BERKELEY
ASTRONOMY

UNIVERSITY OF CALIFORNIA, BERKELEY
WINTER 2024-2025

Astronomy in the News

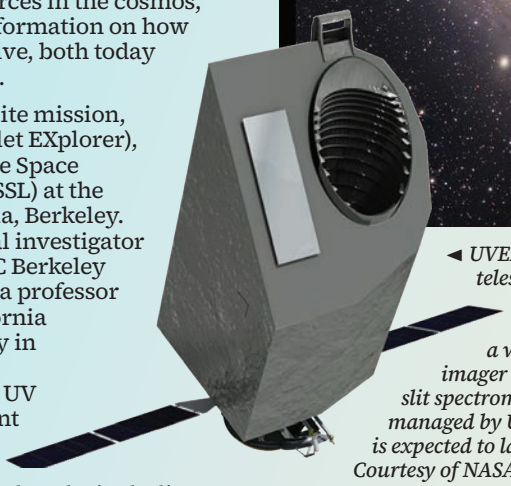
UC BERKELEY WILL MANAGE $300 MILLION NASA MISSION TO MAP THE UV UNIVERSE

UltraViolet EXplorer (UVEX), led by Caltech and managed by UC Berkeley, is expected to launch in 2030

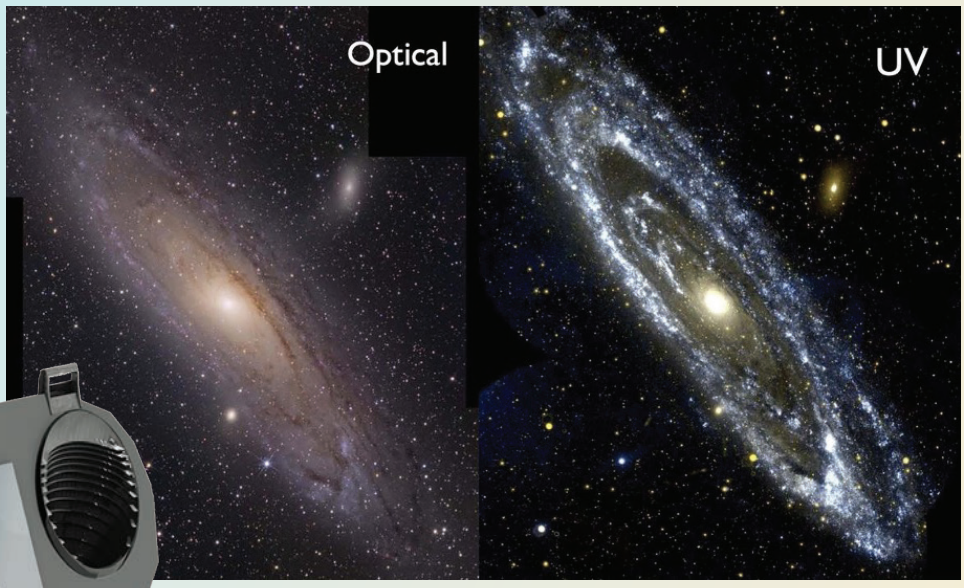
By Robert Sanders

An orbiting space telescope approved by NASA last month and scheduled for launch in 2030 will conduct the first all-sky survey of ultraviolet (UV) sources in the cosmos, providing valuable information on how galaxies and stars evolve, both today and in the distant past.

The $300 million satellite mission, called UVEX (UltraViolet EXplorer), will be managed by the Space Sciences Laboratory (SSL) at the University of California, Berkeley. The mission's principal investigator is Fiona Harrison, a UC Berkeley Ph.D. recipient who is a professor of physics at the California Institute of Technology in Pasadena, California. The telescope's all-sky UV survey will complement ongoing or planned surveys by other missions over the next decade, including the optical and infrared Euclid mission led by the European Space Agency with NASA contributions, and NASA's Nancy Grace Roman Space Telescope, an infrared telescope set to launch by May 2027.



◄ *UVEX, a new NASA space telescope designed to explore the ultraviolet sky, will be equipped with a wide-field, two-band imager and long, multi-width slit spectrometer. Led by Caltech and managed by UC Berkeley, the mission is expected to launch in 2030. Image Courtesy of NASA.*



▲ *The Andromeda Galaxy, M31, looks much different in optical (left) versus ultraviolet wavelengths. UVEX will conduct an all-sky survey to find UV sources, searching in particular for hot binary stars in low-mass galaxies surrounding the Milky Way and for the signatures of exploding stars. Optical: Adam Block/NOAO/AURA/NSF; UV: GALEX/JPL/NASA*

Together, these missions will help create a modern, multi-wavelength map of our universe.

"When UVEX launches, for the first time we'll have the entire sky covered from the UV all the way through the infrared," said Daniel Weisz, one of the science team leaders for the UVEX mission and a UC Berkeley associate professor of astronomy. "Having ultraviolet coverage of the entire sky, which has never really been done before, is groundbreaking."

UV emissions come from hot objects, but these wavelengths are blocked by Earth's atmosphere and must be studied from space. The survey will focus on hot, massive blue stars — many of which are thought to be members of binary star systems — as well as exploding stars. In binary star systems, the most massive of the stellar pair often strips material from its companion, which exposes its hot UV-emitting core. UVEX will map the distribution of these "stripped" stars in galaxies around the Milky Way.

The telescope also will carry a UV spectrograph, jointly built by UC Berkeley and Caltech, to record detail about the UV wavelengths emitted by massive stars and during stellar explosions. These observations will provide new details about how stars and galaxies form and how they die.

"One of the things we're going to produce is a chart of the whole pathway from the genesis of these binary stars all the way to what happens when they explode and interact with whatever materials around them that they've lost over time," he said. "UVEX will just completely change the field."

Continued on page 2

CONTENTS

Continued from page 1

LOW-MASS GALAXIES TODAY AND IN THE EARLY UNIVERSE

Weisz is particularly interested in low-mass galaxies — those that are about one-tenth the size of the Milky Way. The most famous of these are the Large and Small Magellanic Clouds — satellites of the Milky Way that are one-tenth and one-hundredth the mass of the Milky Way, respectively — but there should be millions of smaller galaxies within our galactic neighborhood. Only about 50,000 have so far been seen, and few have been studied spectroscopically at UV wavelengths.

Our sensitivity limits extend to galaxies that are 10,000 times less massive than the Milky Way," Weisz said. "That's about a million solar masses."

Such small, but faint, nearby galaxies are hard to identify using optical or infrared telescopes, he said, because they look nearly identical to very distant galaxies whose UV emissions have been redshifted to optical and infrared wavelengths. But if they also emit UV light, they're likely our near neighbors.

"When you see a galaxy that has UV, optical and infrared, it has to be nearby," Weisz said. "We're trying to map out the structure of these millions of low-mass galaxies across the entire sky in order to better understand how mass, which is mostly made of dark matter, is distributed in the local universe."

The Magellanic Clouds are satellite galaxies of the Milky Way. These dwarf galaxies, which orbit the galactic centre, are only visible from the Southern Hemisphere. Here, they are seen above the Auxiliary Telescopes of ESO's Very Large Telescope (VLT) in Paranal, Chile. Photo by J. C. Muñoz/European Southern Observatory.

Read these full stories online

THIS ROCKY PLANET AROUND A WHITE DWARF RESEMBLES EARTH — 8 BILLION YEARS FROM NOW

Existence of Earth-like planet around dead sun offers hope for our planet's ultimate survival

By Robert Sanders

The discovery of an Earth-like planet 4,000 light years away in the Milky Way galaxy provides a preview of one possible fate for our planet billions of years in the future, when the sun has turned into a white dwarf, and a blasted and frozen Earth has migrated beyond the orbit of Mars.

Astronomers have discovered a distant white dwarf with an Earth-like planet in an orbit just beyond where Mars is in our solar system. Earth could end up in such an orbit circling a white dwarf in about 8 billion years, if, like this exoplanet, it can survive the sun's red giant phase on its way to becoming a white dwarf. Artist impression by Adam Makarenko.

This distant planetary system, identified by University of California, Berkeley, astronomers after observations with the Keck 10-meter telescope in Hawaii, looks very similar to expectations for the sun-Earth system: it consists of a white dwarf about half the mass of the sun and an Earth-size companion in an orbit twice as large as Earth's today.

That is likely to be Earth's fate. The sun will eventually inflate like a balloon larger than Earth's orbit today, engulfing Mercury and Venus in the process. As the star expands to become a red giant, its decreasing mass will force planets to migrate to more distant orbits, offering Earth a slim opportunity to survive farther from the sun. Eventually, the outer layers of the red giant will be blown away to leave behind a dense white dwarf no larger than a planet, but with the mass of a star. If Earth has survived by then, it will probably end up in an orbit twice its current size.

The discovery, published in the journal Nature Astronomy, tells scientists about the evolution of main sequence stars, like the sun, through the red giant phase to a white dwarf, and how it affects the planets around them. Some studies suggest that for the sun, this process could begin in about 1 billion years, eventually vaporizing Earth's oceans and doubling Earth's orbital radius — if the expanding star doesn't engulf our planet first.

Eventually, about 8 billion years from now, the sun's outer layers will have dispersed to leave behind a dense, glowing ball — a white dwarf — that is about half the mass of the sun, but smaller in size than Earth.

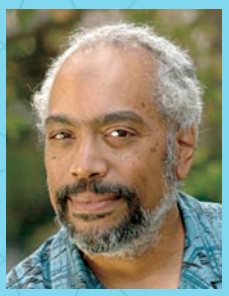
"We do not currently have a consensus whether Earth could avoid being engulfed by the red giant sun in 6 billion years," said study leader Keming Zhang, a former doctoral student at the University of California, Berkeley, who is now an Eric and Wendy Schmidt AI in Science Postdoctoral fellow at UC San Diego. "In any case, planet Earth will only be habitable for around another billion years, at which point Earth's oceans would be vaporized by runaway greenhouse effect — long before the risk of getting swallowed by the red giant."

The planetary system provides one example of a planet that did survive, though it is far outside the habitable zone of the dim white dwarf and unlikely to harbor life. It may have had habitable conditions at some point, when its host was still a sun-like star.

"Whether life can survive on Earth through that (red giant) period is unknown. But certainly the most important thing is that Earth isn't swallowed by the sun when it becomes a red giant," said Jessica Lu, associate professor and chair of astronomy at UC Berkeley. "This system that Keming's found is an example of a planet — probably an Earth-like planet originally on a similar orbit to Earth — that survived its host star's red giant phase."

News and Noteworthy

Dr. Gibor Basri received the **2024 Arthur B.C. Walker II Award** for outstanding achievement in astronomy and education by an African American scientist.



The Arthur B.C. Walker II Award honors an African American scientist whose research has substantially contributed to astronomy or related fields and who has demonstrated a strong commitment to promoting diversity and inclusion in STEM. The 2024 recipient of the Arthur B.C. Walker II Award is Dr. Gibor Basri, Professor Emeritus of Astronomy and former Vice Chancellor for Equity and Inclusion at the University of California, Berkeley, for his contributions to our understanding of the nature and origins of low-mass stars and substellar objects, as well as his lifelong commitment to promoting diversity in astronomy.

Berkeley Astronomy alumnus **Keivan G. Stassun,** A.B. '94 Astronomy, was awarded the **2024 MacArthur "genius" fellowship**. Stassun was recognized by the MacArthur Foundation for his efforts to expand opportunities in science, technology, engineering, and mathematics (STEM) education and careers for underrepresented populations.

"Even as efforts toward diversity and inclusion in higher education are being questioned, progress in science and technology continues to depend crucially on the engagement of human talent and creativity in all of its manifestations, as it always has," said Stassun. "It is imperative for progress in science and engineering that we more fully tap into the human diversity of mind, which means also learning how to more fully include neurodiversity in scientific discovery."

Stassun credits his science education at UC Berkeley as foundational for his career. "Astronomy faculty members, including David Cudaback and Carl Heiles, were central to creating a learning environment that encouraged creativity and helped form my identity as a scientist. Professor Gibor Basri took me under his wing as a research mentee and opened doors for me into graduate school and into the world of diversity and inclusion efforts," said Stassun.

Sanjana Curtis received **the Eric and Wendy Schmidt Award for Excellence in Science Communication**. Dr. Curtis is an NSF Astronomy and Astrophysics Postdoctoral Fellow at UC Berkeley. Her research focuses on some of the most extreme phenomena in the universe, such as the explosive deaths of stars and the mergers of neutron stars and black holes. Many of the elements that make up our bodies and our world were forged in these cosmic cataclysms, and Sanjana is working to uncover their origin stories. She loves sharing these stories, as well as her passion for research and discovery, through her writing, TikTok videos, and public lectures. She firmly believes that science is for everyone.

Berkeley Astronomy alumna **Linda Strubbe, Ph.D.**, Astrophysics, 2011, was awarded the **2024 ODE Education Prize by the IAU**, along with Bonaventure Okere, for their leadership in creating high-quality educational experiences in astronomy for African university students. Bonaventure Okere led the founding of the Pan-African School for Emerging Astronomers (PASEA) at the IAU XXVIII General Assembly in Beijing to improve STEM education in Nigeria and across Africa. Linda Strubbe has been central to creating high-quality educational experiences in PASEA through her design, leadership, and teaching. Her work draws on a strong evidence base across the educational curriculum, from professional development for PASEA instructors to the evaluation of student learning. A survey of PASEA alumni indicates that almost all student participants now teach or work in STEM, and 88% reported that PASEA was very influential in their career choice. PASEA has now trained some 300 students across 18 African countries, with the sixth school being held in Tunisia this year. The impact of Linda Strubbe's and Bonaventure Okere's initiative, leadership, and excellence in implementing PASEA is already enormous and will continue to grow in the future.

Message from the Chair

Jessica Lu, Department Chair

As we come to the close of another year, the UC Berkeley Astronomy Department continues to thrive. We are excited to introduce NASA's newest approved medium-class observatory: the Ultraviolet Explorer (UVEX), with scientific leadership by Professors Dan Weisz and Raffaella Margutti, in close collaboration with the Space Sciences Laboratory and Caltech. UVEX will survey the entire sky at ultraviolet wavelengths, studying galaxies with the lowest mass and metal content, and hunting for rare explosions when black holes and neutron stars are formed or merge. We are also introducing a new time-domain astronomy center, led by Prof. Raffaella Margutti, to our strong lineup of interdisciplinary centers, including the Theoretical Astrophysics Center, the Center for Integrative Planetary Science, and the Radio Astronomy Lab. Our undergraduate major continues to grow, and UC Berkeley Astronomy now graduates the second-highest number of undergraduate astronomy majors in the country — 60 graduated this past year! We are also welcoming a new senior faculty member, Prof. Dan Stark, who studies the most distant galaxies from the earliest era of our Universe. Prof. Stark will join our department in January.

It is my pleasure to work with over 100 graduate students, postdoctoral scholars, researchers, and faculty who help keep our department vibrant, welcoming, and intellectually stimulating. They continue to discover amazing new things about our Universe, successfully compete for observing time on the largest ground and space telescopes, and receive accolades and awards for their research, education, and communication efforts. They are at the forefront of the big data and AI revolutions in scientific research and play critical roles in many of the new facilities that will be built in the coming years. I am excited to see what they will accomplish next year!

Undergraduate Spotlights:

COOPER JACOBUS

Graduating Senior, Spring 2025

My work is about simulating the history of our cosmos to learn about the physics that shaped it. I develop new tools using supercomputers to explore the rich diversity and complexity of our universe and answer questions that are intractable using traditional pencil-and-paper theory. While the questions I am trying to answer are about physics and cosmology, the problems I am working to solve are actually about algorithms and reducing computational complexity. I have invented a new method for simulating the growth of structure in the cosmos that has allowed us to probe the history of the cosmos at scales 1000 times larger than ever before and which will help us understand the physics that shaped our early universe.

During my time at Berkeley, I have discovered an enormous passion for teaching Astronomy and have served for 3 years as a UGSI for our introductory class, Astro C10. I see myself now as a storyteller as much as a scientist, and I draw immense satisfaction from sharing the story of our cosmos with others. Teaching allows me to get back in touch with the version of myself that is still a curious little kid and reminds me to wrestle with the big mysteries about the nature of everything–the questions that just bubble out of my students but which I often lose sight of in my daily work.

I hope to continue teaching and one day teach astronomy at the highest level and to as large an audience as I can find. For me, that means pursuing a PhD next year. My ultimate goal is to one day earn a professorship at a university where I would have the resources to explore the questions that interest me and the opportunity to share them with others.

Advice for future Astrophysics majors?

Spend as much of your time as possible doing what makes you happy. What is actually most important is taking the time to discover what makes you happy, that's what you should pursue once you graduate. And it's ok if you don't know what that is yet! That's what college is for. Remember that everyone has a different path and has different goals, so there is no use in comparing yourself to anyone except your former self.

ELMA CHUANG

Graduating Senior, Spring 2025

I conduct research in Prof. Alex Filippenko's research group where I do optical band observations on the Nickel Telescope at Lick Observatory. We mostly observe supernovae, but I have also used the Nickel to observe other transients such as the gamma ray burst, GRB230818A, which I observed last year with my friend and labmate, Neil Pichay. I also search for supernovae candidates in the Zwicky Transient Facility database. Outside of the astronomy department, I have been working on a project in the Nuclear Engineering Department, in Prof. Guanyu Su's lab, for the past 2 years. I build fiber optic temperature sensors for high temperature use, in support of ongoing development of molten salt nuclear reactors. One of the most appealing aspects of studying astronomy is that the skills you learn can take you far from astronomy, but they often do seem to somehow make it back full circle.

The most rewarding experience I've had in the astronomy department has been working as a UGSI for AstroC10. Most of my students are freshmen and I find it really fascinating to watch people navigate a formative and dynamic period of their lives. It's also rewarding to have been able to develop a rapport with many of my students.

I have plans on pursuing a PhD in nuclear engineering, or some other subset of applied physics, someday. But I'd like to take a few years after graduation to continue working at the FAA as a radar technician. And then far in the future, I'd like to be an astronaut, which would generally also require some sort of military aviation experience. I enjoy working on things that are directly applicable to the real world, and helpful to people. I also like working with my hands. Sometimes it's easy to feel that astronomy is abstracted from daily life, but there are so many avenues to pursue astronomy-adjacent things if you seek them out.

Advice for future Astrophysics majors?

Never be afraid to ask for things. Learn your strengths and weaknesses; tap into what you're good at and what you like doing. Like what you're doing. Work hard and be useful, helpful, kind, enthusiastic, and earnest. Recognize that no task is below you, and that you can learn something from any experience. Don't ever let someone tell you what you can and can't do.

DEX BHADRA

Graduating Senior, Spring 2025

I work with the Moving Universe Lab at Berkeley (MULab) on studying the orbital motion of binaries in microlensing events. Microlensing is almost like a cosmic "funhouse mirror" effect, where light from a distant source becomes brighter as it passes behind a gravitational lens. Several microlensing events are predicted to be binary, and at long-duration binary microlensing events, the orbital motion and dynamics of the involved binary system become extremely important. I make changes to a microlensing software called the Bayesian Analysis of Gravitational Lensing Events (BAGLE) by accounting for the orbital motion of binaries. Doing so helps us study astrometric (position-based) and photometric (light-based) microlensing signals more efficiently. Eventually, these new models will be added to BAGLE's open-source code and used to fit prospective black hole candidates.

Being a student mentor for the Physics and Astronomy Division of the Undergraduate Lab at Berkeley (ULAB) has been my most rewarding experience as an undergrad. I had minimal research experience coming into Berkeley and ULAB helped me gain confidence as a researcher. It helped me develop the necessary habits instrumental in professional research and played a massive role in helping me find research with MULab. As a mentor with ULAB, my focus has been to create a safe space for my mentees and develop a community of curious astrophysicists. After graduation I plan to go to graduate school. I love anything with the words "stellar" and "binaries" in it. My dream is to build a professional career around studying binary systems, and going to graduate school is the next logical step.

Advice for future Astrophysics majors?

I would remind future astrophysics majors that they totally deserve to be here! Whether via clubs like UAS and ULAB, going to the Astro colloquia/TAC/CIPS seminars, or even simply hanging out in the KAIT lounge, I strongly advise every future (and current) astrophysics major to put themselves out there. I know how uncomfortable it can be to put yourself out there, but seeking discomfort and challenging yourself is the ultimate mind-bogglingly gratifying Berkeley experience!

New Multi-RAPTOR Research Center at Berkeley Astronomy

Interview with Raffaella Margutti by Natalie LeBaron and Eli Wiston

What excites you the most about multimessenger transient astronomy?

The possibility to perceive our Universe in a completely different way, and the possibility to combine the information carried by this new messenger with what we already know. In Astrophysics, leaps in our understanding have historically resulted by new ways we could explore the Cosmos (e.g., new types of photons that we learned to "see", like X-rays; improved sensitivity in a given waveband as it is happening now with JWST; particles...). Multi-messenger transient Astrophysics is no exception to this rule. We are very fortunate to be living through a memorable time in the human exploration of the Universe.

You and Ryan Chornock currently lead the TREX research group and are now starting the Multi-RAPTOR center. Where did the dinosaur inspiration come from?

Probably an obsession more than an inspiration! Specifically for Multi-RAPTOR: the m-raptor (or micro-raptor), is a four-winged dinosaur, similarly, there are four messengers of information from our Universe that we know of: light, neutrinos, cosmic-rays (i.e. particles) and gravitational waves. The idea is to be able to "fly on the wings of multi-messenger information" as a way to build a complete picture of the universe. Just like flying on an airplane allows us to have a much better view of the land below us, as opposed to when we walk on the ground. Ironically, it seems that the m-raptor could not fly!

What recent scientific discovery has excited you the most?

I love this question. As my students know, I was asked this very same question during a job interview (it was my first interview for a faculty job). To which I enthusiastically answered: the discovery of feathers on dinosaurs (including T-Rex). I did not get the job.

Within Astrophysics, I would definitely say that the detection of gravitational-waves in 2015 is among the most ground-breaking discoveries that happened during my career. Among discoveries to which I have personally participated in, I would definitely rank first the discovery of light from the gravitational-wave event GW170817, the first and only merger of neutron stars detected with both gravitational waves and photons to date. This event effectively opened this new multi-messenger era.

What is your vision/goal for the center?

I would like the center to have a research and an educational mission. On the "research side" the center will act as a "magnet" to foster interactions among the many faculty at Berkeley (and their groups) that work in fields related to multi-messenger explorations of our Universe, including astronomers, physicists and data scientists (on the observational, theoretical and instrumentation aspects). Interactions will lead to ideas, and ideas to discoveries that would not have been possible otherwise. On the "educational side", the ambition of the center is to play a major role in training the next generation of truly multi-messenger scientists.

TRansient EXtragalactic team (TREX) at UCB, lead by Prof. Margutti and Chornock, from top left: Neil Pichay, Itai Sfaradi, Erica Hammerstein, Ryan Chornock, William Wu, Daniel Brethauer; middle row from left: Nayana A.J., Natalie LeBaron; bottom row from left: Sunny Guo, Raffaella Margutti, Naomi Hahn, Eli Wiston, Rafee Samreuang

How can people interested in multi messenger transients get involved with the center?

There will be several ways as the center will hopefully grow. Here are some examples: We will start by having a weekly meeting series with talks and organized discussions where everybody is welcome to attend and contribute. In addition, there will be research opportunities for undergraduate students and there will be a postdoctoral fellowship associated with the center. We are at the very beginning of the life of this center, so a lot is "TBD", which also means that it is a great time to share your thoughts and vision, get involved, and jump on the wings of the Multi-RAPTOR.

The UC Berkeley center for Multi-messenger Research on Astrophysical Transients and OutReach (Multi-RAPTOR) Multi-RAPTOR faculty affiliates carry out cutting-edge research in a wide area of multi-messenger astrophysics including observations across the electromagnetic spectrum (Raffaella Margutti, Multi-RAPTOR director; Ryan Chornock, Alex Filippenko), AI, machine learning and big-data analysis (Josh Bloom), theory of multi-messenger phenomena (Wenbin Lu, Dan Kasen, Liang Dai), and electromagnetic (Jessica Lu) and gravitational wave instrumentation (Victoria Xu).

WELCOME TO OUR NEWEST GROUP OF GRADUATE STUDENTS!

Hao-Tse (Howard) Huang
(Physics, Chinese University of Hong Kong)

In my undergraduate I explored the various aspects of astronomy, including the accretion outbursts in the protoplanetary disk, the molecular gas observation in the high-redshift massive galaxies, and the tidal disruption event rate modeling. Having spent most of my life in Taiwan and studied in Hong Kong for the past few years, I am excited to start my new astronomy research and life chapter at Berkeley. Currently, I am working with Prof. Wenbin Lu on theoretical modelings of the binary system evolution at the galactic center. Outside of astronomy, I enjoy badminton, hiking, and traveling!

(Peter) Xiangyuan Ma
(Mathematics, University of Toronto)

At UofT Peter explored various applications of machine learning (ML) to (astro)physical problems. Previously he worked on implementing neural networks on FPGAs for the Large Hadron Collider at CERN, to implementing deep learning based feedback controls to enhance gravitational wave detection at LIGO, to deploying real-time machine learning algorithms to detect Fast Radio Bursts at the ATA + CHIME as well as using graph neural networks to uncover dark matter substructure in the Milky Way. He now continues his interests in ML for astrophysics Prof. Josh Bloom.

Kecheng (Stephon) Qian
(Astrophysics and Math, Cornell University)

I have worked on a range of problems in theoretical astrophysics related to planetary dynamics, compact objects, and stellar evolution. I am currently working with Prof. Eugene Chiang on planet formation.

Research Fellows and Postdocs

Dr. Mohammad Farhat is a Miller postdoctoral fellow, who just joined the departments of Astronomy and Earth & Planetary Science at UC Berkeley, after completing his PhD in 2023 at the Observatory of Paris. He has a broad interest in astrophysical and geophysical dynamics, ranging from the Earth-Moon system to extrasolar planets and disks. Specifically, his research involves the architecture of the Kuiper belt and extrasolar debris disks, the orbital and rotational evolution of planetary systems, planetary tidal theory, and fluid dynamics in planetary interiors, oceans, and atmospheres. Mohammad's current work combines state-of-the-art geophysical modeling with planetary orbital dynamics, aiming at addressing some long-standing questions in planetary formation and evolution theory. In parallel, he explores the intricate interplay between the Earth's rotational and geodynamical evolution, and how both shaped our climatic history over geological timescale, ultimately allowing for the emergence of complex forms of life.

Dr. Erica Hammerstein is a postdoctoral scholar working in the TRex group. She received her PhD in Astronomy from the University of Maryland, College Park in April 2024, working on optical and ultraviolet observations of tidal disruption events (TDEs) and their host galaxies. She received her BS in Astronomy from the University of Michigan, Ann Arbor. Broadly interested in time-domain and survey science, she is continuing her work as part of the Zwicky Transient Facility (ZTF) TDE working group, where she helps discover new TDEs for further follow-up and characterization. Through this work she explores supermassive black hole (SMBH) accretion and jet formation, galaxy evolution, and the connection that SMBHs have with their host galaxies.

Dr. Bahram Khalichi is a postdoctoral associate at the Radio Astronomy Lab in the Astronomy Department. Before joining UC Berkeley in August 2024, he conducted postdoctoral research at the Courant Institute of Mathematical Sciences at New York University and Bilkent University's Nanotechnology Research Center. He obtained his Ph.D. in Electrical and Electronics Engineering from Bilkent University, Turkey, in 2020. He was the recipient of the 2018 IEEE AP-S Doctoral Research Award and the 2022 IEEE Turkey Section Best Ph.D. Thesis Award. He was also honored with the 'Seal of Excellence' for the MSCA-Postdoctoral Fellowship in 2022 from the European Commission. His expertise spans Applied and Computational Electromagnetics, Optics, Nanophotonics, and Magnetohydrodynamics. At UC Berkeley, he has focused on the design of wideband antennas for 21 cm cosmology. His work aims to assist in characterizing the redshifted 21 cm hydrogen signal from the Cosmic Dawn and the Epoch of Reionization, as well as exploring innovative electromagnetic systems and devices.

Itai Sfaradi is a postdoctoral scholar who joined UC Berkeley in September 2024. His research is focused on the study of high-energy astrophysical transients such as supernovae and tidal disruption events. In particular, he uses radio observations to study the energy of these events, the density profile of their environments, and the evolution and structure of their fastest moving outflows at different time scales. He is currently studying supernovae that exhibit excess radio emission years, and tens of years, after their stellar explosion.

UPGRADES TO LEUSCHNER OBSERVATORY– OUR STUDENT TELESCOPE

By Dirk Wright

The UC Berkeley Astronomy Department has relied on the 30-inch telescope at Leuschner Observatory for both training and groundbreaking research over that past 55 years. Now, thanks to the UC Discovery Initiative, this historic instrument is receiving a modern makeover!

Three years ago, we embarked on an upgrade project to enhance the observatory's precision, reliability, and capabilities. Key goals included tightening the telescope's pointing and tracking accuracy to match its resolving power, eliminating outdated hardware that posed maintenance headaches, and reducing the risk of system failures that could shut down observation sessions. Plus, we've integrated new, advanced tools like plate solvers, higher-order pointing models, and autofocus to streamline observing.

Under the meticulous planning of former department engineer Frank Latora, we selected the Sidereal Technology FORCE-1 pointing controller for this upgrade. The observatory's motors, encoders, limit switches, and other components were rewired over the following year. The control upgrade was partially deployed for Astro 120 students in fall 2023, offering them an exciting preview of the new system's capabilities. This summer, we completed the final integration, bringing dome control, movable mirrors, and the secondary mirror focuser under a unified system. Now fully operational, our current undergraduates have already used the enhanced setup to observe planetary transits this fall under the guidance of Alan Chew and Professor Jessica Lu.

Looking ahead, we've completed essential painting and roof repairs to the observatory building, and are now focused on refurbishing the telescope dome, tuning the SFSU Echelle spectrograph, and planning for an upgraded primary science camera. Future goals include cleaning (and possibly re-coating) the primary mirror and developing an off-axis optical feedback guiding system to boost precision. However, new funding sources will be crucial to bring these enhancements fully to life.

The Astron 120 Advanced Optical Lab class took a field trip out to Leuschner Observatory on October 9th, 2024. Known as the department's student observatory, Leuschner is located 12 miles east of the Berkeley campus. The 30-inch reflector telescope provides undergraduate Astrophysics students with hands-on experience on a research-grade professional telescope as part of their training to become future researchers. During this field trip, the students were given an opportunity to tour the telescope dome then observe the operation of the telescope's drive system.

2024 Commencement

The Department of Astronomy Spring 2024 Commencement honored the class of 2024 to celebrate their accomplishments.

DEGREES CONFERRED 2024:

45 Astrophysics BAs
4 Astrophysics MAs
9 Astrophysics PhDs

PRIZES & AWARDS:

Department Citation
Joshua Bromley (Undergraduate) (Astronomy & Physics)

Dorothea Klumpke Roberts Prize
Connor Jennings (Undergraduate) (Astronomy & Physics)
Rav Kaur (Undergraduate) (Astronomy & Music)

Mary Elizabeth Uhl Prize
Andrea Antoni (Astronomy)
Chris Moeckel (EPS)

Daniel Edward Wark Award
Charlie Tolley (Undergraduate) (Astronomy)
Sophie Willis (Undergraduate) (Astronomy)

Robert J. Trumpler Award
Chris Moeckel
Kishore Patra

Outstanding Graduate Student Instructor Awards
Daniel Brethauer (Astronomy)
Eli Wiston (Astronomy)
Cooper Jacobus (Undergraduate) (Astronomy)

The Department of Astronomy Commencement 2025 will be held on Monday, May 19th at the Hertz Hall from 9am to 12pm

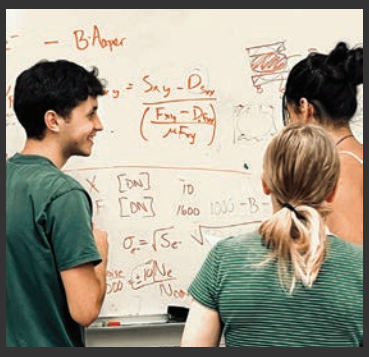









UNIVERSITY OF CALIFORNIA, BERKELEY
DEPARTMENT OF ASTRONOMY
501 CAMPBELL HALL #3411
BERKELEY, CA 94720-3411



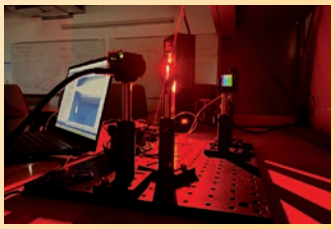
UC Berkeley Department of Astronomy

Join us in making an impact!

Many employers will match your gifts to UC Berkeley. To discuss matching or other opportunities to support Astronomy at Berkeley, contact Ryan Guasco, Associate Development Director (rguasco@berkeley.edu, or via phone at 510-599-8698).

Supporting Astronomy

Berkeley Astronomy, home to world-renowned scientists and researchers, is universally regarded as one of the top astronomy departments in the world. Our award-winning faculty and outstanding students are engaged in some of the most fascinating research today, from studying the relationship between planets and moons in our solar system, to discovering new planets, galaxies, and black holes, to creating a road map for exploring the structure of the Universe. We invite you, our philanthropic partners, to explore the ways you can have a meaningful impact on our mission of excellence through high-quality instruction, cutting-edge experimentation, and bringing undergraduate and graduate students along in research endeavors, by supporting any of the following funds:



The Friends of Astronomy Fund directly supports all facets of the department's operations from research to instruction, recruitment of top faculty and staff, to the day-to-day technology and supply needs in the classrooms and teaching labs.

The Graduate Student Support Fund in Astronomy assists efforts to cover the necessary resources for graduate students. One of the top priorities for the Astronomy Department, and the Division of Mathematical and Physical Sciences, is advancing our recruitment efforts to attract the best and most promising graduate students. Help us strengthen the critical financial support that enables young scientists to select Berkeley for their studies.

The Student Observatory Fund assists with the maintenance of the latest instrumentation and teaching observatories managed by the Astronomy Department. The fund also provides support for the department's upper-division undergraduate laboratory course, the capstone experience for all astronomy majors.

Newsletter Credits: Jessica Lu, Natalie LeBaron, Maria Kies, Bradley Perl, Yasasha Ridel, Aileen Serrano, Eli Wiston, Dirk Wright

Design: Lisa Krieshok

GO BEARS!

Thank you for your supporting the future of Berkeley Astronomy!