students and alumni over the past few months. We were also touched this semester by the recognition of alum **Nadine Barlow** and Regents Professor Emeritus **H. Jay Melosh** with named craters on Mars. These were highly appropriate recognitions both for Nadine, who produced the first comprehensive catalog of Martian craters, and Jay, an impact cratering expert who literally wrote the book on impact processes.

LPL alum **Dr. Thomas Jones**, who participated in one of the earliest LPL field trips, returned to LPL in November to give two excellent lectures about his experiences as a **Space Shuttle** astronaut. Tom also took time to answer career-focused questions from our students. College of Science Dean Carmala Garzione recognized Tom's accomplishments with a Career Achievement Award.

For more content and **expanded stories with links**, visit [LPL.Arizona.edu/news/2024/fall](https://lpl.arizona.edu/news/2024/fall).

HELP FUND A MOON TREE BENCH

As our cover photo attests, a highlight of this semester was the planting of our second **Moon Tree**, a sweetgum grown from a seed that flew on the **Artemis 1** mission around the Moon. Our original Moon Tree, a sycamore grown from a seed that flew aboard the **Apollo 14** command module, has stood between the **Kuiper building** and **Flandrau Science Center** for about five decades. Since being planted, tens of thousands of students visiting Flandrau have gathered under the shade of the tree. Our own **Dolores Hill** is an expert on the Apollo Moon Trees (and reports that ours is the only remaining Arizona one). I asked her to submit LPL's application for an Artemis tree and we are so grateful that she expertly led the entire process all the way through to planting.

To both protect our young sapling and to provide a spot to enjoy the respite it will offer future visitors to campus, we are aiming to locate a high quality bench adjacent to the tree, with a plaque denoting the significance of the tree. We would be grateful for donations to support the cost of the bench and its installation. Donations can be made online at [give-uafoundation.org/science-lpl](https://give.uafoundation.org/science-lpl) with a designation for the **LPL Gift Account** with a note in the text box that the donation is for the **Moon Tree bench**. Abraham Lincoln said that "He who plants a tree, plants a hope." I think that is particularly appropriate for this tree as we look to the future of LPL's continuing involvement in lunar research.



THANKS TO LPL DONORS

Thanks for supporting research, education, and outreach at LPL. To give to LPL programs, visit:
<https://give.uafoundation.org/science-lpl>.

Individual Donors: Victor R. Baker, Gordon L. Bjoraker, Daniel T. Cavanagh, Laura L. Dugie, Anthony J. Ferro, John Gizis, William B. Hubbard, Michael J. Kaiserman, Colin A. Leach, Christian Carey Lear, Renu Malhotra, Robert S. McMillan, Michael C. Nolan, Dale Ann Petersen, Alexander Pimentel, Jani Radebaugh, Justin Rennilson, Michelle G. Rouch, Al F. Scorsatto, Maxine M. Youngelman

Corporate Donor: ExxonMobil Foundation

CONGRATULATIONS PTYS GRADUATES



ADAM BATTLE

November 15, 2024

Implications of Non-Compositional Effects on Spectral Characterization of Natural and Artificial Space Objects

Advisor: **Vishnu Reddy**

New position: Postdoctoral Research Associate, LPL, University of Arizona



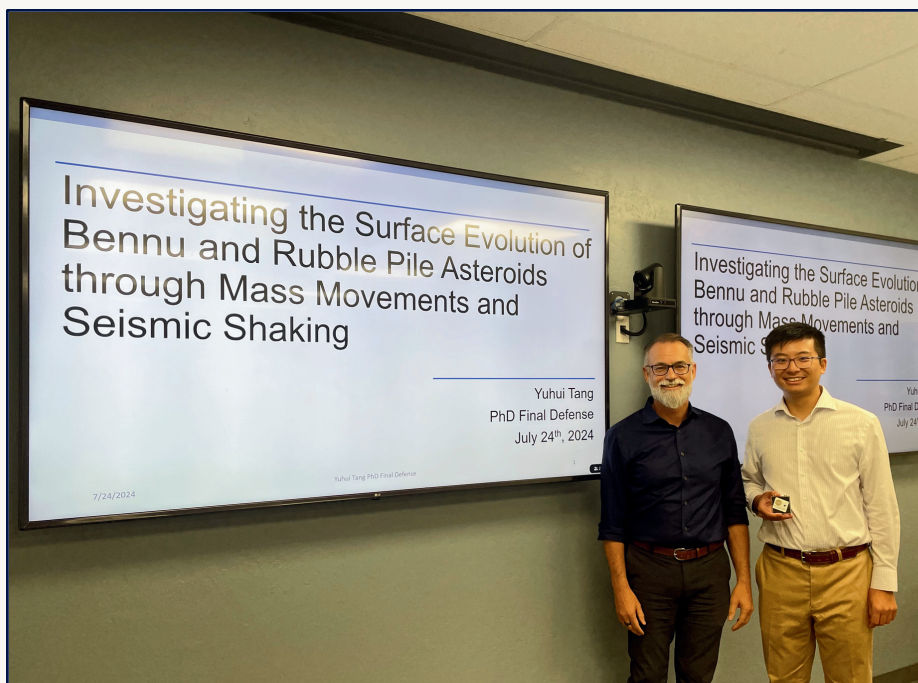
MACKENZIE MILLS

October 2, 2024

Evolutionary Landscapes and Resurfacing Processes of Planetary Surfaces

Advisor: **Alfred McEwen**

New position: U.S. Geological Survey, Water Resources (Washington state)



YUHUI "HARRY" TANG

July 24, 2024

Investigating the Surface Evolution of Benu and Rubble Pile Asteroids Through Mass Movements and Seismic Shaking

Advisor: **Dante Lauretta**



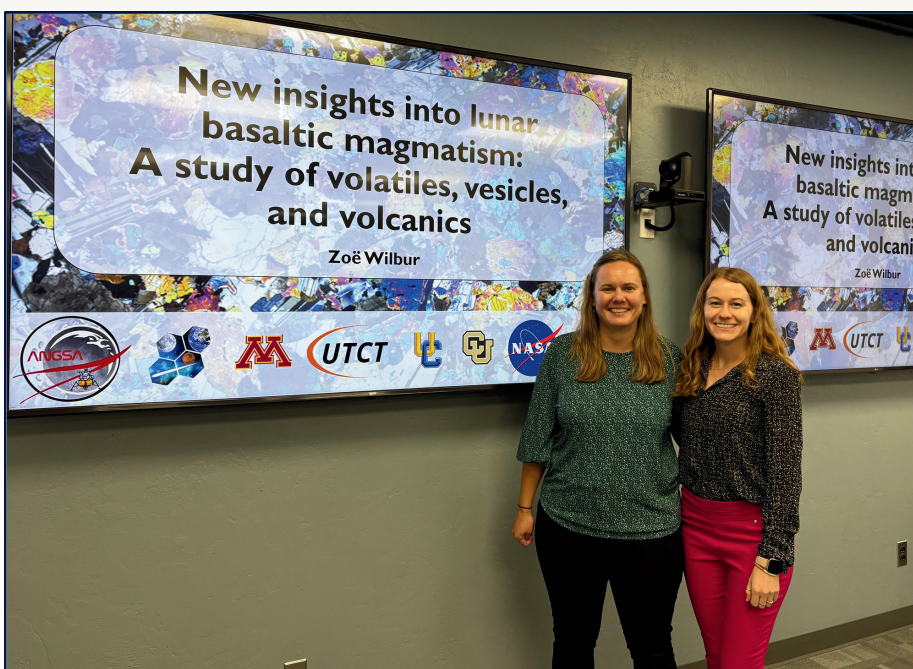
JADA WALTERS

November 8, 2024

Pressure Anisotropy-Driven Instabilities in Solar and Astrophysical Plasmas

Advisor: **Kristopher Klein**

New position: Postdoctoral Research Associate, LPL, University of Arizona



ZOË WILBUR

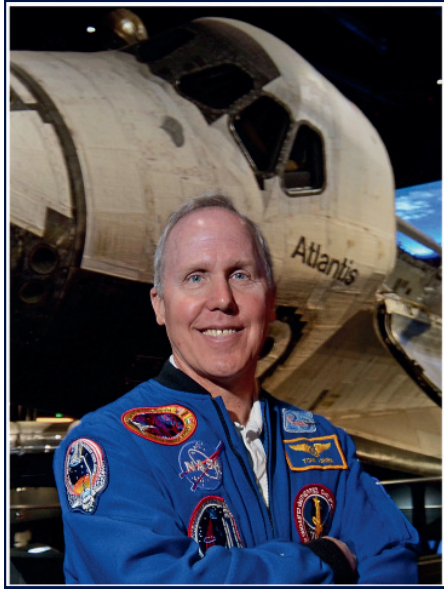
November 4, 2024

New Insights into Lunar Basaltic Magmatism: A Study of Volatiles, Vesicles, and Volcanics

Advisor: **Jessica Barnes**

New position: Smithsonian National Museum of Natural History

LPL ALUMNI



TOM JONES

LPL alumnus **Dr. Thomas Jones** (1988) visited LPL and the University of Arizona in November to both receive and to bestow special awards. On November 12, Tom was presented with a special **Professional Achievement Award** from **Arizona Alumni** in recognition of his career prominence. In conjunction with the award presentation, Tom gave a lecture in support of his latest book, ***Space Shuttle Stories: Firsthand Astronaut Accounts from all 135 Missions***. A reception and book signing followed. The following day, Tom held a roundtable with LPL graduate students and presented a lecture titled, ***Sky Walking: An LPL Astronaut's Journey***. At a ceremony that evening, Tom presented a 2024 **Astronaut Scholar Award** to U of A student **Bryce Wilson**.

Before becoming an astronaut Tom was a bomber pilot in the Air Force. Tom is a scientist, speaker, author, pilot, and veteran NASA astronaut. In more than eleven years with NASA, he flew on four **Space Shuttle** missions. On his last flight, he led three spacewalks to install the centerpiece of the **International Space Station**, the **American Destiny laboratory**. At LPL, his dissertation involved both telescopic and laboratory studies of asteroids and meteorites.



Above left: Tom Jones with his dissertation advisor, LPL Professor Emeritus **John Lewis**. Above right: Local alums including **Ginny Gulick**, **Bob Marcialis**, **Shelly Pope**, and **Lisa McFarlane**, in addition to LPL director **Mark Marley**, attended Tom's award lecture and book signing reception.

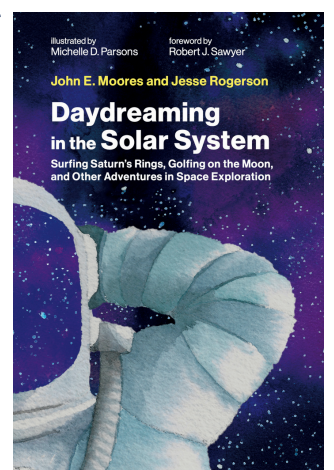


JOHN MOORES

This past summer, Professor **John Moores** completed a two-year term as the Science Advisor to the President of the Canadian Space Agency and became director of **York University's Earth and Space Science Program**, which hosts 90 graduate students. He has recently (October 2024) published with co-author, Professor **Jesse Rogerson**, a popular science book titled, ***Daydreaming in the Solar System***.

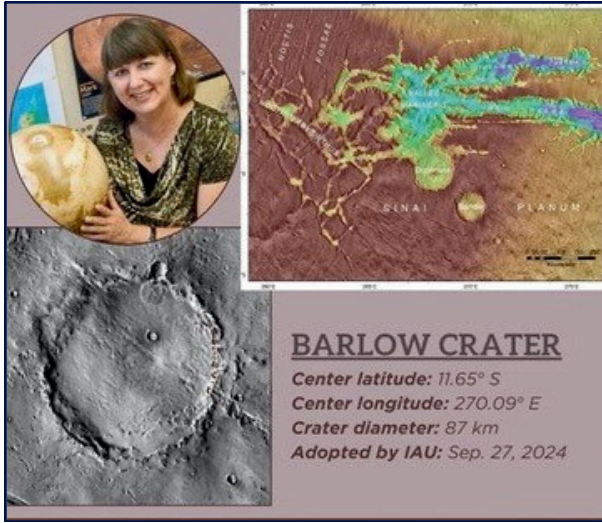
About the book, John writes, "Where Carl Sagan's *Cosmos* sought to open a window onto the planets for a broad audience, we aim to pull the reader completely through the doorway. In science and story, we aim to immerse the reader in planetary environments and to communicate what it would feel like to actually be there on our neighbor worlds using the details we have learned from more than sixty two years of robotic space exploration. The book imagines an inclusive and optimistic view of the future of solar system planetary science. This vision is vividly explored with sixteen watercolor paintings and twenty six playful diagrams provided by illustrator, **Michelle Parsons**.

John continues, "In putting together this volume, I've been especially grateful for the broad knowledge base I developed as an LPL grad. I have appreciated the conversations with former classmates, other alumni and the entire extended LPL family over the past 16 years that have continued to deepen that understanding. I feel fortunate to be able to share our excitement and awe at exploring the solar system with the public."



LPL ALUMNI

NADINE BARLOW



A prominent impact crater on Mars has been named in honor of LPL alumna, **Dr. Nadine Barlow (1958–2020)**. For her dissertation at LPL, Nadine mapped and categorized every impact crater on Mars visible in **Viking Orbiter** imaging above a threshold size. In her subsequent career, she made many advances in our understanding of Mars from this dataset and from later enhancements. Nadine was a professor at **Northern Arizona University**, a noted leader in the field of Mars crater studies, and a dedicated teacher and mentor to students and colleagues. Nadine’s contributions to education and planetary science have also been recognized with a display at the **Astronomy Discovery Center at Lowell Observatory** (Flagstaff).

ALI BRAMSON



Dr. Ali Bramson is the recipient of the 2024 **Greeley Award in Planetary Sciences** from the **American Geophysical Union**. The award recognizes significant early-career contributions to the field of planetary science.

Ali is an **Assistant Professor** in the Dept. of Earth, Atmospheric, and Planetary Sciences at **Purdue University**. She studies the quantitative geomorphology of other planets, especially the physical processes related to ice and volatiles that affect the surfaces of solid bodies in our solar system. She uses spacecraft remote sensing observations and theoretical modeling, supplemented by occasional field work at terrestrial analog sites and experimental studies. Her research on Martian mid-latitude ice is helping to shape the future of in situ resource utilization and human exploration of Mars.

JAMIE MOLARO



Dr. Jamie Molaro won both the 2024 **Sagan Medal** and the 2024 **Neibur Early Career Award**. The Sagan Medal, awarded by the Division for Planetary Sciences of the American Astronomical Society, recognizes outstanding communication by a planetary scientist to the public. The Neibur Award is given by NASA’s Solar System Exploration Research Virtual Institute to an investigator within 10 years of their Ph.D. who has made significant contributions to the exploration science communities.

Jamie is a Research Scientist with the **Planetary Science Institute**. She is a former participating scientist on NASA’s **OSIRIS-REx** mission and current member of the sample science team, as well as a co-investigator for **Project ESPRESSO** (Exploration Science Pathfinder Research for Enhancing Solar System Observations). She studies how heating and cooling breaks down rocks and boulders over time. Outreach and service are important parts of her career. She is the founder and the director of both **The Art of Planetary Science**, a public engagement effort to help people connect to science through art shows and workshops, and **DAIS** (Disabled for Accessibility In Space), a peer networking and support organization for Disabled scientists.

JAMES KEANE



Dr. James Keane was awarded a **NASA Early Career Achievement Medal** in recognition of early career achievement in the geodynamics of the Moon and icy worlds, and for championing the Endurance rover science concept in the planetary decadal survey.

James is a planetary scientist at the **NASA Jet Propulsion Laboratory**. He studies the interactions between orbital dynamics, rotational dynamics, and geologic processes on rocky and icy worlds using theoretical models and the analysis of spacecraft-derived datasets. These techniques facilitate his investigation of the dynamics, structure, origin, and evolution of solar system bodies. James has experience with NASA missions including **GRAIL** and **New Horizons**.

Dr. Keane is also an accomplished science illustrator and communicator.

PTYS 590: PLANETARY GEOLOGY FIELD STUDIES

The Channeled Scablands
October 12-20, 2024



by Vic Baker and Jack Holt

The PTYS 590 Planetary Geology Field Studies Course was a bit different this semester. Firstly, it operated from a rather complete field conference facility in the **Dry Falls/Sun Lakes State Park of Washington state**. Named *Camp Delany*, it provided a central base for 9 days of intensive geological and geophysical investigations of the **Channeled Scablands** landscapes in east-central Washington, where spectacular erosional and depositional features resulting from megafloods relevant to Mars are located. Our camp had 8 spacious cabins, a complete restroom building with showers, and a large recreation hall that served as kitchen and dining hall, with ample space for equipment storage and preparations, evening presentations, and discussion groups.

Another difference this semester was the trip format. Students from Tucson arrived in the late afternoon of Oct. 12 at the **Dry Falls Visitors Center**, where the head ranger provided an excellent regional overview. Days 2 and 3 involved extensive



field drives through the area, including particular attention to potential locations for subsequent intensive investigations to be carried out by teams of students, course instructors, and visiting scientists. Professor **Jerome Lesemann**, University of Vancouver Island, Canada, also participated in these trips.

On days 4 through 8, the various topical field investigations were in full force. The two course instructors, **Jack Holt** and **Vic Baker**, were joined by LPL associate professor **Lynn Carter** and postdoctoral research associate **Dr. Stefano Nerozzi**, as well as by local experts **Dr. Jim O'Connor** of the U.S. Geological Survey, and geologist **Bruce Bjornstad**, the author of the most authoritative guidebooks on the regional geology and an expert on drone photography. The core group of 16 University of Arizona students was joined by local participants from the **University of Washington, Eastern Washington University, and Mount Hood Community College in Oregon**.



Support the LPL Graduate Field Trip by donating to the Wilkening-Sill endowment
<https://give.uafoundation.org/science-lpl>



Above left: Course participants and leaders studying an immense boulder of **Columbia River Basalt** that was eroded by the high-energy megaflooding and transported to the **Ephrata Fan** depositional complex. The smaller boulders in the foreground are composed of granite that occurs more than 70 kilometers upstream of this site. (Photo by Roberto Jose Aguilar Martinez)

The various field investigative teams were divided into groups that focused on (1) **ground penetrating radar** studies of the **basalt bedrock** and the **mega-flooding depositional forms** (gravel bars and dunes), (2) **high-resolution topographic analysis of boulders** emplaced by the mega-flooding, and (3) geological studies of **bedrock erosion features**, notably the rock basins in **Moses Coulee**. These studies resulted in some interesting, new findings that may be publishable. In general, the students felt that the immersive approach was valuable, providing first-hand experience into how geological and geophysical investigations can lead to interesting new insights into geologic processes.

The final day of our trip involved cleaning up the camp, travel and returning to Tucson. However, the previous day's field investigations culminated in a wonderful barbeque dinner organized by the Wenatchee chapter of the **Ice Age Floods Institute** and held at the home of the chapter president **Ken Lacy**, whose back yard provided a spectacular sunset view of the gravel dune field emplaced by the cataclysmic flooding.



LPL field trippers on the rim of a rock basin eroded into the **Columbia River Basalt** by high-energy mega-flooding. This site is within a mile of the Camp Delany field venue. (Photo by Roberto Jose Aguilar Martinez)

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UNDERGRADUATE PROGRAMS



LINAE LARSON PTYS UNDERGRADUATE MINOR

Linae is an **Astronomy** major with minors in **Planetary Sciences, Astrobiology, and Chemistry**. Linae chose Planetary Sciences as a minor because it complemented the Astrobiology minor. She enjoyed taking **PTYS 411: Geology and Geophysics of the Solar System** with **Associate Professor Christopher Hamilton**. The class focused on the diversity of processes that shape planetary surfaces, topics of interest to Linae, who didn't have any prior experience with geology. She also appreciated that Dr. Hamilton was open to questions and could provide applications to the topic at hand. One of Linae's in-class questions became the foundation of her **Space Grant** research project!

Linae plans to graduate in Spring 2026 and then pursue a Ph.D. in astronomy or planetary sciences. Her goal is to be a mission scientist on an astrobiology-focused mission such as **Dragonfly**, which is visiting Saturn's moon Titan in 2034. Linae is a **Space Grant** intern working with **Dr. Christopher Hamilton** on a new mechanism of ocean mixing for icy moons like Europa and Enceladus. The shockwave produced by asteroid impacts on icy moons could cause chunks of ice to fragment on the underside of the icy shell and be ejected into the ocean. This would cause ocean mixing that otherwise would not occur, affecting chemical abundances and habitability. She is using geophysics and finite-element modeling to explore the feasibility and consequences of this process. In addition, she is currently working with LPL Research Scientist **Dr. Michael Phillips** to use spectroscopy of Mars massifs, ancient mountains formed during giant impact events, to reveal the early history of Mars and its mantle overturn event. She uses GIS software to describe and highlight individual features and then creates scientific figures in **Python**.

When Linae is not doing homework or working on research, she enjoys hanging out with friends for movie nights or trivia. She also designs and builds dynamic **LEGO** models, like a rotating asteroid **Bennu** or flying Santa's reindeer. She also enjoys the challenge of playing competitive indoor power soccer in sports wheelchairs with her team the **Minnesota Northern Lights** at regional and national tournaments.



NOAH FLEISHER ASTROBIOLOGY UNDERGRADUATE MINOR

Noah is majoring in **Ecology & Evolutionary Biology** with minors in **Astrobiology, Marine Science, and Geosciences**. When Noah chose his major, he decided to add a minor that satisfied his interest in space science and would help answer his big questions like, "Where did we come from?" and "Are we alone in the universe?" He also wanted to take advantage of being on campus with such great space science programs!

Noah really enjoyed taking **PTYS 214: Life in the Cosmos** with **Professor Dante Lauretta** in Fall 2023 when the **OSIRIS-REx** asteroid sample returned to Earth. He was able to hear about mission details and the **Bennu** asteroid sample return first-hand from mission principal investigator Lauretta. Dr. Lauretta's enthusiasm inspired Noah to be more involved with **astrobiology**.

To support his passion for astrobiology, Noah began working at the **Arizona Astrobiology Center**, where he studies behavior in **tardigrades**. The project aims to measure any signals that may be produced by the tardigrades in association with the **cryptobiosis behavior** that makes them **extremophiles**. He is also completing a senior honors thesis project with **Dr. Diane Thompson** (Geosciences). The project uses corals to study **paleoclimate patterns**, specifically using manganese within the coral's aragonite skeleton as a proxy for understanding wind patterns across the Pacific over time. Noah plans to apply to doctoral programs in **evolutionary biology** to research life on Earth, past and present, in order to understand **macroevolutionary processes** that can be applied to predicting how life would evolve on other worlds.

When he isn't studying or pursuing his research, Noah enjoys spending time as vice-president of the campus **Marine Awareness and Conversation Society**, focusing on outreach to teach the community about marine biodiversity and ecology.



LPL GRADUATE STUDENTS



KIANA MCFADDEN

2023 Speaker Awardee Division for Planetary Sciences and National Society of Black Physicists

Kiana presented her award talk, entitled *Size and Albedo Constraints for (152830) Dinkinesh Using WISE Data*, at the NSBP Fall 2023 meeting. Her presentation described work that was critical for helping the **NASA Lucy mission** plan their November 2023 encounter with this small main-belt asteroid.



SAMANTHA MORUZZI

2024 Amelia Earhart Fellow

The fellowship is awarded annually to up to 30 women in doctoral programs in aerospace engineering and space sciences.

Samantha seeks to better understand the interior of Pluto through the geophysical evolution of Sputnik basin and surface tectonics.



CHRISTINA SINGH

2024 University of Arizona College of Science Robin Distinguished Fellowship

Awarded for academic excellence, exceptional potential to advance knowledge in the discipline, and ability to broaden perspectives and inquiry based on life experiences.

Christina is a first-year graduate with research interests that include astrobiology, photogrammetry, and planetary surfaces.



KAYLA SMITH

2024 University of Arizona Fellows Award

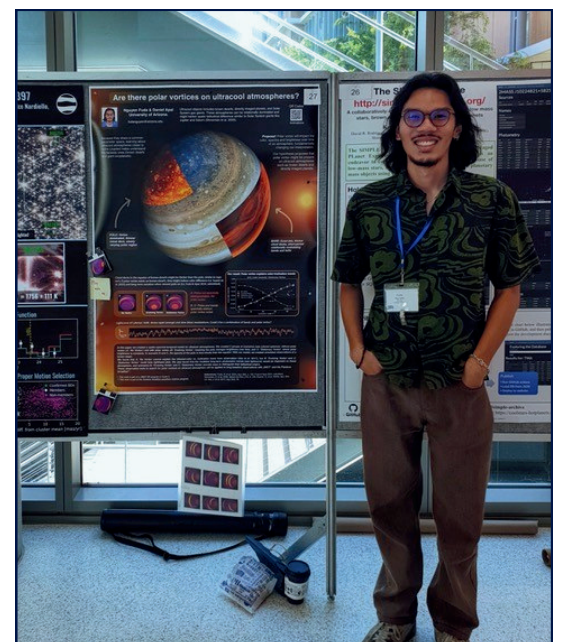
This prestigious fellowship is offered to the University of Arizona's highest-ranked incoming graduate students and includes a competitive financial package, professional development, mentoring, and community engagement opportunities.

Kayla is a first-year graduate student; her research interests include astrobiology, exoplanets, and planetary atmospheres.

FUDA NGUYEN

Best graduate student poster, Cool Stars 22 meeting (June 2024)

The “best poster” award provided Fuda with the opportunity to present a talk on his research on **brown dwarf variability**, conducted with his advisor, **Professor Daniel Apai**. Fuda’s excellent talk drew on solar system-brown dwarf synergies and harkens back to the work of LPL’s **Adam Showman**.



CURSON TRAVEL AWARD

The **Shirley D. Curson Education Plus Fund in Planetary Sciences and LPL** (formerly the Shandel Education Plus Fund) was established by **Shirley Curson**, a generous donor and friend of LPL, for the purpose of supporting travel expenses outside the state of Arizona during summer break. The award is open to LPL students who propose to fund study, museum visits, special exhibits, seminars, instruction, competitions, research and other endeavors that are beyond those provided by the normal campus environment and are not part of the student's regular curriculum during the recipient's school year.

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THE **CURSON TRAVEL AWARD** SUPPORTED TRIPS FOR THREE LPL GRADUATE STUDENTS FOR SUMMER 2024.



ROBERTO AGUILAR MARTINEZ

The Curson Travel Award supported my participation in the 8th International Conference on **Mars Polar Science and Exploration**, which took place at the Kwanlin Dün Cultural Centre in **Whitehorse, Yukon, Canada**. This conference directly aligned with my research on the formation and evolution of **glaciers on Mars** and their potential as water resources for future human landing missions.

At the conference, I delivered an oral presentation titled, ***New Insights on Internal Layering of Martian Mid-Latitude Glaciers with SHARAD***. My presentation focused on the use of orbital radar and high-resolution imagery to study internal climate signals within Martian glaciers. I received feedback from experts in the field, particularly those studying

mid-latitude water ice deposits on Mars and terrestrial analogs. These discussions and connections contributed to my current work funded through a **NASA FINESST** grant.

During the mid-conference field trip, we visited **Kluane National Park** and explored a rock glacier. This site is relevant to my research on terrestrial analogs and can potentially be a location to test the drone-based ground-penetrating radar that we are developing at LPL. I am grateful to the Curson Travel Award for enabling my participation in this conference, which not only advanced my current research but also facilitated meaningful professional connections within the Mars research community.

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NAMYA BAIJAL

The Curson Travel Award supported my travel to the **University of Bern, Switzerland**, for a mentoring workshop and collaboration meeting associated with the **NASA Psyche Mission**, which is set to conduct the first in-situ investigation of a **metal-rich asteroid, (16) Psyche**, to answer the key question, *Is Psyche the leftover core of a differentiated planetesimal, and if so, how did it form?*

My graduate research is centered around developing a testable hypothesis for Psyche's collisional history and its observable surface geology. In Bern, I collaborated with colleagues to enhance

my understanding of the **Bern Smoothed Particle Hydrodynamics (Bern SPH)** code, our impact modeling tool of choice and vital for my research as a student collaborator on the Psyche mission. Two parameters integral to modeling impact craters on Psyche are the ability to incorporate the realistic shape of the asteroid and interior porosity. Bern SPH is one of the few codes in the world with this unique capability, making this meeting an important opportunity for me to gain in-depth training on the codebase.

I also participated in discussions to develop ideas for the interior composition of Psyche. In order to investigate variations in crater shape based on the asteroid's interior, we formulated a new material to match Psyche's overall density using the **Tillotson Equation of State**, which simulates the behavior of complex materials during hypervelocity impacts. I learned how to implement such features into the Bern SPH code, allowing me to set up a new suite of simulations during that week. I was able to incorporate impact parameters which were previously untested, such as the role of impact angle in the collisions. I gained expertise in

developing high-level 3D graphical visualizations of our impacts on the Psyche target using **VAPOR** software, which allowed me to map physical properties such as porosity, density, and pressure onto a 3D isosurface of the asteroid and generate publication-style figures for my first manuscript on this work.

This experience allowed me to conduct a wide range of impact models to simulate the formation of impact basins on Psyche, which I presented at a **Psyche team meeting**. With the help of this collaboration, I also advanced my knowledge of the Bern SPH code which I hope to creatively use in the future to solve problems pertaining to small bodies in our Solar System.

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MELISSA KONTOGIANNIS



I am grateful that the **Curson Travel Award** supported my travel to Chicago in August to present my research at the **2024 Goldschmidt Conference**. This was a significant milestone in my research career, as it was the first time I presented my work at an event outside the U of A.

My research is centered on the analysis of samples recently returned from **asteroid Bennu** by the **OSIRIS-REx** mission, with specific focus on the **sulfide minerals** these samples contain and what these minerals can reveal about the **formation and alteration process Bennu** may have experienced throughout its history.

During my first year at LPL, I mainly worked on **X-ray Computed Tomography (XCT)** analysis of 20 mm-scale asteroid samples. XCT is a powerful, non-destructive analytical technique, which is especially valuable in the analysis of precious and irreplaceable samples such as these asteroid materials, as it allows us to study the interior of a sample prior to any destructive or altering processes required for later analyses. Because these asteroid samples need to be cut/sectioned before any chemical analyses can take place, XCT data preserves the intact samples and provides likely the only complete picture of the sulfide populations they contain. The statistics of

these sulfide populations are important, as the distribution, orientation, and abundance of sulfide minerals can be used to compare different sample morphologies, determine particle density, and identify trends and broader features that may be evidence of hydrothermal alteration processes. I was able to use the XCT data I collected to perform statistical analyses of sulfide populations in three particles, and presented the preliminary results of this work during a 15-minute talk at the conference.

Because Goldschmidt is a **geochemistry-focused conference**, presentations spanned numerous fields, which not only gave me a chance to share my work with an audience that may not have been extensively familiar with planetary science research and its importance in the field of geochemistry, but also allowed me to learn about a variety of interesting topics in which I have very little background. Additionally, the conference hosted a variety of early-career focused events, through which I had the opportunity to meet graduate students from several other institutions and various research fields; these connections help to foster scientific interdisciplinarity and collaboration, which I am passionate about promoting.

Support the Curson Travel Award endowment
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LPL IN THE NEWS

Complete list of LPL headlines and linked stories available at: [LPL.Arizona.edu/news](https://lpl.arizona.edu/news)

On the morning of Dec. 3rd, LPL's **Vivian Carvajal**, working on a joint asteroid survey project between **Spacewatch** and the **Catalina Sky Survey (CSS)** and using the 90" **Bok telescope** on **Kitt Peak**, discovered an imminent Earth impacting asteroid, which fell over Russia. This was the 11th such object to be found ahead of impact (6 out of 11 being found by CSS), the first impactor discovered by Vivian, by the joint project, and by a telescope at Kitt Peak. While all of these small objects burned up harmlessly in the atmosphere, these are fantastic tests of the entire asteroid early warning system of which CSS and Spacewatch are key players. Congratulations to Vivian and the entire CSS and Spacewatch teams!

New 'Spectral Fingerprint' Atlas of Satellites Aims to Improve Space Security. LPL researchers have created the first astronomical equivalent of a fingerprint database for satellites. (Battle, Reddy, Cantillo)

LPL Scientists Have Their Eyes on Europa, Jupiter's Mysterious, Icy Moon. NASA's Europa Clipper will orbit Jupiter and make 49 planned flybys of its moon Europa to study the moon's icy shell and help researchers better understand what lies beneath. (Sutton, McEwen)

Winds of Change: James Webb Space Telescope Reveals Elusive Details in Young Star Systems. A team of astronomers led by LPL researchers has used NASA's James Webb Space Telescope to obtain some of the most detailed insights into the forces that shape protoplanetary disks. (Pascucci, Bajaj)

OSIRIS-REx, 1 Year Later: Asteroid Sample Continues to Provide Clues About Early Solar System and Origins of Life on Earth. Intriguing clues about the early solar system and potential origins of life on Earth have emerged from study of the sample. (Lauretta, DellaGiustina)

Bennu Holds the Solar System's 'Original Ingredients,' Might Have Been Part of a Wet World. A deep dive into the sample of rocks and dust returned from near-Earth asteroid Bennu by the LPL-led OSIRIS-REx mission has revealed some long-awaited surprises. (Lauretta, Marley)

Space Sciences, Water Resources, Geosciences Excel in Latest US News Global Ranking. From space sciences to water resources, the University of Arizona is again recognized as one of the world's top research institutions.

Studying Arctic Glaciers with Airborne Radar: LPL Project Attracts \$30M from NASA. A LPL-led project that uses advanced airborne radar mounted to low-flying aircraft to study arctic glaciers is one of six new missions that have received funding by NASA. (Holt)

Webb Telescope Finds Plethora of Carbon Molecules Around Young Star. A team of astronomers, including scientists from LPL, has used NASA's James Webb Space Telescope to study the disk of gas and dust around a young, very low-mass star. (Pascucci)