

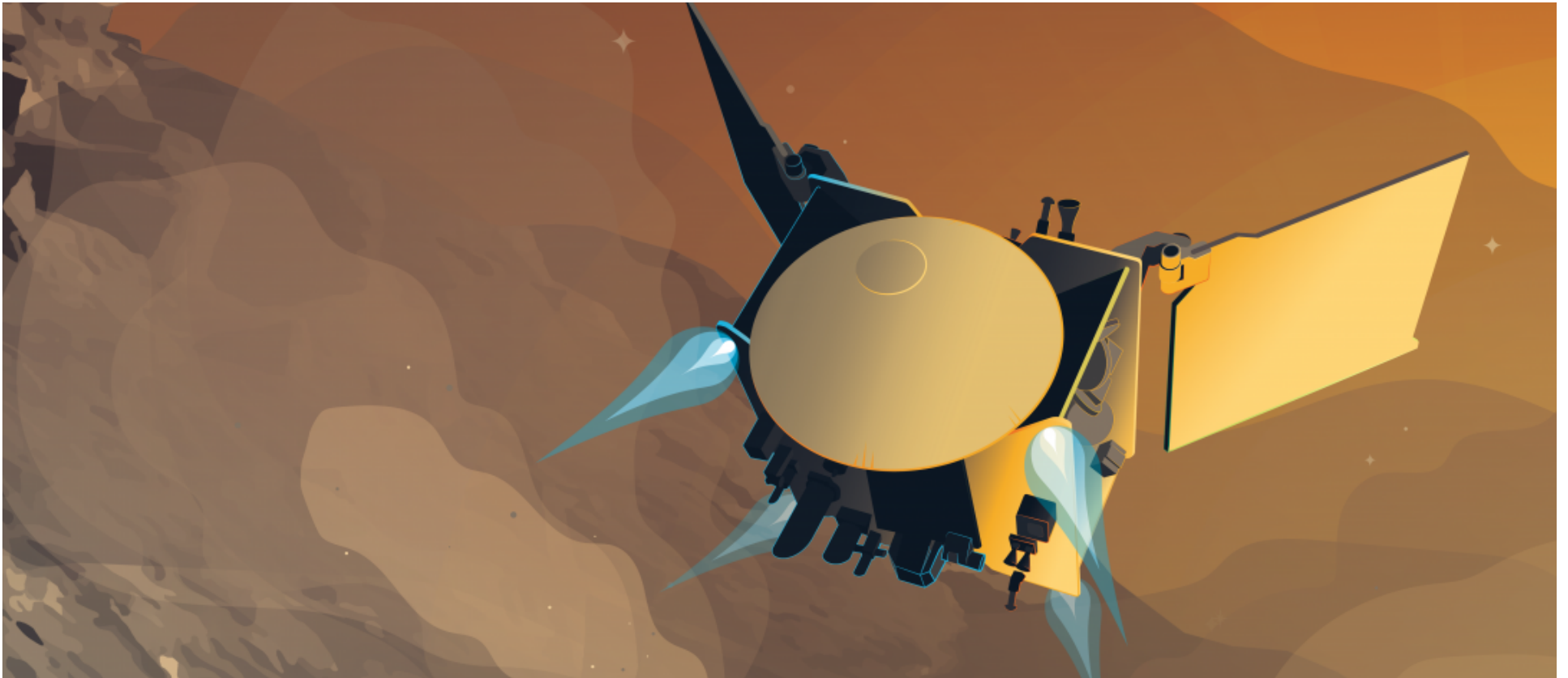


THE UNIVERSITY OF ARIZONA  
COLLEGE OF SCIENCE

# LUNAR & PLANETARY LABORATORY

SPRING 2022

## LPL NEWSLETTER



NASA has extended the UArizona-led OSIRIS-REx mission, which will be renamed **OSIRIS-APEX**, to study near-Earth asteroid **Apophis** for 18 months. Apophis will make a close approach to Earth in 2029. LPL will lead the mission, which will make its first maneuver toward Apophis 30 days after the OSIRIS-REx spacecraft delivers the sample it collected from Bennu back in October 2020. At that point, the original mission team will split: the sample analysis team will analyze the Bennu sample, while the spacecraft and instrument team transitions to OSIRIS-APEX, which is short for OSIRIS-Apophis Explorer.

Regents Professor of Planetary Sciences **Dante Lauretta** will remain principal investigator of OSIRIS-REx through the remaining two-year sample return phase of the mission. OSIRIS-REx deputy principal investigator **Dani DellaGiustina** will then become principal investigator of OSIRIS-APEX. The extension adds another \$200 million to the mission cost cap. DellaGiustina is an assistant professor at LPL.



"Apophis is one of the most infamous asteroids," DellaGiustina said. "When it was first discovered in 2004, there was concern that it would impact the Earth in 2029 during its close approach. That risk was retired after subsequent observations, but it will be the closest an asteroid of this size has gotten in the 50 or so years asteroids have been closely tracked, or for the next 100 years of asteroids we have discovered so far. It gets within one-tenth the distance between the Earth and moon during the 2029 encounter. People in Europe and Africa will be able to see it with the naked eye, that's how close it will get. We were stoked to find out the mission was extended."

OSIRIS-APEX will not collect a sample, but when it reaches Apophis, it will study the asteroid for 18 months and collect data along the way. It also will make a maneuver similar to the one made during sample collection at Bennu – that is, approaching the surface of the asteroid and firing its thrusters. This event will expose the asteroid's subsurface, to allow mission scientists to learn more about the asteroid's material properties. The scientists also want to study how the asteroid will be physically affected by the gravitational pull of Earth as it makes its close approach in 2029. They also want to learn more about the composition of the asteroid. Apophis is about the same size as Bennu – nearly 1000 feet at its longest point – but it differs in what's called its spectral type. Bennu is a B-type asteroid linked to carbonaceous chondrite meteorites, whereas Apophis is an S-type asteroid linked to ordinary chondrite meteorites.

**Read more:** <https://news.arizona.edu/story/nasa-gives-green-light-osiris-rex-spacecraft-visit-another-asteroid>

# WELCOME TO THE LPL NEWSLETTER



## MARK S. MARLEY

DEPARTMENT HEAD AND LABORATORY DIRECTOR

This semester's newsletter is chock full of wonderful news from the past few months. The **OSIRIS-REx** extended mission selection, two outstanding new faculty hires, the latest adventures of our legendary graduate student field trips, our inaugural **Showman Visiting Lecturer**, and a host of prizes and recognitions for our faculty and students. I'm particularly excited about our new faculty hires and the research strengths they will be adding to our Department at the interface of exoplanetary and planetary science.

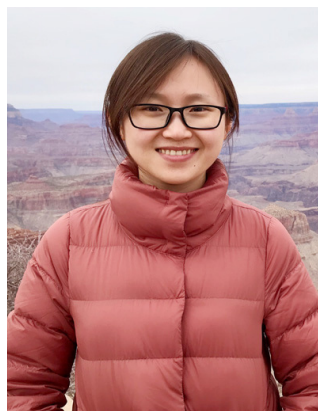
**Dr. Sukrit Ranjan** works on a host of interesting chemical processes related to surface-atmosphere interactions and the origin of life. **Dr. Tyler Robinson** studies planetary atmospheres and the best methods to assess habitability of extrasolar planets. Ty played a key role in defining the capabilities of NASA's future life-finding telescope and will no doubt continue to be a key player in the future of planetary habitability. Together, Sukrit and Ty will be leading LPL into some new directions and I'm excited to see all that they will accomplish.

## 2022 ADAM P. SHOWMAN DISTINGUISHED VISITING LECTURESHIP PROFESSOR HEATHER KNUTSON

Professor Heather Knutson of Caltech visited LPL from April 18-21 as the inaugural speaker for the **Showman Distinguished Lectureship**. Professor Knutson studies the dynamics and chemistry of extrasolar planetary atmospheres, one of the many fields in which **Professor Adam Showman** conducted pioneering research. During her stay, she gave a colloquium on *Exploring the Mysterious Origins of Super-Earths and Mini-Neptunes* and a special seminar titled, *Bulk Compositions of Small Planets Orbiting Small Stars*. Faculty, students, and postdoctoral scholars from LPL and Steward Observatory had the opportunity to meet Professor Knutson and discuss their research.

To support the Showman Distinguished Lectureship, please go to:

<https://give.uafoundation.org/science-lpl>



**Feng Long** is a Sagan Fellow (NASA Hubble Fellowship Program) whose research focus is the formation and evolution of protoplanetary disks—the cradle of young planets. In particular, she uses the powerful radio interferometers to study the physical and chemical properties of protoplanetary disks, and thereby to identify key aspects of the planet-formation process. Her past works have demonstrated the prevalence of gap and ring features in disks, which are the likely imprints of young planets. As a **Sagan Fellow** at LPL, Feng will employ observational data from cutting-edge facilities to establish the impact of these disk features on planet formation and to study the associated young planet population. She aims at better understanding the earliest phase of planet formation, and to shed light on the origin of the observed diversity in exoplanet properties.

## INCOMING POSTDOCTORAL FELLOWS FENG LONG AND BRITTANY MILES



**Brittany Miles** is a **51 Pegasi b Fellow** in Planetary Astronomy. Brittany's expertise lies in mid-infrared observations of brown dwarfs—astronomical objects that share properties with both planets and stars. At UArizona, Brittany will continue her observations of brown dwarf atmospheres to obtain data on cloud composition and behavior. Her brown dwarf observations inform her work as an instrumentalist who retrofits and tests detector capabilities to support more precise characterization of exoplanets. As co-principal investigator on a **James Webb Space Telescope** proposal, she will explore the coldest known brown dwarf to inspect possible water clouds and water vapor and infer how such features may behave on gas giant exoplanets. Brittany also plans to enhance the sensitivity of ground-based instruments to capture images of more Earth-like planets.

## JOINING FALL 2022 SUKRIT RANJAN AND TYLER ROBINSON



LPL will welcome **Dr. Sukrit Ranjan** as an assistant professor this fall. Dr. Ranjan's work is focused on the origin of life on Earth, the search for life on other worlds, and the atmospheres of rocky exoplanets. He applies photochemistry to questions related to the origin of life on Earth and the search for life on other worlds. Sukrit works to constrain the palette of environmental conditions from which life arose on Earth to constrain and guide experimental studies of the origin of life. To search for life elsewhere, he works to determine observational tests by which life on other worlds may be remotely discriminated. In collaboration with experimental colleagues, Sukrit seeks to obtain the critical measurements of fundamental photochemical parameters required to build robust models in support of both goals.

Sukrit completed his Ph.D. in Astronomy and Astrophysics at **Harvard University**, where he was the first student to earn a certificate in **Origin of Life studies**. Sukrit completed his undergraduate work at **MIT**, majoring in physics and minoring in astronomy and history. In addition to research, Dr. Ranjan values outreach and education.



**Dr. Robinson** will join LPL as an associate professor in the fall. He is an alumnus of the **University of Arizona**, earning a B.S. in Physics and Mathematics in 2006. He completed a Ph.D. in Astronomy and Astrobiology from the **University of Washington** in 2012. Ty held prestigious postdoctoral positions as a **NASA Postdoctoral Program Fellow** at NASA Ames Research Center and as a **Sagan Fellow** at the University of California, Santa Cruz, and he is a **Cottrell Scholar** (Research Corporation for Science and Advancement).

Ty uses sophisticated radiative transfer and climate tools to study the atmospheres of Solar System worlds, exoplanets, and brown dwarfs. He also develops instrument models for exoplanet direct imaging. He combines these areas of expertise in his work on the **Habitable Exoplanet Observatory (HabEx) Science and Technology Definition Team**, and in his contributions to the **LUVOR**, **WFIRST/Rendezvous**, and **Origins Space Telescope** mission concept studies. He has had great success in building diverse research groups.

## PROMOTION TO FULL PROFESSOR ILARIA PASCUCCI

Professor Pascucci's research is directed towards understanding how planets form and evolve; she seeks to understand if planetary systems like our own Solar System are common. She carries out observations aimed at characterizing the physical and chemical evolution of gaseous dust disks around young stars, the birth sites of planets. In addition, she uses exoplanet surveys to re-construct the intrinsic frequency of planets around mature stars. By linking the birth sites of planets to the exoplanet populations, the research contributes to building a comprehensive and predictive planet formation theory, a necessary step in identifying which nearby stars most likely host a habitable planet like Earth.

Dr. Pascucci earned her Ph.D. from the **Max Planck Institute for Astronomy** (Heidelberg) in 2004 and has been with LPL since 2011; she currently serves as Associate Department Head.



## LPL FIELD TRIP MOJAVE DESERT

by Shane Byrne

This semester (Spring 2022), the LPL field trip (PTYS 590) headed off to the **Mojave Desert** in California armed with various remote sensing datasets. There is a wide variety of test data in the Mojave from Synthetic Aperture Radars to visible wavelength cameras and there is an even wider range of geologic features to examine, from sand dunes to lava flows. We often spend a lot of time looking at data from places we'll never see in person, so this was a chance for us to do both!



Gathering at top of a cinder cone in the **Cima Volcanic Field**.

On the first evening, we stopped at the giant **Kelso sand dunes** and tried to figure out how to explain their radar appearance in different bands. A sunset hike to the top allowed us to take in a gorgeous moonrise from the summit. We experienced the Kelso dunes' rare ability to boom. **Booming dunes** make low rumbling sounds during sand avalanches thanks to their very specifically shaped and sized sand grains.

The desert southwest has a lot of playas and the Mojave is no exception. We visited two of these dry lake beds with very different radar signatures. **Soda Lake** (a bone-jarring hour-long drive down dirt roads) is still connected to the subterranean Mojave River and is wet just below the surface, whereas **Broadwell Playa** is hydrologically isolated and dry.

The Mojave has plenty of volcanos and we were able to visit cinder cones and lava flows at **Cima, Pisgah, and Amboy**. The different flows at these sites have very different radar behavior that is a proxy for their age. We camped beside the most recent (~11 thousand years old). Although a bit hard to scramble into, caves at Cima and Pisgah added an astrobiological dimension to the trip. Data from airborne spectrometers help us figure out the weathering state of the cinder cones and composition of other geologic units.

Our last night was spent near the town of Amboy on Route 66 (a ghost town that refuses to die). Roy's motel will always be beloved by the group and the high winds we had that night certainly made the last campsite memorable. The Mojave is always a favorite as it teaches all kinds of things about remote sensing, geology, and four-wheel-drive controls.



Aerial view of the campsite at the edge of a young lava flow.  
Photo courtesy of student **Nathan Hadland** and his drone.

Support LPL field trips with a gift to the  
**Wilkening-Sill Field Trip Fund**

<https://give.uafoundation.org/science-lpl>



## KATHRYN VOLK

### VERA RUBIN EARLY CAREER PRIZE

**Dr. Kathryn (Kat) Volk**, LPL Associate Staff Scientist, is the recipient of the **2021 Vera Rubin Early Career Prize**. The Division on Dynamical Astronomy (DDA) of the American Astronomical Society awards the prize annually to recognize an early career dynamicist who demonstrates excellence in scientific research in dynamical astronomy, has had impact and influence on the field, and shows a promise of continued excellence as demonstrated by past practice in research, teaching, and the advancement and support of the field of dynamical astronomy.

Kat is a 2013 alumna of LPL, completing her Ph.D. under the direction of Regents Professor **Renu Malhotra**. She uses theory, numerics, and observations in her research, which spans both Solar System and exoplanetary science.

Dr. Volk has made fundamental contributions to the observational characterization of small-body populations through her core role in the **Outer Solar System Origins Survey** and her work to apply her extensive numerical investigations to theoretical models of the early Solar System. Her research has been influential in quantifying the rates at which Jupiter-family comets are generated from their hypothesized source in the scattered disk beyond Neptune and in characterizing the underlying resonant trans-Neptunian object populations as observational anchors for theories of the early Solar System.

Dr. Volk has also significantly shaped the field of exoplanetary science with her influential proposal that most planetary systems begin in compact configurations and her fundamental contributions to our understanding of the long-term dynamical stability of exoplanetary systems. Kat's research demonstrates that the future lifetimes of mature exoplanet systems are set by slow chaotic diffusion induced by the overlap of secular (rather than mean-motion) resonances.

Dr. Volk will give the prize lecture at the 54th annual DDA meeting in the spring of 2023.

## STEFANO NEROZZI

### GALILEO CIRCLE POSTDOCTORAL SCHOLAR AWARD

**Dr. Stefano Nerozzi** received a **Galileo Circle Postdoctoral Scholar Award** from the University of Arizona College of Science.

Stefano joined LPL in January 2020 to work with Professor **Jack Holt**. He received his Ph.D. from the University of Texas at Austin, where he worked on Mars polar stratigraphy and geomorphology. Dr. Nerozzi is the Science Principal Investigator on a selected **NASA Mars Data Analysis Program** proposal to study the intricate fluvial and geologic history of outflow channel systems in Utopia Planitia on Mars. He was recently selected for the Early Career section of the **International Mars Ice Mapper Measurement Definition Team** for his expertise in Mars radar sounding, geomorphology, terrestrial analogues, and geomechanical stability of icy deposits. Stefano is also the enthusiastic mentor of a diverse group of three undergraduate research assistants working on Mars geology and geophysics projects.



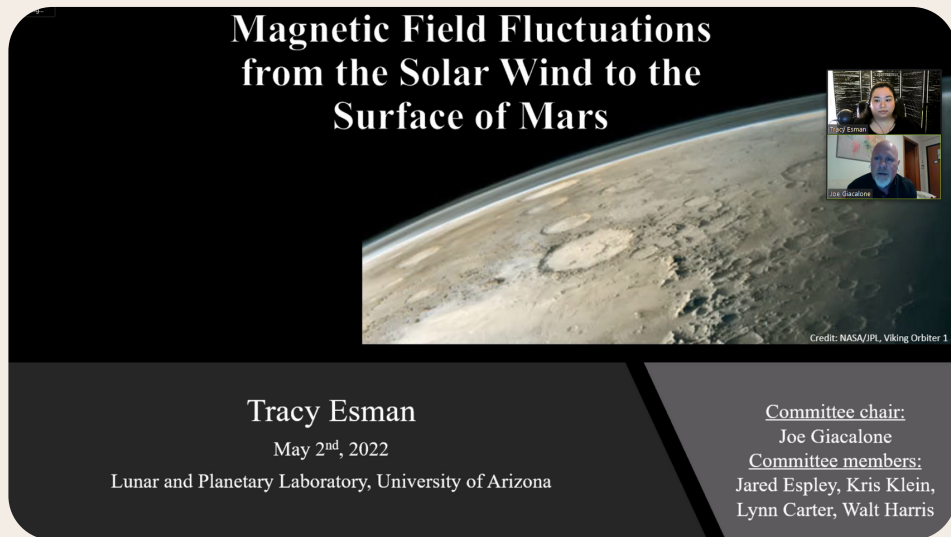
## OSIRIS-REX MISSION TEAM

### 2022 SWIGERT AWARD FOR SPACE EXPLORATION

The **OSIRIS-REx** asteroid sample return mission team was selected to receive the **2022 John L. "Jack" Swigert Jr. Award for Space Exploration** by the **Space Foundation**, a nonprofit organization that advocates for space exploration and space-inspired industries. The award was presented on April 4 during the opening ceremony of the 37th Space Symposium in Colorado Springs. The award recognizes extraordinary accomplishments in the realm of space exploration and discovery and honors the memory of astronaut John L. "Jack" Swigert Jr., one of the inspirations for the creation of the Space Foundation.

"I am enormously grateful to the Space Foundation for this honor," said LPL Regents Professor **Dante Lauretta**, principal investigator of the OSIRIS-REx mission. "The OSIRIS-REx team represents the pinnacle of human achievement. Team members have diverse backgrounds, skillsets and expertise. Together, we overcame numerous challenges to successfully collect a massive sample from asteroid Bennu. The best times are ahead of us, and the team is busy preparing for the analysis of these scientific treasures from outer space."

# CONGRATULATIONS GRADUATES



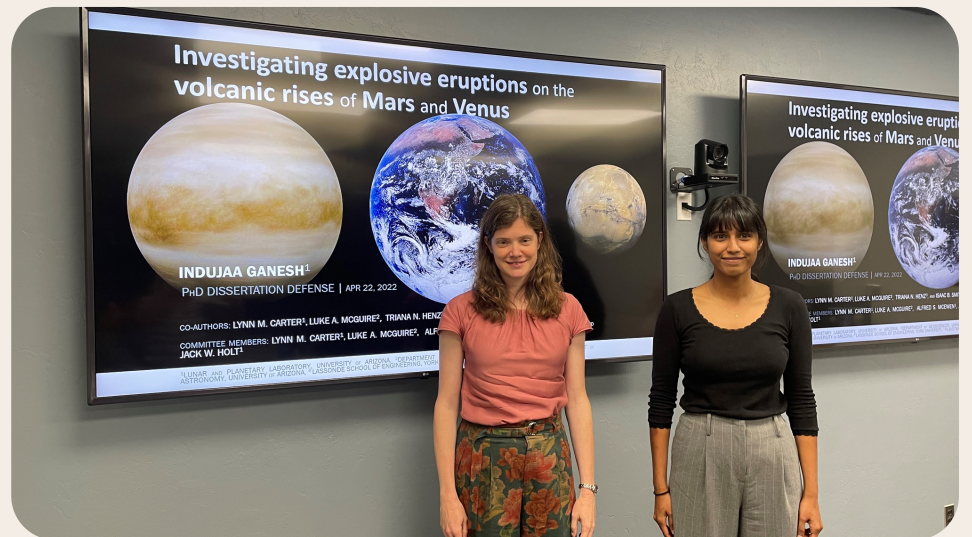
**Tracy Esman**

May 2<sup>nd</sup>, 2022

*Magnetic Field Fluctuations from the Solar Wind to the Surface of Mars*

Advisor: Professor **Joe Giacalone**

New position: Postdoc, **Goddard Space Flight Center**



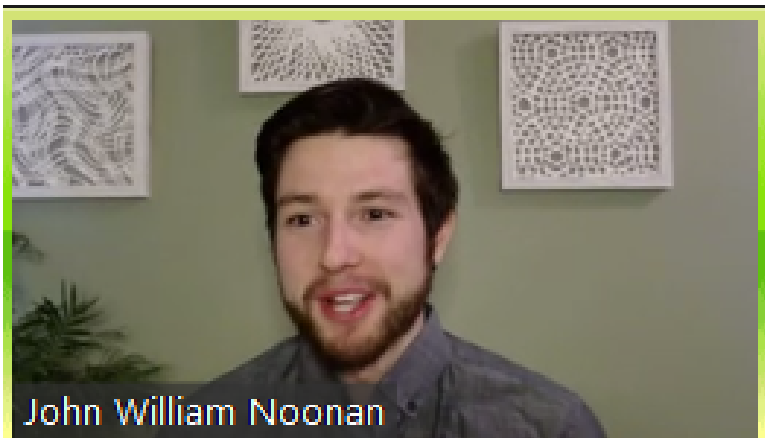
**Indujaa Ganesh**

April 22, 2022

*Investigating Late-stage Explosive Eruptions on the Volcanic Rises of Mars and Venus*

Advisor: Associate Professor **Lynn Carter**

New position: Postdoc, **University of Alaska, Fairbanks**



**John Noonan**

January 7, 2022

*The Comet Cipher: Understanding the Ultraviolet Emissions of Cometary Comae*

Advisor: Professor **Walt Harris**

New position: Postdoc, **Auburn University**



**Sarah Sutton**

April 18, 2022

*Fissure-fed Volcanism on Mars and Earth*

Advisor: Associate Professor **Christopher Hamilton**

Continuing her work as a Photogrammetry & Image Processing Scientist with **HiRISE**

## AMANDA STADERMANN ANDERSSON AWARD FOR SERVICE AND OUTREACH

ATTENTION TO BROADER IMPACTS AND INVOLVEMENT IN ACTIVITIES THAT BENEFIT THE DEPARTMENT, UNIVERSITY AND THE LARGER COMMUNITY.

Amanda Stadermann is the recipient of the **2022 LPL Leif Andersson Award for Service and Outreach** and the **College of Science Excellence in Service Award for LPL**.

Throughout her career as a graduate student, Amanda has been passionate about serving both local and planetary communities.

In her role as **Graduate Representative to the Faculty**, Amanda attends faculty meetings to represent student concerns and present data and other relevant information as needed. As Grad Rep, Amanda also welcomes prospective students with an orientation to LPL and the academic program, as well as the campus and life in Tucson.

Amanda has been active in her support of special programs and events like **The Art of Planetary Science** (2018-2020). She has been a regular volunteer for LPL outreach events such as **Summer Science Saturday**. In 2019, Amanda was invited to give a talk at the **Arizona Sonora Desert Museum**, and also made presentations at UArizona Special Collections (*Moon*) as well as at Tucson's Coronado K-8 School (*Parker Solar Probe: Exploring the Sun*).

Amanda has served the wider planetary science community in peer review roles and as an executive secretary for NASA proposal review panels (**ROSES**). She is the communications chair for **NextGen**, a community group of early career researchers who have a passion and vision for lunar science and exploration. With NextGen, Amanda maintains and revises the community web site, distributes information and announcements, and coordinates in-person and virtual meet-ups. She also helped to organize a community panel discussion on ethical lunar exploration. Amanda has been invited to give several oral presentations on NextGen initiatives. Amanda's work with NextGen helps to create a better sense of community among early career lunar scientists, engineers, and explorers.



## JOANA VOIGT GERARD P. KUIPER MEMORIAL AWARD

**Joana Voigt** is the recipient of the LPL **Kuiper Memorial Award** and **College of Science Excellence in Scholarship Award for LPL** for 2022. Joana is a fourth-year student whose research focuses on comparisons between volcanic processes on Earth and Mars.

Joana has an impressive publication record that includes 12 peer-reviewed articles, including 4 first-author and 1 co-first author papers. Three first-author articles from 2021 summarized her work studying the 2014–2015 Holuhraun eruption in Iceland, providing insight into: (1) geomorphological mapping of the lava flow-field to understand its lava emplacement dynamics during fissure-fed eruption; (2) statistical characterization of lava surface roughness to inform mapping studies of lava flow-field using remote sensing data (e.g., topography and radar); and (3) determination of the relationship between lava flow facies and time average effusion rates to determine how eruption rates influence the products of large fissure-fed eruptions. Joana has also published work related to the characterization of the **InSight** landing site, cryovolcanism on **Europa**, and impact melts on the **Moon**.

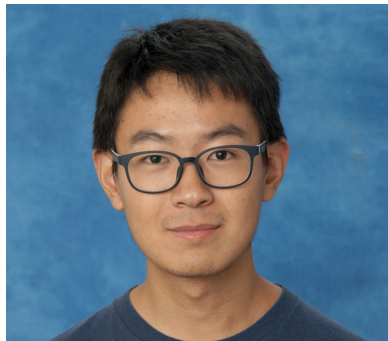
In 2021, Joana received the **Amelia Earhart Fellowship** to support her field work, and a **NASA FINESST** to complete a study related to the four-dimensional reconstruction of lava flow emplacement within Elysium Planitia using geological mapping and **SHARAD** radar analysis. She has also served on two NASA panels as an executive secretary and established a visiting studentship at Caltech with Professor Bethany Ehlmann.

Joana is the Deputy Principal Investigator of Associate Professor Christopher Hamilton's **RAVEN: Rover-Aerial Vehicle Exploration Network** project to field test rovers and drones in Iceland to inform the next generation of Mars Science Helicopter mission. She also works with Hamilton, who serves as her dissertation advisor, on a **JPL Strategic University Partnership Program** to test science operational scenarios for the exploration of lunar lava tubes, in support of JPL's Discovery Mission concept **Moon Diver**. Joana is also part of a newly selected proposal to investigate volcanic outgassing from flood lava eruptions on Mars and their effects on climate.

Joana plans to graduate in December 2022.

# CURSON TRAVEL AWARDS

SUPPORTING TRAVEL EXPENSES OUTSIDE THE STATE OF ARIZONA DURING SUMMER BREAK



**Xiaohang Chen**

Travel to Johns Hopkins University Applied Physics Lab to present at the **Parker Two 2022 Conference**



**Emileigh Shoemaker**

Travel to Colorado to attend the **19th International Conference on Ground-Penetrating Radar**



**Lucas Smith**

Travel to **Washington University** to train on NanoSIM and Nanoprobe instruments



**Jada Walters**

Travel to work with mentors at **Princeton Plasma Physics Laboratory**

To donate to the Curson Travel fund, visit:  
<https://give.uafoundation.org/science-lpl>

## ZOË WILBUR HITACHI ELECTRON MICROSCOPY SCHOLARSHIP

The **Kuiper Materials Imaging and Characterization Facility** awards the **Hitachi Scholarship in Electron Microscopy** annually to two graduate students generating cutting-edge research and publications in the area of electron microscopy. The scholarship was established by **Hitachi High-Technologies** as part of their partnership with University of Arizona.

PTYS graduate student **Zoë Wilbur** is one of the scholarship recipients for 2022/2023. Zoë's research focuses on unraveling the mysteries of lunar volcanism through the chemical analysis of Apollo samples. Additionally, Zoë is interested in the formation and evolution of meteorites, and what they can tell us about volatile elements in our solar system. Zoë is entering her fourth year as a graduate student; she is advised by Assistant Professor **Jessica Barnes**.

"The Hitachi Electron Microscopy Scholarship will give me the financial freedom to focus on advancing my research this upcoming year, with the goal of publishing a first-author paper about how understudied Apollo 17 samples erupted onto the lunar surface," says Zoë.

**Yi Zhang**, a sixth-year Ph.D. student in Materials Science & Engineering, is also a recipient of the **Hitachi Electron Microscopy Scholarship** for the year. Yi studies additively manufactured nickel-based superalloys, a group of alloys used widely in aviation. The research includes characterizing the interactions of microstructures and defects in the alloys and studying how the interactions correlate with fatigue performance.





# 2022 GALILEO CIRCLE SCHOLARSHIPS

**Galileo Circle Scholarships** are awarded to the University of Arizona's finest science students and represent the tremendous breadth of research interests in the **University of Arizona College of Science**. The scholarships are supported through the generous donations of **Galileo Circle** members. Galileo Circle Scholars receive \$1,000 and the opportunity to introduce themselves and their research to the Galileo Circle patrons.



## Rachel Fernandes

*Advisor: Ilaria Pascucci*

Seeking to expand on our understanding of the primordial short-period population by detecting and measuring the occurrence rates of planets in young (<1 Gyr) stellar clusters with the Transiting Exoplanet Sky Survey.



## Nathan Hadland

*Advisor: Solange Duhamel & Christopher Hamilton*

Studies planetary analogs in Iceland and elsewhere to evaluate the nature of life and their resulting biosignatures in extreme environments that have similar characteristics as Mars.



## Kiana McFadden

*Advisor: Lynn Cater and Ellen Howell*

Studies asteroids and other small bodies using radar and thermal data.



## Allison McGraw

*Advisor: Vishnu Reddy*

Researching the Gefion asteroid family.



## Laura Seifert

*Advisor: Tom Zega*

Analyzes circumstellar grains preserved inside primitive meteorites using transmission electron microscopy.



## Emileigh Shoemaker

*Advisor: Lynn Carter*

Studies volcanism and ice deposits using ground penetrating radar.



## Joana Voigt

*Advisor: Christopher Hamilton*

Seeks a comprehensive understanding of the relationship between eruption dynamics and the final lava morphologies by using a combination of remote sensing techniques and instruments, unmanned aircraft systems, and field observations.

## MORGAN CRYDER PTYS UNDERGRADUATE MINOR

**Morgan Cryder** is a rising senior majoring in **Geosciences** with a minor in **Math** as well as Planetary Sciences. Morgan chose Planetary Sciences because she is just as curious about the other planets in our solar system as she is about the Earth. Morgan says, "I find it really interesting that I can apply what I learned in my geoscience studies or classes to other bodies in our solar system." Morgan has enjoyed all of her PTYS courses but says that the **Mars** course taught by Regents Professor **Alfred McEwen** was most memorable. The class was able to request **HiRISE** images and at the end of the course and each student presented on different Mars topics. Morgan felt that through this course she was able to really understand more about the red planet.

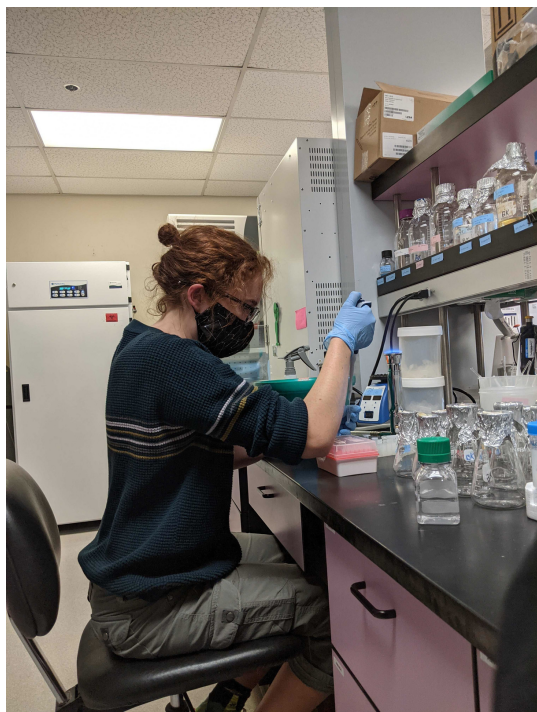


Morgan is currently researching Martian wrinkles with Associate Professor **Jeff Andrew-Hanna**. They have been analyzing the variability of these ridges and creating different codes to get better data on the characteristics of these ridges. In March, she presented this research at the **53rd Lunar and Planetary Science Conference**.

Morgan is still undecided on the direction she wants to take her education and career. This summer she is participating in a petroleum camp and is looking forward to applying those new skills to her research. She hopes that she can incorporate both Earth science and space science into her future career.

## UNDERGRADUATE MINORS

24 students are pursuing a **Planetary Sciences** minor and 28 students are enrolled for the **Astrobiology** minor. We are pleased to feature two students in this newsletter.



## BROOKE CARUTHERS ASTROBIOLOGY UNDERGRADUATE MINOR

Rising senior **Brooke Caruthers** is majoring in **Molecular and Cellular Biology** with minors in **Marine Science** and **French** in addition to **Astrobiology**. Brooke plans to earn a Ph.D. and pursue astrobiology research related to microbiology either at NASA or another academic institution. Brooke is passionate about the amazing chemical complexity that is biology, but wanted to learn more about how biology interacts with, and is affected by, other processes in order to understand the potential for life elsewhere.

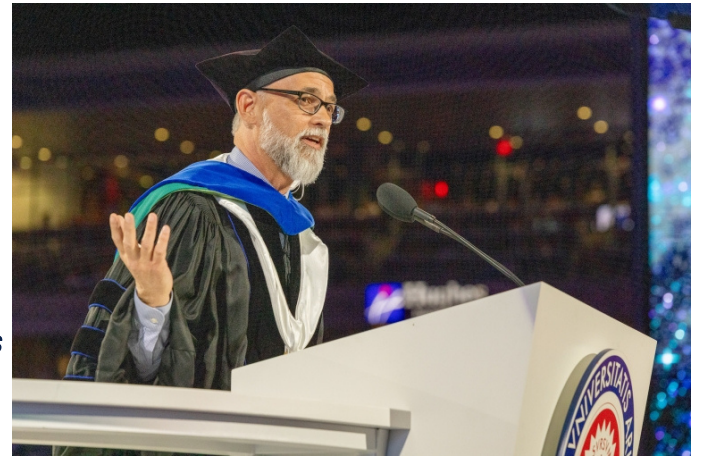
She found that the astrobiology minor was the perfect way to take courses on material outside the norm for her major and to interact with other students and professors from various departments. "Plus," Brooke says, "astrobiology allows me to pursue the most fun questions of all, where did we come from and are we alone?" The astrochemistry course taught by Regents Professor **Lucy Ziurys** has been Brooke's favorite class because she

had the opportunity to visit the 20m radio telescope at **Kitt Peak National Observatory**.

Brooke has been working with the **Kacar Lab**, which recently moved from the UArizona to the University of Wisconsin-Madison, in reconstructing ancient proteins to study the evolution of life on a molecular scale. Brooke will soon begin her senior thesis on a climate science GIS mapping project with LPL Professor **Amy Mainzer**.

## 2022 UARIZONA COMMENCEMENT SPEAKER DANTE LAURETTA

LPL's **Dante Lauretta** delivered the UArizona commencement address on May 13. Professor Lauretta graduated from UArizona in 1993 with a Bachelor of Science in physics and mathematics and a Bachelor of Arts in Oriental studies with an emphasis in Japanese. He earned his Ph.D. in Earth and planetary sciences in 1997 from Washington University. He is Principal Investigator of the **OSIRIS-REx** sample return mission.



In his speech to graduates, Lauretta advised students to "say yes" to unexpected opportunities in their upcoming careers. Lauretta said a series of yeses led him to unexpected opportunities – and eventually to the helm of the United States' premier mission to collect a sample from a potentially hazardous near-Earth asteroid and bring that sample back to Earth.

While this year's graduates' journeys will look different from his, Lauretta said, they should still watch out for their own opportunities to say yes. "You will know in your heart when such an opportunity presents itself," said Lauretta. "When it crosses your path, take chances, take risks and say yes to the invitations that call to you," he said.

Interspersed throughout Lauretta's speech, video clips showcasing OSIRIS-REx's biggest milestones played on the stadium's big screens. And before he shared tales of overcoming the monumental challenges that come with space exploration, Lauretta took graduates back to a time they could relate to a bit more.

Lauretta's first yes, he said, came one day in 1992, after a long shift as a short-order breakfast cook – before Lauretta, then a math, physics and East Asian studies major at UArizona, even knew planetary sciences was a discipline. He opened an issue of *The Daily Wildcat*, the university's student newspaper, to find a full-page ad emblazoned with, "Work for NASA." He applied and was accepted to NASA's **Space Grant** internship program, launching him into a career of yeses, he said.

The next significant yes, Lauretta said, was in 2004, when he received a phone call from **Michael J. Drake**, then the director LPL. Drake asked Lauretta to join him and some executives from Lockheed Martin to discuss a partnership on a new space mission. That mission was **OSIRIS-REx**, which would go on to launch in 2016, arrive at near-Earth asteroid Bennu in 2018 and collect a sample in 2020. Now on its return journey, it is expected to deliver the sample to Utah's West Desert in September 2023. The sample will

likely yield fundamental knowledge about the origin of terrestrial planets and strategies to avoid potential asteroid impacts on Earth.

While the mission's successes are clear in hindsight, it was tough to say yes, at the time, to the opportunity that ended up defining his career, Lauretta told the graduates. Drawing up the mission plans and finding funding would be a monumental task, and it could all get canceled at any moment. But he couldn't shake the notion that he could play a role in answering some of humanity's toughest questions: "Where did we come from?" "Are we alone in the universe?" The urge to help find those answers, he said, was too strong for him to say no. Lauretta encouraged graduates to not overlook moments like these.

"On your journeys, remember that big things come from these small moments," he said. "I said yes to applying to the NASA Space Grant program. I said yes to joining Mike on the mission – even when it seemed like magic, like we were wizards trying to summon stones from outer space into our laboratories. By simply saying yes to what presented itself, I found myself at the helm of one of history's greatest scientific expeditions."

Lauretta urged the graduates to reflect on their time in college, imagine their paths ahead and understand that they are not alone. He asked them to take in their surroundings at the ceremony and to recognize that "this is your moment." Even after graduation, they won't stop learning, he assured them.

"It will be the opportunities along the way that you say yes to, the diverse people you meet, the mentors you seek to support (you), the invitations you accept and the challenges you embrace that will lead you toward your destiny and provide for you a much deeper understanding of how it all comes together, how it all fits, just by saying yes," he said. "Stop and take it all in," he added. "These are all the results of yes."

# LPL IN THE NEWS

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

**NASA Deputy Administrator: UArizona a 'Crown Jewel' for the US.** During a visit to campus, NASA Deputy Administrator Pam Melroy discussed some of the space agency's most ambitious and impactful space missions with the LPL scientists who pursue them.

**Planetary Science Decadal Survey Prioritizes LPL-led Planetary Defense Mission.** A new decadal survey from the National Academies of Sciences, Engineering, and Medicine recommends NASA fully support **NEO Surveyor**, a space-based survey designed to discover and measure asteroids and comets that could pose an impact hazard to Earth. Professor **Amy Mainzer** leads the effort.

**NASA Gives Green Light for OSIRIS-REx Spacecraft to Visit Another Asteroid.** The extended mission, dubbed **OSIRIS-APEX**, will study the near-Earth asteroid Apophis, which will have a close encounter with Earth in 2029.

**Small But Mighty: How UArizona Researchers are Harnessing the Power of Algae to Capture Carbon.** An astrobiologist, an engineer and an ecologist have teamed up to mitigate the worst effects of climate change.

**UArizona Students Confirm Errant Rocket's Chinese Origin, Track Lunar Collision Course.** Students studying the object's composition confirmed that it is most likely a Chinese booster and not a SpaceX booster, as previously reported.

**\$7.5M Effort Seeks to Prevent Lunar Traffic Jams.** University of Arizona researchers are developing ways to detect, characterize and track objects in cislunar space, or the space between Earth and the moon.

**It Takes a Special Kind of Planet to Make a Moon.** Generally thought to be the products of celestial bodies crashing into each other, moons around terrestrial planets may play important roles in shaping the conditions for life to emerge. For sizable moons to form successfully, the circumstances must be just right.

**Power On! Webb Telescope's Instruments Are On, and UArizona's NIRCarn Will Soon See Starlight.** Now begins the process of aligning all 18 mirror segments so that they work together as one.

**OSIRIS-REx mission team wins 2022 Swigert Award for Space Exploration.** The award recognizes the team behind the mission's successful collection of a pristine sample from an asteroid for laying "the groundwork for forging the next generation of scientists, astronomers, geologists and more."

**UArizona Leads Nation in Astronomy, Astrophysics Research Spending.** University spent nearly \$122M in FY 2020.

THE WINTER

**Meet the Scientist Moms Fighting Climate Change for Their Children.** When it comes to climate change, despair is not in short supply. For all the progress made, the challenges remaining can seem insurmountable. At the same time, there is a growing movement not only to show the way climate systems are changing, but also to fight so-called climate doomerism.

**Why Are Asteroids and Comets Such Weird Shapes?** The less massive an object is, the less round it is.

**How to Spot Asteroids.** Be patient. Keep your mortal fear in check.

**UArizona to Help NASA Understand Solar Wind and Plasma with HelioSwarm Mission.** Most visible matter in the universe exists as plasma, and NASA has funded a new mission to study this state of matter that's rarely found on Earth.