

UCLA EPSS

EARTH, PLANETARY & SPACE SCIENCES

2023 NEWSLETTER

CONTENTS

IN THIS ISSUE:

EYU 2022	2
Faculty Award Features	3
A Day at the Museum	5
Are We Alone in the Universe?	6
Growing My Own Roots	7
Introducing the World of Geoscience	8
In Memoriam	9
Did You Say Marsquakes?	12
EPS SCI 133: A Voyage Into Deep Time	13
Celebration of Prof. Russell's 80th	15
Explore Space with Eyes and Ears	16
Solar Wednesdays	17
EPSS Welcomes Charles Drew	18
Commencement and Student Awards	19
Department Farewells and Hellos	22
Donor Recognition and Endowments	25

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EPS SCI 133 Grand Canyon Field Stop
Photo Credit: Nika Eskandari

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Plasma Ball at EYU 2022
Photo Credit: Nika Eskandari

Greetings from the Chair

CAROLINA LITHGOW-BERTELLONI

We hope you enjoy reading this annual newsletter for the Department of Earth, Planetary, and Space Sciences. In this issue we highlight the 2022-2023 academic year, my first as chair.

Last year as I said hello to our wider EPSS family, I mentioned starting my tenure as chair with trepidation. Indeed, it has been an eventful and somewhat turbulent first year. We have had significant staff turnover and we say arrivederci (not goodbye, but till we see you again) to long serving and valued staff and distinguished faculty and researchers. You will see several pieces throughout the newsletter honoring our departing EPSS citizens and describing our farewell events.

Given recent departures, it was important to succeed in attracting new faculty as well as weather staff changes to maintain our research, educational and outreach missions. Since the beginning of 2022, we have successfully hired several rising stars, two of whom have already joined us. You can read about them on page 24. We have also been able to shore up our financial office to assist our indefatigable fund managers and will soon announce two new crucial staff hires.

In keeping with the goals of maintaining our long-term strengths and forging new connections with the wider community, you will find another theme running through the newsletter highlighting and celebrating our outreach efforts, from the first in-person EYU since the pandemic (p. 2), hosting the Saturday Science Academy of Charles Drew University, the only HBCU in California (p. 18), to the SETI Citizen Science platform launch (p. 6). Our students continue to be central to departmental life and you will find their reflections and efforts in this newsletter (p. 5 A Day in the Museum, p. 7 Growing My Own Roots, p. 17 Solar Wednesdays). We also celebrated the restart of our Distinguished Alumni Lecture series and welcomed Hilary Petrizzo (p. 8), who gave a fantastic lecture inspiring our students (<https://youtu.be/ATCdbvUelMU>). We continue to be leaders in many areas from Geology to Planetary Science. Distinguished Professor An Yin was awarded the 2022 Penrose Medal of the Geological Society of America (p. 4) and you will read Prof Beghein's piece on marsquakes (p. 12). For more information on departmental news, cutting-edge research, and events, please visit epss.ucla.edu/news/.

We welcome visits and news from our friends and alumni (write us at alumninews@epss.ucla.edu), and hope to be able to invite you to on-campus events again this coming academic year. If you are so inclined and are able, please do consider contributing a gift to make our goals possible.

Wishing you all the very best,

In Proof: Professor An Yin

It is with a heavy heart that we announce the sudden passing of our colleague Distinguished Professor An Yin on July 12th this year. This newsletter for the academic year July 1st 2022- June 30th 2023 was in proof when the devastating news reached us. Following his motto of "just do it," we decided to publish what we had. You will find an obituary by Distinguished Professor Mark Harrison on our webpage at epss.ucla.edu, along with links to a beautiful memorial website (anyinmemorial.com) by Professors Lingseng Meng and Peng Ni. We will honor Professor Yin's scientific legacy with a memorial event at UCLA's Faculty Center, and we have also established a fund in his memory to support both graduate student scholarships and our field mission, both near and dear to his heart. Links to all the above can be found using the QR code on the right.



SEE WAYS TO HONOR AN'S MEMORY & ADVENTURES HERE

EYU 2022's Triumphant In-Person Return

NIKA ESKANDARI

On November 6th, 2022, science enthusiasts of all ages converged in UCLA's Court of Sciences for Exploring Your Universe (EYU), the largest annual science fair in all of LA county.

"We... hosted booths from a greater diversity of science subjects than ever before."

Held in person for the first time in two years, the event's heavily anticipated return to campus – along with EPSS' contributions – marked the "most successful EYU to date," according to EYU 2022 President and EPSS graduate student Abijah Simon.

Drawing a record-breaking 13,000 visitors, EYU 2022's uptick in attendance was also accompanied by an increase in accessibility and scientific topics covered. "We provided free buses for 150 Title 1 middle-school students to our event," Simon stated, "and hosted booths from a greater diversity of science subjects than ever before, including more engineering and environmental/sustainability booths and other STEM fields."

Bolstering this newly-expanded diversity in scientific subject matter were the EPSS department's wide array of geology, planetary science, and NASA satellite mission booths, many of which were crowd favorites.

The EPSS Family Mentorship Program (EFMP) booth, "Stratigraphy in a Jar," taught the basics of the formation and ordering of strata, or rock layers, using colored sand in a jar. The SpinLab booths' various water-based experiments explained concepts ranging from atmospheric flow to solar convection, all by utilizing rotating water tanks, food coloring, and occasionally, LEGOs and ice. UCLA's first student-built satellite mission, ELFIN, joined forces with the space weather and plasma science booths to create a room with fascinating demonstrations: plasma globes, Tesla coils, magnetic models of space weather phenomena, and the full-scale ELFIN satellite model on display. Other EPSS booth subjects included earthquakes, meteorites, southern Californian rocks, oceanic studies, water erosion, planetary missions, and more.

With something for everyone, enthusiasm ran high for attendees and booth leaders alike, rendering the afternoon of hands-on scientific exploration and joy a smashing success!

EYU will return this fall, continuing its tradition of providing accessible science education to the greater LA area: for more information on joining the fun, follow EYU on Instagram and the web. We look forward to seeing you at EYU 2023 on Sunday, November 5th!

INSTAGRAM: @exploringyouruniverse
WEB: exploringyouruniverse.ucla.edu

Children and parents pour layers of colored sand into a jar to learn about stratigraphy.



Top: Children reach out to touch SpinLab's "Great Red Spotalator" demonstration, which recreates Jupiter's atmospheric vortices (like the Great Red Spot) using rotating fluids and food coloring.

Bottom: EPSS graduate student Cameron Brown guides EYU attendees through an interactive experiment that models factors responsible for causing landslides.

Back Cover: A child learns about space weather phenomena through a plasma ball.

| Photo Credits: Nika Eskandari

Faculty Award Features

CONGRATULATIONS ON YOUR ACHIEVEMENTS!

MACKENZIE DAY

2022 AGU Ronald Greeley Early Career Award in Planetary Sciences



MACKENZIE DAY IS A leader at interpreting modern and ancient planetary surface systems affected by windblown sediment. Her scientific advances are built on a deep understanding of aeolian processes that is creatively applied to estimate environmental properties encoded in landforms and sedimentary deposits.

Mackenzie's careful work has demonstrated that the structure of simple dune fields and their constituent dunes are truly reflections of their formative wind regimes and sediment supplies. This has provided foundational support for Earth analogue studies and confirmed that surface conditions on planetary bodies can be accurately estimated using appropriate morphodynamic frameworks. Mackenzie's expertise in modern aeolian systems has also benefited mission operations, including how different types of windblown deposits affect rover trafficability and identification of sites of active bedrock erosion that likely make optimal sampling locations for ancient Martian biosignatures.

In addition, Mackenzie has made significant contributions to our understanding of the early Martian environment via innovative stratigraphic analyses, helping define ancient wind fields and more. Working across scales, Mackenzie has contributed to a better definition of subthreshold grain saltation at particle dimensions, and a better definition of erosive, rim-generated vortices at the crater scale. Sediment transported by these vortices is commonly worked into dunes that interact with each other as they migrate and grow. Mackenzie has made fundamental contributions to understanding these dune interactions, as well as the sedimentary structures they generate.

Following Ronald Greeley's legacy, Mackenzie's considerable scientific contributions are matched by her professional services that include the training and mentoring of junior planetary scientists. Mackenzie Day has earned the Ronald Greeley Early Career Award for "innovative application of theory, field and remotely sensed data to the erosion and deposition of planetary landforms by windblown sediment."

— DAVID MOHRIG, UNIVERSITY OF TEXAS AT AUSTIN, adapted from AGU Citation

KEVIN MCKEEGAN

2022 Leonard Medal of the Meteoritical Society



DISTINGUISHED PROFESSOR KEVIN MCKEEGAN was awarded the Leonard Medal of the Meteoritical Society in a ceremony at Glasgow, Scotland, in August 2022. The Medal, the Society's highest and oldest award, is given to individuals who have made outstanding original contributions to the science of meteoritics or closely allied fields. It is named for Frederick C. Leonard who was a founder and the first president of the Society and, coincidentally, the first professor of UCLA's Astronomy Department. McKeegan was recognized for his work on "the microanalysis of isotopes including the discovery of deuterium enrichments in interplanetary dust particles (IDPs), oxygen isotopes in the sources of Ca-, Al-rich inclusions (CAIs), discovery of extinct beryllium-10 in CAIs implying particle irradiation in the Solar System, the oxygen isotope composition of the first CAI fragment from Comet Wild 2, and the measurement of the oxygen isotope composition of the Sun from the NASA Genesis Mission obtained by developing the new MegaSIMS instrument." The citation was given by Marc Chaussidon, Director of the Institut de Physique du Globe de Paris.

SEULGI MOON

2022 AGU Luna B. Leopold Early Career Award from & Robert Sharp Lecture



IT IS MY GREAT pleasure to introduce Prof. Seulgi Moon as the recipient of the 2022 Luna B. Leopold Early Career Award. In her short career, Prof. Moon has already made several seminal contributions to the current understanding of landscape evolution and surface processes on Earth and other solar system bodies. These contributions reflect her innovative integration of fundamental physics and chemistry, numerical modeling, and state-of-the-art laboratory techniques.

First, she has elucidated local, regional, and global budgets of silica weathering. Second, she assessed the interactive and coupled effects of tectonics, climate, topography, and

lithology on fluvial and glacial erosion and transport in active orogenic systems. Third, she quantified the impact of topography-induced stresses on physical weathering processes. The latter research subject is specifically relevant regarding current efforts to determine the nature and evolution of the critical zone that supports surface and near-surface biological activity on our planet. In addition to her work on the Earth, Prof. Moon has also made significant contributions to planetary studies including the formation of cold traps on (her namesake body) the Moon and fluvial fans on the Saturnian icy-satellite Titan. Her research also provides, for the first time, a quantitative linkage between engineering-based site parameters and attributes of morphological features. Finally, Prof. Moon and her colleagues developed a new Quaternary dating method using optically stimulated luminescence (OSL) methods.

Her exceptional mentoring record and her contribution to broadening the participation of students from underrepresented social groups illustrate her full dimension as a leader in the Earth and planetary science community. It is with all of the above achievements that I present to you this year's recipient of the AGU Luna B. Leopold Early Career Award.

— AN YIN, UNIVERSITY OF CALIFORNIA, LOS ANGELES, AGU Citation

AN YIN

2022 GSA Penrose Medal



PROFESSOR AN YIN HAS made profound contributions to understanding how planetary lithospheres form and deform by relating his tectonic and geophysical observations with rigorous mechanical models. His tectonic reconstruction of the Indo-Asian collision has been the starting point of geological research there for over 25 years and the vast range of studies he conducted there establish him as arguably the greatest authority on this key region. He used diffusion-induced pressure-wave theory to relate for the first-time slow earthquakes to tectonic tremor propagation and, over the past decade, investigated extra-terrestrial tectonic processes leading to provocative proposals that Mars experienced localized plate tectonics and a new kinematic model for the formation of tiger-stripe fractures on Saturn's moon Enceladus. I am honored to introduce Professor An Yin as the 2022 recipient of the Penrose Medal for his outstanding original scientific contributions which collectively represent a major advance in the science of geology.

— MARK HARRISON, UNIVERSITY OF CALIFORNIA, LOS ANGELES, GSA Citation

2022-23 AWARDS

FACULTY | RESEARCHERS | EMERITI

FRAZ BASHIR - Researcher
2022 AGU Space Physics and Aeronomy's Basu Innovation Scholar Grant

PETER CHI - Researcher
Domain Faculty Lead of the 2022 Frontier Development Lab (FDL) team "Seismic Insight within Geomagnetic and Ionospheric Data" that received the FDL 2022 "Most Dramatic Pivot" Innovation Award

PAUL DAVIS - Emeritus
Co-awardee of the Newcomb Cleveland Award of the AAAS for the *Science* paper "Seismic Detection of the Martian Core"

MACKENZIE DAY - Faculty
2022 AGU Ronald Greeley Early Career Award in Planetary Sciences

KEVIN MCKEEGAN - Faculty
2022 Leonard Medal of the Meteoritical Society

SEULGI MOON - Faculty
2022 AGU Robert Sharp Lecture
2022 AGU Luna B. Leopold Early Career Award
2022 Sloan Research Fellow

MARCO VELLI - Faculty
2022 AGU Eugene Parker Lecture in Space Physics and Aeronomy

AN YIN - Faculty
2022 GSA Penrose Medal



ABOVE: PHOTO 1

A Day at the Museum: Dinos, Gems, and Rare Specimens

KYLE WEBSTER

Last Spring Quarter, the EPSS Student Organization (EPSSSO) and Family Mentorship Program (EFMP) joined together for a day trip to the Natural History Museum of Los Angeles. Our group consisted of both EPSS undergraduate and graduate students. Upon arrival at the museum on a bright and sunny Saturday, we were greeted by our two museum experts: Emily Patellos, a graduate student working in the Dino Lab, and Aaron Celestian, the curator of the mineralogy exhibit.

"Don't get that stuck, it's the rarest gemstone in the world!"

After splitting into groups, Aaron led the first group on a tour of the world-class mineral collection in the public gallery. He then took us behind the scenes to a secure vault with the rarest and most precious gems and minerals (Photo 1: PC Joseph Lewis-Merrill), where we heard some shocking stories about the specimens. In one funny moment, EPSS graduate student Ashley Schoenfeld put on a ring with an orange gemstone, and Aaron exclaimed, "Don't get that stuck, it's the rarest

gemstone in the world!" Ashley quickly took it off and snapped a picture (Photo 2: PC Ashley Schoenfeld).

"We all felt like gleeful kids when we were allowed to touch it with our hands."

During the Dino Lab tour, Emily led us around the seemingly endless displays of dinosaurs and other prehistoric life. Some of us couldn't help but get distracted during the tour and took some selfies with the whales hanging overhead (Photo 3: PC Kyle Webster). The Natural History Museum not only imports specimens and showcases them, their skilled paleontologists also conduct research on fossils found near Los Angeles and in the Western US. In a restricted top floor research area, Emily unveiled an amazing fossil - an entire Ichthyosaur (a prehistoric marine predator)! We all felt like gleeful kids when we were allowed to touch it with our hands (Photo 4: PC Ashley Schoenfeld).

After the tour, we convened in the Rose Garden for a group photo (Photo 5: PC Valeria Jaramillo) and a surprise activity - a

scavenger hunt! Teams of four students had to complete a long list of tasks in the museum. The participants only had 30 minutes, and some activities required multiple people. Some favorite activities included finding a Turquoise browed motmot in the museum's extensive bird section, and locating Augustynolophus (Auggie) Morrisi, the California state dinosaur. One of the winning teams was Team Gneiss (Photo 6: PC Team Gneiss), who recreated a Spider-Man meme in the museum rotunda, where scenes from the original Tobey Maguire *Spider-Man* movie were filmed. The other winning team was Team Easily Distracted by Rocks, who recreated a white bear standing on its hind legs (Photo 7: PC Team Easily Distracted by Rocks). Both teams must not have been distracted because they achieved almost perfect scores, gneiss job!

Overall, everyone enjoyed exploring the museum and sharing the fun experience with old and new EPSS friends. We hope to do more fun events like this in the future!

Want to Get Involved?
 INSTAGRAM: @efmp_ucla
 WEB: sites.epss.ucla.edu/efmp/



PHOTO 2



PHOTO 3



PHOTO 4



PHOTO 7



PHOTO 5



PHOTO 6



UCLA SETI science and communications team | Credit: Ben Paul and UCLA SETI

Are We Alone in the Universe?

UCLA SETI Launches Citizen Science Collaboration

JEAN-LUC MARGOT

On February 14, 2023, UCLA SETI launched a citizen science collaboration to share the excitement of the search for life in the universe with the general public. The platform is designed for ages 9-99 and is accessible at arewealone.earth. After a quick tutorial, volunteers can classify UCLA SETI data and identify interesting signals; in the process, they are helping us train artificial intelligence tools that will accelerate our search. Nearly 20,000 volunteers have joined the collaboration so far. UCLA graduate student Megan Li, who leads the data analysis, said: "Humanity's most pro-

found discovery could be a few clicks away." The citizen science collaboration is built on the Zooniverse platform with funding from The Planetary Society, the NASA Citizen Science Seed Funding Program, and a generous gift from Robert Meadow and Carrie Menkel-Meadow.

SETI researchers must frequently overcome the "giggle factor" even though the search for technosignatures - evidence of technological activity - and the search for biosignatures - evidence of biological activity - are highly complementary. Certain technosignatures, such as extraterrestrial radio

emissions concentrated in a narrow range of frequencies, are advantageous because they have no false positives and can be detected throughout the Galaxy. In contrast, biosignatures are prone to false positives and can be detected only around the Sun and nearby stars, a volume that is a million times smaller. Do you think that the first unambiguous evidence for extraterrestrial life will be biological or technological in nature?

Learn more about UCLA SETI or join our collaboration at our website!

WEB: seti.ucla.edu



Growing My Own Roots MEGAN LI

This year, as part of UCLA SETI, I helped launch a first of its kind project to search for extraterrestrial life in the galaxy. But although I'm a new PhD student in Earth, Planetary, and Space Sciences (EPSS), this is not where my UCLA story began.

In 8th grade, my parents placed an order to the BearWear catalog and bought me a Hello Kitty UCLA hoodie – one of many BearWear items in my closet at the time. It was no secret that my family wanted me to become a Bruin. After all, that was kind of a family tradition of ours.

My grandparents immigrated from Taiwan to Los Angeles in the 1960's for my grandfather to pursue a PhD in System Sciences at UCLA. While living in graduate student housing, they had my father and uncle, who would go on to become Bruins themselves. Despite being a young parent in a new country, my grandfather finished his Ph.D. In fact, his master's thesis and Ph.D. dissertation are both still available in the UCLA library just a few steps from where I now work.

So, you can only imagine my immense disappointment when I received a rejection letter from UCLA as a high school senior. In tears, I took down the Hello Kitty UCLA hoodie from my closet and handed it to my mom, telling her we should donate it to charity. She gave me a big hug and moved the hoodie back into my closet in a tucked away corner. "You never

know what will happen in the future; let's just keep it," she told me.

"Those times were hard for us because we didn't have roots. That's what makes you so lucky."

From the ages of 1 to 7, I suffered from an illness that prevented me from leaving the house or making friends. One thing I could do was read astronomy books and solve math problems with my grandfather, which I did almost every night. Looking back, I think our nights working on science problems together was a way for him to stay connected to a passion he never got to pursue.

I only heard my grandfather's stories of his struggles for the first time a few years ago. He feared his story might be lost and he shared those experiences in a large circle of our family. Then he turned to me directly and said "Those times were hard for us because we didn't have roots. That's what makes you so lucky."

After spending my undergraduate years at UC San Diego, I was finally able to realize my dream of coming to UCLA when I was accepted to a PhD program under Professor Jean-Luc Margot in the EPSS department. Professor Margot had the position of my dreams available – a PhD in the search for technosignatures by way of citizen science,

outreach, and machine learning. The stars had aligned for me to do exactly what I wanted, exactly where I wanted to do it – at the school that gave my family a home 60 years ago.

"Science is not just about numbers, it's about passion."

One of the most important lessons I've learned as an academic in STEM is that the people you choose to do science with is what matters most. For me, these were people like Professor Karin Sandstrom at UCSD, Sofia Sheikh at the Berkeley SETI Research Center, and Professor Jean-Luc Margot at UCLA. They all saw me first and foremost as a fellow scientist. It's important to spend your energy with people who see you for who you are – and who you could one day be.

I never had a perfect GPA or the fastest running code, but when I look back at my academic journey that's not what I focus on. I think about my grandparents' struggle as they moved from Taiwan to Westwood. I think about my parents falling in love in the library on top of Boelter Hall. I think about my weekends at the Rose Bowl in Bruin blue and gold, and I think about how much I love sharing SETI with everyone I know. Science is not just about numbers, it's about passion.

I was fortunate enough to grow up with a biological family who could do just that. My advice to future students is to find your family, whether given or chosen. And then grow your roots.

This story first appeared on the UCLA Division of Physical Sciences website, in both English and Mandarin.



Left: Megan Li and her family. Above: Megan as a young child with her brother and parents at a UCLA basketball game.

Alumni News Distinguished Alumni Lecture Series Restarts!

IT WAS THE EPSS department's pleasure to host the Earth, Planetary, and Space Sciences Distinguished Alumni Lecture, *Adjusting the Model: New Data Points in Subsurface Geology, Climate Science & Life*, on January 26th, 2023; thank you to all who attended! The lecture was given by EPSS Geology alumna Hilary Strong Petrizzo, class of '07, now currently the Carbon Capture & Sequestration Commercial Development Manager at SoCalGas.

We greatly appreciate your support in making the lecture a success, and look forward to seeing you at our next event! For those who were unable to attend, there is a recording available at the QR code to the right.

Photo: Speaker Hilary Petrizzo during the event's reception. | Credit: Don Liebig/ASUCLA



Introducing the World of Geoscience NSBE Outreach Event Experience CAMERON BROWN



Top: Students learn about the meteorites in the EPSS meteorite gallery. Bottom: Students test rock hardness by rubbing them on paper.

On May 25, 2023, the National Society of Black Engineers (NSBE) hosted an outreach event at UCLA, collaborating with EPSS volunteers to provide a wonderful opportunity to introduce less well-known fields of STEM to underrepresented youth in Los Angeles.

With geoscience being the theme of the outreach event, middle school students participated in engaging activities that allowed them to explore the various career fields that geoscientists specialize in. These activities included a paleontology and geology experience, where students analyzed fossils from the Jurassic period, as well as the properties of sedimentary, metamorphic, and igneous rocks.

In addition to giving students a glimpse into Earth during the Jurassic period, we also toured them through UCLA's Meteorite Gallery. Amidst these space rocks, we encour-

aged them to consider science beyond Earth, such as the formation and evolution of planets, and the existence of planets similar to Earth outside of our solar system.

Students were also trained as environmentalists, developing team-work and problem-solving skills to find solutions to current environmental issues. Through two sandbox experiments, students learned about processes responsible for creating geological structures such as mountains, volcanoes, and rivers, as well as the environmental hazards that they pose and how to apply geomorphology to mitigate these disasters.

This memorable experience broadened the students' horizons and introduced them to novel fields of science to consider as they continue their academic careers.

Cameron Brown is a UCLA EPSS graduate student, and volunteer at the NSBE event.

| Photo Credit: Nirmala Mahadevan



| Photo Courtesy of Kelly Rojas

In Memoriam: Emeritus Professor David Jackson

PAUL DAVIS, WITH CONTRIBUTIONS FROM PETER BIRD

Professor David Jackson passed away on 30 March 2023 at his home in Pacific Palisades, California. He is survived by his wife Kathy and children Kelly and Morgan. Professor Jackson was a kind man with a wonderful sense of humor, and was ever ready to lend a helping hand to some whom others might pass by.

Professor Jackson graduated in Physics at Caltech in 1965, followed by a PhD in geophysics at MIT in 1969. He was appointed Professor in Residence/Researcher at UCLA in 1969, then Assistant Professor in 1972, and he retired as a Distinguished Professor in 2011. He was Chair of the Department 2004-2008 and held a joint appointment in the Institute of the Environment and Sustainability, 2008-2011. He served as Director of the Southern California Earthquake Center, 1996-1999. His expertise was sought after by numerous government and professional bodies.

He, along with Yan Kagan, led what is re-

garded as the foremost earthquake-statistics team, guided by a principle espoused in the title of his early article 'Interpretation of Inaccurate, Insufficient, and Inconsistent Data.' His first demonstration of this philosophy was his deflation of the Palmdale bulge. In the mid-seventies repeated surveying suggested a large bulge in the ground had developed around the section of the San Andreas fault near Palmdale, California, similar to bulges that had been reported before giant Chinese earthquakes. There was considerable worry that Los Angeles was about to experience a huge earthquake. He applied his analysis to reveal that the data supporting the bulge could be explained by cumulative, hitherto-hidden, surveying errors. A controversy ensued, but the earthquake never happened, and few now think a bulge ever existed.

Professor Jackson's research then progressed to set up the formalism to put earthquake prediction into a statistical framework. Earthquake prediction has been a subject rife with anecdotal evidence, optimistic interpre-

tation, and reinterpretation of pre-earthquake events. This set the stage for the statistical likelihood testing methods that were used by Professor Jackson and continue to be used by colleagues today. He encouraged the use of the word 'forecasting' rather than 'prediction' to reflect the uncertainties involved. In many of his later papers his ideas on forecasting are central to their subject matter. In particular, his quantification of the clustering model in which a forecast is based on the proximity in space and time of recent earthquakes appears to hold more promise than the accepted paradigm in which earthquakes occur in relatively quiet 'gaps' along plate boundaries.

He issued a challenge to earthquake forecasters to make prospective rather than retrospective forecasts. Largely as a result of his input, SCEC (Southern California Earthquake Center) set up an earthquake forecasting contest called RELM (Regional Earthquake Likelihood Models) in which different ideas are translated into earthquake probability as a function of space,

magnitude, and time, against which null hypotheses can be compared in a formal manner. Different groups across the country, including Prof. Jackson's, signed up for RELM and contributed a 5-year forecast. After the 5-years had elapsed, the results were published by the National Academy of Sciences. The HJK forecast, authored by Agnes Helmstetter, Jackson and Kagan, based on his clustering model, is still (Bayona et al., 2022) regarded as one of, if not the most successful method.

Professor Jackson became an important consultant for translating current earthquake forecasting knowledge into policy documents. He served on the National Earthquake Prediction Council which wrote the blueprint for prediction-evaluation procedures. He also served on the Science Review Committee engaged in writing the report of the Working Group on California Earthquake Probabilities, a report that was used in the National Seismic Hazards Mapping Program, and in setting earthquake insurance rates in California. Without his input, earthquake insurance rates at that time would have been much higher.

As his career progressed his interests extended from earthquakes to environmental issues. Under Professor Jackson's leadership as Chair, he established an effective dialogue between the units and departments involved in Geoscience research at UCLA (Departments of Earth and Space Sciences, Atmo-

spheric and Oceanic Sciences, and the Institute of Geophysics and Planetary Physics, among others) to launch the Geosciences Initiative. He recognized the limitations of Departmental boundaries, many of which were drawn nearly a century ago. The geosciences served as an archetype example of complex system science with relevance to climate, environment, natural hazards and energy, the understanding of which requires pooling expertise across traditional boundaries. As a result of his efforts new FTE were added, and inter-departmental connections now flourish.

His teaching also reflected this widening interest, and included Environmental Geology of LA, a course he designed, as well as the graduate course on Inverse Theory, one on Earthquakes, a Fiat Lux on Oil and Water, and a new offering Environmental Science, a course for the interdepartmental major of the same name. Students described his classroom approach as supportive and were stimulated by his 'passion' for the subject. Special note was made of his environmental field trips.

He has organized special sessions at the Fall meetings of the American Geophysical Union, including one on energy resources, as the price of gas soared, and one on the Effectiveness of Natural Disaster Scenarios, furthering his understanding of the environment and its extremes.

He served on the panel that designed the interdepartmental major in Environmental

Science and was instrumental in getting that program established. It now has over 450 majors. As a result of these initiatives, he was invited to hold a joint appointment in the Institute of the Environment and Sustainability.

Professor Jackson served as Secretary of the U.S. National Committee of the International Union of Geodesy and Geophysics (IUGG), and on its Finance committee and set up a program for the IUGG General Assembly. He wrote the document used by member nations to request support from their governments. The U.S. National Committee selected him for the US representative on the Governing Bureau of IUGG.

In his 54 years since arriving at UCLA in 1969, Professor Jackson rose to a position of national and international distinction that implicitly recognized the need for his careful statistical approach in assessing the likelihood of natural hazards such as earthquakes, as well as his preeminence in this area. His nomination to leadership positions in the foremost world organization in geophysics (IUGG), his contributions to the State of California's earthquake preparedness and insurance issues, to the University in the Geosciences and Environmental Sciences initiatives, and his contributions to the morale of staff, students and faculty in the Department leave us a legacy of intellectual rigor, dedicated energy, and human warmth which will be a model for the next generation.

Dave's EPSS Memorial KATHY JACKSON

On May 4 and again on June 28 UCLA honored one of our long-time members by lowering to half-mast the university flag by Pauley. Emeritus Professor David D. Jackson died on 3/30/23 after long and devoted service to the department since arriving as Dr. Knopoff's protégé in 1969.

His joy in teaching, curious and exuberant spirit, and community service as vice chair and chair and frequent committee participant for the department and university were

commemorated by Professors. Paul Davis and Peter Bird and others like Dr. Sean Solomon from Dave's Caltech undergrad and MIT grad school days. Some of his Ph.D students spoke as well as members from other departments he affected, including the Institute of the Environment, for which he was a founding member. His active participation in AGU and international science organizations was briefly noted.

Right: Dave Jackson's colleagues, friends, and family gather to celebrate his life at the EPSS memorial service. | Credit: Emil Chang



Elders of the community like Dr. Margaret Kivelson and Joanne Knopoff lent the air of continuity as did several emeriti professors with whom Dave had worked. The celebration with video, photos and slides was often funny and always moving. Many were surprised by Dave's quiet and sustained productivity. The department generously hosted a prior reception and videoed the event for the absent. Many of Dave's close friends were able to come: Drs. Ritusko and Mitsuhiro Matsu'ura from Japan, and others from Northern California and the East Coast.

His wife Kathy and son Morgan attended and were very comforted, as were his daugh-

ter Kelly and others who could not be present mid-week but caught up with the video. Any donations to honor his contributions should be made to the Hertz Foundation's program for young scientists. Dave himself was a recipient in 1967 at MIT.

The video is available at the QR code on the right, as is Kathy's remembrance of her beloved partner of some 57 years.

"Sorrow is only a slice of the story."

Ann Roiphe, *Epilogue*



Above: Kathy Jackson remembering her husband, Dave Jackson. | Credit: Kelly Rojas

Left: Scan to view the memorial service video.



In Memoriam: Professor Paul H. Roberts

JONATHAN AURNOU



action was fully impossible, as many (including Einstein) thought at the time, or develop a model for how dynamo action actually works. That was a bit much to ask of anyone, and Paul switched advisors after a year. However, it helped to set his intellectual sights and over the arc of his career he provided the answers to Bondi's original questions.

In 1965, working with Stan Scott, Paul formally showed that it is possible to use the differences in geomagnetic field maps made at different times to determine the large-scale motions of the molten metal in Earth's core. In 1975, with Subodh Kumar, he showed that there exist spherical fluid motions which are indeed capable of generating dynamo action. In 1988, he worked with his UCLA colleague Stanislav Braginsky to build a detailed mathematical framework to describe the turbulent convection in Earth's core. And in 1995, Gary Glatzmaier and Paul numerically solved the equations formulated with Braginsky to generate the first self-sustaining supercomputer model of Earth's dynamo. Remarkably, the magnetic field in their model

underwent a polarity reversal, similar to the behavior of Earth magnetic field. Further, the solid inner core in their model rotated faster on average than the mantle, a novel finding that launched a plethora of following studies.

I feel lucky to have gotten to discuss and work on planetary core dynamics with Paul during our overlapping time at UCLA. But I believe my favorite interaction with him was just after Krista Soderlund's Ph.D. defense in 2011. After the defense was completed, Paul graciously congratulated Krista on a job well done. Then, with a twinkle in his eye, he told us that he greatly appreciated that almost all the key terms used in Krista's thesis were coined by him. The Elsasser number, the alpha-effect, the omega-effect, MAC balance—he'd named them all and was pleased as punch that these names had all stuck. It hit me then, and a bit forcefully at that, that almost everything my group studies is set within the broader theoretical framework, the intellectual landscape, that Paul Roberts crafted, quietly and humbly, but with great effort and focus, over his seventy amazing years in the field.

We are also saddened by the passing of beloved EPSS community members Vicki Jones and Jim Valentine. Their widespread impact will be remembered with warmth and gratitude.

Did You Say Marsquakes?

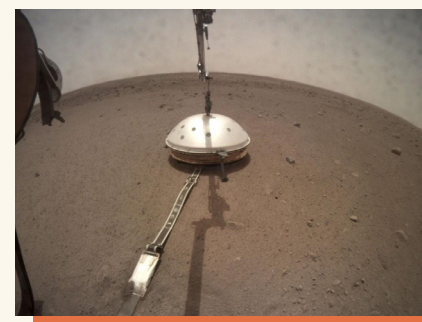
CAROLINE BEGHEIN

What is the internal structure of Mars? What is it made of? Does it have seismic activity? These questions are key to understanding the formation and evolution of rocky planets, both within and beyond our Solar System.

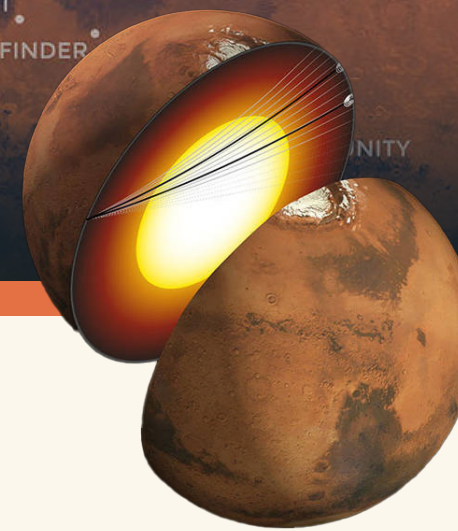
THE BEST SEISMIC STATION

NASA's Mars InSight (Interior exploration using Seismic Investigations, Geodesy and Heat Transport) spacecraft, which just finished its four year run on the Martian surface in December 2022, was built to help seek the answers. Launched in May 2018, InSight's mission was to peer into Mars' deep interior using a suite of geophysical instruments, including a broadband seismometer (SEIS) that can be used to "listen" to the red planet's interior – or rather, the seismic waves that travel through it.

After landing successfully in November 2018 on Elysium Planitia, a flat and smooth plain near the Martian equator, InSight began sending back data to its science team, which included myself and Emeritus seismology Professor Paul Davis. SEIS recording began in February 2019, and the absence of human activity and ocean waves made for low environmental noise, allowing the detection of seismic events with a moment magnitude around 1.8 lower than on Earth. One could say it is the best seismic station in the solar system!



NASA's InSight lander SEIS instrument, taken by the Instrument Deployment Camera on the robotic arm. | Credit: NASA/JPL-Caltech



Left: Artist's concept showing a cutaway of Mars along with the paths of core-transiting seismic waves from two separate quakes in 2021. | Credit: NASA/JPL-Caltech/University of Maryland

CORE & MANTLE DISCOVERIES

After only a few months of recording, the InSight team was able to constrain the size of Mars' core to around 1,100 miles, which is much larger than pre-mission estimates. The data also revealed the mantle structure and the presence of layers within the crust beneath the landing site.

By the end of the mission, over 1,300 seismic events had been recorded. Most were close to the lander and quite small. One exception was the magnitude 4.2 quake that occurred in Valles Marineris, over 5,000 miles from the lander and coincidentally a region where our late colleague Professor An Yin had argued for the presence of strike-slip and normal faults in 2012.

Marsquakes like the Valles Marineris one, with epicenters occurring far from the InSight lander measurement site, are classified as teleseismic. Seismic data from five such teleseismic events helped our team detect a mantle discontinuity (attributed to the post-olivine phase transition) within the Martian planet. These observations were used to infer that the Martian mantle is more iron rich than Earth, and that both planets have a similar potential temperature.

Combined together, these discoveries imply a difference in internal structure between the red planet and ours: unlike Earth, Mars does not have a lower mantle. A later study using core-transiting waves was also able to determine that the composition of the core differs from that of Earth in that its light element content – such as sulfur, oxygen, carbon, and hydrogen – is about twice as high.

THE IMPACT OF SURFACE WAVES

In May 2022, a massive, 4.7 magnitude temblor rocked the red planet. It was the largest ever detected on Mars, releasing five times more energy than any other marsquake in recorded history. This rare, long-awaited occurrence also released seismic surface waves, sending them completely around the planet's circumference.

Recording and analyzing these surface waves marked another tremendous step forward in our understanding of the red planet. The data from this "monster" marsquake was combined with InSight's data from a colossal meteor impact in December 2021 to investigate Mars' crustal structure. Like the marsquake, this meteor impact was strong enough to produce surface waves, allowing my group to peer at Mars' surface and history for the first time.

Though the InSight mission ended in December 2022 due to dust accumulation on the lander's solar panels, its success in mapping the seismic activity, location, and frequency of impacts on Mars is of the utmost importance for future research and missions to the planet. By helping reveal Mars' interior and exterior structure, it has not only provided more groundwork with which to understand the rocky planets of our universe, but also informed scientists and engineers about "where and how to build structures to ensure the safety of future human explorers" (*UCLA Newsroom*). InSight's exploration has made an impact of its own, and the waves produced by its discoveries will continue to be felt in the scientific community for generations to come.

EPSS seismology Professor Caroline Beghein was one of the Participating Scientists selected to join the NASA InSight mission in 2018.



Lightning strikes as the sun sets on the Grand Canyon during the final night of the EPS SCI 133 trip. | Credit: Nika Eskandari

EPS SCI 133: A Voyage Into Deep Time

DEAN LEWIS

It was 9:00 am. Duffel bags, rolled-up tents, and packed coolers lined the walkway of the loading dock behind the Geology building. We were standing in a circle-like blob around a weathered map. Dr. Kevin Coffey (or just “Kevin” to most that know him) was explaining the rock formations and geologic units surrounding UCLA. EPS SCI 133 was about to embark on a field trip.

Soon, we would travel hundreds of miles over several hours and cross a transform plate boundary into a new geologic space - transporting ourselves hundreds of millions of years into the past. But for now, we were standing at the loading dock, trying to commit each other’s names to memory.

worksheets and attend lectures about it, and so on and so forth. However, nothing compares to actually experiencing it — going out into the world and seeing things in action. This was the basis for the journey we were about to take.

To say that the following days would be unforgettable would be an understatement. Our first day of camp was spent in Valley of Fire State Park, Nevada. As morning light poured across the landscape and set the sandstone aflame in hues of deep orange and red, we understood where the valley had earned its name. One breakfast and Bighorn sheep sighting later, we huddled under the shadow of an outcrop to escape the desert heat, listening as Kevin taught us that the valley was a literal window in time, opening up into the Jurassic. We then hiked out across the dry underbrush and into the maw of the land to observe fallen trees, preserved for hundreds of millions of years as quartz and agate fossils in the Triassic-aged Chinle formation. The trees were eerily familiar, a reminder of the persistence of life on Earth.

Later that day, we arrived at Zion National Park, just in time to see the sun drench the walls of the canyon with copper and gold.

Zion, I can safely say after this trip, is one of my favorite places on the planet. The canyon itself tells a deep geologic story, opening up about 100 million years of Earth’s history. We hiked inside the canyon as a class, listening to Kevin lecture over the low roar of the Virgin River. He showed us where rock had fallen away from the canyon walls, and where cross-bedding revealed how the rock had been formed. We learned how rocks wept, fresh water dribbling and streaming down the sides of the gulch. Birdsong and greenery filled the canyon, framing swaths of geologic time as we looked up. As we separated for individual ventures, some of us took the time to experience the showers of the Emerald Pools, waterfalls soaking us. For others, close encounters with wildlife were had. We all re-assembled by the end of the day, partaking in campfire storytelling and delicious vegan chili.



HORSESHOE BEND
05/21/2023



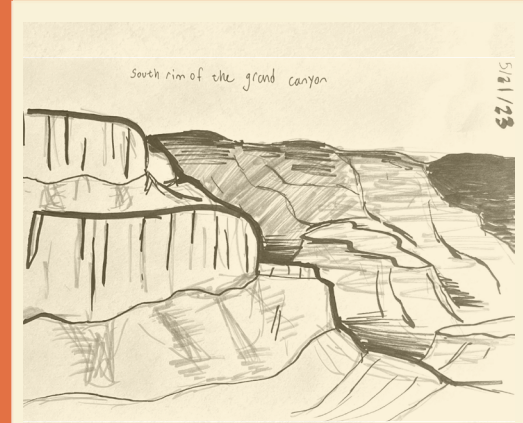
EPS SCI 133 GROUP PHOTO
05/21/2023



CAMPFIRE AT ZION
05/19/2023



KEVIN LECTURING AT ZION
05/20/2023



GRAND CANYON FIELD SKETCH
BY DEAN LEWIS
05/21/2023

"We leaned over the railings, staring down over a billion years of Earth's history. "

Our final leg of the trip was spent on the South Rim of the Grand Canyon. We drove across the Colorado Plateau, through desert thunderstorms and multiple time zones, to get there. Every second of waiting, every mile we traversed to get there was absolutely worth it.

I had never been to the Grand Canyon before, and I don’t think I will ever truly leave now. We leaned over the railings, staring down over a billion years of Earth’s history. “Grand” is not a large enough word to describe the way the rock stretched miles and miles into the distance, fading into the sky. I found that focusing on the information Kevin was feeding us about the canyon was difficult, especially when I could see the other side of it from over his shoulder while he talked.

The glorious climax of it all came as a red-colored sunset. Much like the first day at the Valley of Fire, we sat together, as a class. Sunlight peeked through the clouds in the distance, gently draping the canyon, inch by inch, in the warm purple hues of twilight. I have the scene baked into my memory, etched into my field notes. What was learned there, what we experienced, would not easily be forgotten.

"No matter how well you understand the theory and mechanics of the Earth and the processes inside and on it, it will always be different seeing it."

Prior to the trip, I had a vague, technical understanding of the ways in which our corner of the universe formed itself. I understood

how and when the continents formed, the ways in which mountains formed and landmasses smashed together and separated. I could recite the ways in which country rock buckled and stretched under pressure. But when talking on timescales of hundreds of millions of years, there is only so much that the brain can account for. We are simply not built to understand such grand periods of time. But to be immersed in the geology is different. There is a vastness to it, a grandiosity that draws a deep sense of scientific respect and awe.

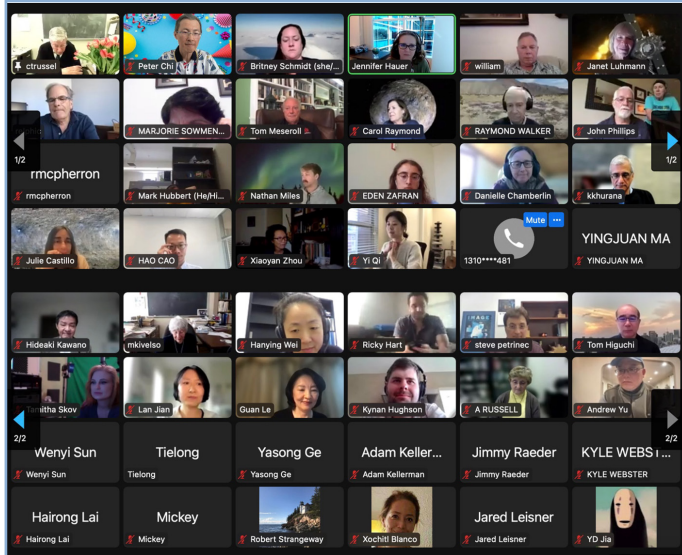
No matter how well you understand the theory and mechanics of the Earth and the processes inside and on it, it will always be different seeing it. EPS SCI 133’s trip was a unique experience in that regard, and we all walked from the loading dock on that final day with a greater appreciation for the billions of years that made Earth what it is today.

| Photo Credits: Nika Eskandari

Celebrating Prof. Christopher Russell's 80th Birthday

PETER CHI

Photo: Screenshot of Zoom party attendees.



Prof. Hao Cao added their congratulatory remarks to Chris' milestone birthday. Former EPSS scientist Janet Luhmann (now at UC Berkeley) presented an analysis of solar activity at the time of Chris' birth and his 80th birthday. Deputy PI of NASA's Dawn mission Carol Raymond (JPL) reflected how Chris changed her career trajectory in a profound

way, and Julie Castillo (JPL) praised Chris for leading the amazing Dawn mission. International scholars who visited Chris' group (Xochitl Blanco-Cano, Michael Gedalin, Tomoyuki Higuchi, and Hideaki Kawano) also joined this special Zoom party even though the event was held in the wee hours for some of them.

Many former students shared valuable lessons and experience in their graduate study from Chris. Rick Elphic (PhD '82), Chris' first student and current head of the neutron spectrometer experiment on NASA's VIPER rover to the Moon, reflected on the development of the flux transfer event concept when he worked with Chris at UCLA. Roberta Johnson Killeen (PhD '87), First Lady of the University of Illinois System, cherished her fond memories at UCLA and passed the experience to her children. Former NASA astronaut John Phillips (PhD '87) recalled how his graduate training from Chris at UCLA changed his career trajectory in an important way. Britney Schmidt (PhD '10) applauded Chris' long-time and understated support to female scientists, using the records of the Dawn mission for promoting

women scientists in leadership roles as an example. The presentations were followed by a "social hour" led by Steve Petrinec (PhD '93) and Tamitha Skov (PhD '02). The Zoom party was also attended by former students Guan Le (PhD '91), Tielong Zhang (PhD '92), Francis Chun (PhD '92), Linda Spilker (PhD, '92), Tom Meseroll (MS '96), Peter Chi (PhD '97), Andy Yu (PhD '04), Galen Fowler (PhD '04), Liz Jensen (PhD '05), Misa Cowee (PhD '07), Lan Jian (PhD '08), Jared Leisner (PhD '09), Yasong Ge (PhD '09), Hanying Wei (PhD '10), Hairong Lai (PhD '14), Jennifer Scully (PhD '15), Mickey Villarreal (PhD '18), Kynan Hughson (PhD '19), Yi Qi (PhD '19), and Ricky Hart (PhD '22), as well as by current students Mark Hubbert, Kyle Webster, Nathan Miles, and Wenyi Sun.

Representatives from several groups joined this special event and announced their appreciation for Chris' contributions. Dean of UCLA Physical Sciences Miguel García-Garibay and Faculty Director of the UCLA SPACE Institute Jacob Bortnik bestowed on Chris a Lifetime Achievement Award. The Ultra Large Terrestrial International Magnetometer Array (ULTIMA) consortium presented to Chris a Global Impact Award (presented by Peter Chi). The Geospace Environment Modeling (GEM) group thanked Chris for his substantial contributions to the program (presented by Adam Kellerman, the GEM Chair). The NASA Magnetospheric Multiscale (MMS) mission conferred on Chris a Certificate of Appreciation (presented by Guan Le).

A symposium in honor of Chris' extraordinary academic career is being planned for 2024.

Organizers of the "Russell @ 80" Event: Rick Elphic (NASA ARC), Liz Jensen (PSI), Guan Le (NASA GSFC), Steve Petrinec (Lockheed Martin), Britney Schmidt (Cornell), Tamitha Skov (Millersville U), Paul Song (UMass Lowell), Hanying Wei, and Peter Chi (UCLA).

Close to 60 EPSS colleagues, students, alumni, and friends across North America and around the world were united on the internet on May 10, 2023, to celebrate Prof. Christopher "Chris" Russell's 80th birthday. Organized by several of his former students who are also EPSS alumni, the event began with an in-person presentation by current students and group members at Chris' office, followed by an hour-long Zoom party with oral presentations and stories told by former colleagues and students, including the Russell family (Chris and Arlene, and daughters Jennifer and Danielle).

These were followed by Prof. Margy Kivelson, who highlighted several of his key academic achievements. She also thanked Chris for their research collaboration (90 co-authored papers) and noted that "we would never have been awarded the Galileo magnetometer without Chris' guidance and support, and my career would have been very different." Prof. Bob McPherron recalled how he and Chris developed their highly cited 1973 paper on geomagnetic activity that described what is now called the Russell-McPherron effect. EPSS Chair Carolina Lithgow-Bertelloni, and Professors William Newman and

Visualization of THEMIS satellite encountering plasma waves.
| Credit: Emmanuel Masongsong, NASA GSFC

Explore Space with Your Eyes and Ears

JASPER LACA

Society's increasing reliance on satellite technology heightens vulnerability to disruptions caused by solar activity, known as space weather. Solar eruptions pose risks to satellites, astronauts, and even ground infrastructure like communications and power grids. Thus, events in space can impact our daily lives.

"HARP's findings can enhance space weather models, improving predictions and understanding of auroral processes."

An international team led by UCLA and the Space Science Institute invites the public to collaborate with NASA scientists in studying space weather's indicators – plasma waves. The project, Heliophysics Audified: Resonances in Plasmas (HARP), recently launched a web app that converts satellite magnetic data into sounds for public analysis.

Plasma waves result from solar charged particles interacting with Earth's magnetic field, producing vibrations and radiation that can harm spacecraft and astronauts. On the bright side, plasma waves can power the colorful aurora, or northern and southern

lights. HARP's findings can enhance space weather models, improving predictions and understanding of auroral processes. Mike Hartinger, HARP principal investigator of the HARP project and EPSS PhD alumnus, employs NASA THEMIS satellite data to explore Earth's magnetic environment where plasma waves form.

Similar to seismologists using seismic waves to study the interior of the Earth, HARP employs magnetic vibrations to examine space weather's evolution due to solar activity. HARP builds on a UK pilot project where high school students identified a new behavior of plasma waves, and were included as co-authors in a scientific journal article. Studies show that using our eyes and ears together is better at uncovering hidden wave patterns than either alone.

"With just a few minutes of training, anyone can engage with NASA data and contribute significantly to space science!"

"Identifying plasma waves in vast satellite datasets requires public participation, there is too much data for us to analyze alone," said Hartinger. "Volunteers even found things

that theory-based computer algorithms had missed!"

HARP users first complete a brief tutorial, listening to satellite data while viewing a spectrogram – a graph depicting frequency and intensity over time. Users outline interesting features, describe attributes like pitch changes, and record their unique observations. With just a few minutes of training, anyone can engage with NASA data and contribute significantly to space science!

THEMIS principal investigator and EPSS professor Vassilis Angelopoulos stressed that space weather has become more relevant as more satellites are launched and daily functions increasingly rely on them. UCLA is a pioneer in space weather research, building sensors, and managing missions to study plasma waves near the Sun, on Earth, the Moon, Mars, and Jupiter's moon, Europa. Angelopoulos also oversaw the successful student-built ELFEN CubeSat space weather mission.

While HARP focuses on data from one satellite mission, future phases will include more satellites and data sources. The public's involvement is critical to HARP's success; visit the website to learn more!

WEB: listen.space-science.org

Solar Wednesdays

ABE AMIRI

Sunspots | Credit: David Dayag, CC BY-SA 4.0

I am a new graduate student in EPSS pursuing a master's degree in Planetary Science with Professor David Jewitt, and am gratefully supported by a special award from the Kavli Foundation.

I recently came from Afghanistan, where I led a nonprofit organization called the "Afghan Astronomy Association." Our objective – the first effort of its kind in the country's history – was to provide access to science through looking at the sky, for people who had never before had that opportunity.

In pursuit of our accessibility goal, we published the first astronomy textbooks in local Afghan languages, printing and distributing tens of thousands of copies to students in various corners of the country. Additionally, we set up over 180 astronomy clubs across Afghanistan, each equipped with a Newtonian telescope. We organized planetarium shows and observing events, created exciting online

animations geared towards young children, and ran an astronomy essay contest that garnered entries from thousands of students. Through these events and activities, we were able to inspire young people to engage more with science.

"Anyone is welcome to have a look at the changing face of our star!"

I am keen to continue my outreach efforts in EPSS. I have already launched a small activity called "Solar Wednesdays," where every Wednesday around noon, I set up one or two of the department's solar telescopes (with filters showing different details) in the Court of Sciences, right in front of the west entrance to our building. Anyone is welcome to have a look at the changing face of our star (but only if the sky is sunny at noon!).

I have found that, even at UCLA, most people have never looked through a telescope! I love giving people their very first telescopic experience, and I have already done this activity a couple of times during Spring Quarter 2023. Every week, dozens of people stop by to observe and ask questions. If 50 people experience the sun per week, that is about 500 people per quarter, bigger than any science GE class. While they are hanging out near the scope, I usually give them quick facts about the celestial sphere and introduce some basic features. Most people are unaware of the science of the sky and how it, along with the Sun and Moon, affects our planet and everyday lives; however, that only motivates me to do more. I intend to introduce new ideas for EPSS outreach efforts as we move forward in time and would love to talk to anyone about ways to proceed.



Mazar-e Sharif, Afghanistan in October 2020. The women pictured are all members of an astronomy club that was established by the Afghan Astronomy Association (AAA). As founder and director of AAA, I loved to interact with school students in person. This picture was taken during Afghanistan's first nationwide astronomy essay contest, the "Galileo Astronomy Olympiad," and demonstrates the use of one of the telescopes donated to all 180 clubs.



Every Wednesday, I take out our department's solar scopes in front of the Geology building in the Court of Sciences. On this particular day over 60 people stopped by to look at the sunspots through our telescope, and I enthusiastically answered their many questions. My main goal in communicating science with the public is to transfer my enthusiasm to others, sharing my unique skill in making astronomy interesting for the public.

EPSS Welcomes Charles Drew University Saturday Science Academy

EMMANUEL MASONGSONG

EPSS hosted a special outreach event on March 25th, 2023, forging a serendipitous new partnership with Charles Drew University (CDU) in South Los Angeles, our only local historically Black college.

"These kinds of formative experiences are so motivating for young kids that aren't otherwise exposed to meteorites, fossils, and other cool demonstrations."

This was the first year that the CDU Saturday Science Academy presented curriculum outside their traditional areas of biology and life sciences, instead focusing on Earth and physical sciences. The organizers were looking for a unique field trip or experience to culminate their program, and were thrilled at the invitation to bring over 150 students to the EPSS department. Ranging in ages from 4-18, it was a unique challenge to keep the curriculum exciting and relevant for all students, basically structured like a "miniature Exploring Your Universe."

It is especially critical for underserved students to have access to hands-on learning experiences, and early exposure to geo- and space sciences is more important than ever.

By empowering students to investigate their surroundings, we can foster their curiosity about exciting real-world applications and encourage them to develop the skills necessary to thrive in any STEM field. "These kinds of formative experiences are so motivating for young kids that aren't otherwise exposed to meteorites, fossils, and other cool demonstrations. It really leaves an impression on them, and can inspire them to pursue their passions," said Jasper Laca, one of the staff booth coordinators.

The event featured a variety of fun hands-on activities across several disciplines. One booth displayed rare minerals and examples of different rock types, along with unique fossils and meteorites that could be examined up close through microscopes. The next booth had demonstrations of earthquakes using fault models, and examples of geomorphology using the augmented reality sandbox, discussing erosion and topographic maps. At the space weather booth, kids and parents alike played with magnetic field toys, colorful plasmas, and held the student-built ELFEN satellite. The planetary science booth, one of the crowd favorites, allowed each of the kids to help in making a comet and then photograph it and themselves with an infrared thermal camera, just like a real satellite instrument would. Last, the kids enjoyed playing with different foods as analog models of rheology,

the deformation and fluid-like flow of solids like the Earth's mantle.

Beyond science topics, EPSS Chair Carolina Lithgow-Bertelloni led a presentation with Q&A on preparing for college, and how to pursue career opportunities in Earth and space sciences. Additionally, several undergrads shared their personal journey and how they found the department.



The event was a huge success, thanks to all the volunteers and labs who came in on a Saturday to make this a memorable experience for our CDU guests. With the arrival of a new Diversity, Equity, and Inclusion Outreach Coordinator, EPSS will continue to build stronger partnerships with local schools and expand the mobile EYU concept, so we can share our exciting science with the community and expand access to STEM for all!

Above: Students learning through a hands-on model of a strike-slip earthquake fault and geomorphology demonstrations. | Credit: Kira Fish

A young student having fun in the astronaut photo booth. | Credit: Valeria Jaramillo

2023 GRADUATES

MINORS

Esther Sarina Cabello
Israel Carrillo
Miranda Samantha Chang
Cassandra Camille Chawke
Raj Ajay Ajit Kumar Hamlai
Lingxi Liu
Charlotte Elizabeth Six

MAJORS | BACHELOR OF ARTS

Tam Anh Thi Luong
Serenity Rothery
Erin Lin Slagerman
Kaleb J. Tuliau

MAJORS | BACHELOR OF SCIENCE

Grace Marie Elias
Breeann Michelle Getman
Maya Havi Gross
Tessa Anneke Beate Holzmann
Nada Mareechi Jacinto
Clare Bonnie Madera
Eduardo Jacques Martinez
Jennifer Estrella Martinez
Hearth Kaia Yager O'Hara
Caleb Joshua Paul
Marcelo Alessandro Perdomo
Shawronna Sengupta
Gwyneth Rose Stolo

MASTER OF SCIENCE

Hayley Lauren Bricker
David Abraham James
Elisha Lakme Jhoti
Emily F. Klonicki
Jade Lauren Nicole Knighton
Joseph Charles Merrill-Lewis
Saeed Yahya Mohanna
Catherine A. Psarakis
Deepshikha Upadhyay
Yingchi Wang
Kyle Douglas Webster
Emily Anne Whittaker

DOCTOR OF PHILOSOPHY

Han Bao
Xiyuan Bao
Taylor Christopher Dorn
Akash Gupta
Justin Takeshi Higa
Yang Li
Dave Gerald Milewski
Nathan Daniel Miles
Tyler Powell
Liutauras Rusaitis
Kevin Shao
Ashley Marie Schoenfeld
Yufan Xu

EPSS COMMENCEMENT & AWARDS 2023

JUNE 17, 2023



2023 UNDERGRAD AWARDS

VALEDICTORIAN

Gwyneth Rose Stolo | Eugene B. Waggoner Scholarship

ACADEMIC MERIT - MAJORS

Maya Havi Gross | Deane Oberste-Lehn Scholarship
Tessa Anneke Beate Holzmann | Deane Oberste-Lehn Scholarship
Eduardo Jacques Martinez | Harold & Mayla Sullwold Scholarship
Caleb Joshua Paul | J. Douglas & Patricia Traxler Scholarship
Erin Lin Slagerman | Deane Oberste-Lehn Scholarship

ACADEMIC MERIT - MINORS

Miranda Samantha Chang | Deane Oberste-Lehn Scholarship
Esther Sarina Cabello | Deane Oberste-Lehn Scholarship
Israel Carrillo | John & Frances Handin Scholarship
Cassandra Camille Chawke | Deane Oberste-Lehn Scholarship
Raj Ajay Ajit Kumar Hamlai | John & Frances Handin Scholarship

QUEEN'S ROAD UNDERGRADUATE RESEARCH FELLOWSHIP

Shawronna Sengupta

SUMMER FIELD SCHOLARSHIPS

Breeann Michelle Getman | Walter S. Harris Award
Tessa Anneke Beate Holzmann | Robert Joseph Horodyski Award
Duyen Ngoc Le | Deane Oberste-Lehn Award
Max Toake Liu | Clarence A. Hall, Jr. Award
Jennifer Estrella Martinez | Deane Oberste-Lehn Award
Shawronna Sengupta | Deane Oberste-Lehn Award
Sophia Alexandria White | Deane Oberste-Lehn Award
Mengmeng Zhang | Deane Oberste-Lehn Award

UNDERGRADUATE RESEARCH AWARDS

Israel Carrillo | Donald Carlisle Endowment
Ian Paul Fu | Joe & Andrea Straus Endowment
Raj Ajay Ajit Kumar Hamlai | John W. West Fund
Masooma Saiyeda Hasnain | Deane Oberste-Lehn Scholarship
Tessa Anneke Beate Holzmann | Deane Oberste-Lehn Scholarship
Adrian (Ling Ho) Lam | Joe & Andrea Straus Endowment
Max Toake Liu | John W. West Fund
George Vetushko | John W. West Fund
Sophia Alexandria White | Deane Oberste-Lehn Scholarship



| All Photo Credit: Nika Eskandari

2022-23 GRAD STUDENT AWARDS

JEWEL ABBATE

National Defense Science and Engineering Graduate Fellowship (NDSEG)

ALANA ARCHBOLD

2023 NASA Spacegrant Fellowship

XIYUAN BAO

Computers and Geosciences Research Scholarship

JORDAN BRETZFELDER

2022 Amelia Earhart Fellowship

CY DAVID

NSF Graduate Research Fellowship

AKASH GUPTA

51 Pegasi b Fellowship

Harry H. Hess Postdoctoral Fellowship, Princeton University

Future Faculty in Physical Sciences Fellow, Princeton University

2023 American Astronomical Society (AAS) Rodger Doxsey Travel Prize

Exoplanet Summer Program Mini Grant by Heising-Simons Foundation & UC Santa Cruz

JADE KNIGHTON

2023 Schmidt Futures Quad Fellow
2022 uAspire Winning Edge Scholar

JOSHUA LEE

2023 AGeS3-Grad Geochronology Award

DANIEL SEPÚLVEDA

2022-2023 BIO Fulbright-ANID Fellowship

YUFAN XU

AGU Outstanding Student Presentation Award (OSPA), AGU Fall 2022

2023 Retirement Celebration

CARLENE BROWN



Retirement celebration attendees toasting to their colleagues' futures. | Credit: James Diaz

The Earth, Planetary, and Space Sciences department hosted a special farewell celebration on June 27, 2023 for eight longtime members of the department who recently retired from UCLA. The event was held on campus in the Hershey Salon of the historic Mira Hershey Hall. Altogether comprising more than 300 years of service, the departing group included four faculty, one academic researcher and three administrative staff members: Distinguished Professor Christopher Russell (57 years; actual retirement date was July 1, 2022); Distinguished Professor J. William (Bill) Schopf (55 years); Distinguished Professor T. Mark Harrison (34 years); Distinguished Professor Kevin McKeegan (33 years); Dr. Robert Strangeway, Researcher (39 years); Lauri Holbrook, Student Affairs Officer (34 years); James Nakatsuka, Administrative Officer (32 years); and Carlene Brown, Chief Administrative Officer (22 years).

With such a large group of honorees, department chair Carolina Lithgow-Bertelloni kept the mood light and the jam-packed program moving quickly. There were short introductions for each retiree, offered by a close colleague and filled with a collection of personal anecdotes, comical reminiscences, impressive accomplishments, and noteworthy contributions to science and/or EPSS. These were followed by brief, touching speeches from the retirees themselves to express highlights of their long, illustrious career and express gratitude to all the members of the department, family, and friends who provided support over the years. Afterwards, everyone enjoyed a lovely outdoor reception on the adjacent patio complete with cake, and a champagne toast, along with many informal stories and remarks provided by various members of the department.

Our retiring colleagues will be sorely missed in the department but we wish them well in this new chapter of their life.

To see the event slideshow with fun photos and memories from the retirees, scan the QR code to the right.



VIEW THE
EVENT
SLIDESHOW
HERE!

Department Farewells

CONGRATULATIONS TO OUR 2023 RETIREES!

CARLENE BROWN

22 Years | CAO



AFTER MORE THAN TWO decades at UCLA, including eight years of service as the Chief Administrative Officer (aka manager) in EPSS, I am looking forward to a post-retirement life that involves long days of hiking and backpacking in the Sierra Nevada and other mountainous areas, exploring back country roads throughout remote areas of the country, and spending plenty of leisure time with my family and friends. Before joining EPSS, I also worked in several other units throughout the College of Letters & Science, including the College Deans office, the Institute for Society and Genetics, Undergraduate Education Initiatives, and the Dodd Humanities Group; however, the best part of my UCLA career has been all the great relationships with EPSS faculty, staff and students and the challenging, stimulating environment of working with world class scientists in pursuit of cutting-edge innovations and discoveries.

JIM NAKATSUKA

32 Years | Senior Fund Manager



MANY THANKS TO ALL who have been a part of my journey: my dedicated coworkers and teammates whose expertise made my job easier; my managers whose guidance and mentorship have been instrumental in growing and shaping me professionally and personally; the distinguished faculty, researchers and staff whom I'm proud to know and had the honor to support—I look forward to hearing about the many new projects they continue to accomplish. Thanks to my family who have listened to me incessantly talk work over family dinners and know all the researchers by name as well as I do. I am grateful for my years at IGPP/EPSS and look forward to this next leg of my journey: spending more time with my family, caring for our elderly relatives, gardening, fixing up our home, and traveling.

LAURI HOLBROOK

34 Years | Student Affairs Officer



LAURI HOLBROOK RETIRED AS Department Advisor of EPSS after 23 years, with almost 35 years of service at UCLA. From the first moment entering the Geology Building in Fall Quarter 1979 as a UCLA freshman, Lauri felt at home. Her famous and infamous professors included Nelson, Dollase, Schopf, Watson, Christie, Bird, Hall, Ernst, Reed, Jackson, DePaolo, Boettcher, and a new guy named Ingersoll. With a B.S. in Geology in 1984, Lauri worked as a Geologist at Getty Oil in Bakersfield, CA, until her move back to Los Angeles. UCLA experiences included IGPP, ESS, Biology, Chemistry and Biochemistry, Neuroscience, and Social Welfare, prior to her return to ESS in the year 2000. In Lauri's words: "Each batch of newly minted graduates has made me proud to be associated with this Department. I am humbled to have had the honor of serving the many students and faculty of this super awesome department at UCLA. I honestly could not have found a better place, a better family-style organization, which combines the love of nature with the Science of Geology, and

encompasses the study of everything, from the core of the Sun to the planets, the evolution of life as we know it, and the physical processes that dictate structure and properties from the infinitesimally small upward to galactic scales and beyond. As a true Geologist and a fan of Star Trek, Star Wars, and the future, thanks to everyone along the way who is truly making a difference, discovering and pursuing the answers to the mysteries of the universe. It is just so much fun to walk into the Geology Building. I will miss being a dedicated "core part" of the operations but I am super satisfied with the continual sense of accomplishment that comes when seeing grants get funded, new students welcomed, and the degree candidates congratulated. Now pass along that enthusiasm to the next generation! A big hug and thanks for the ride."

KEVIN MCKEEGAN

33 Years | Professor



AT THE UNIVERSITY OF California, I have been a postdoc, a Specialist, a Research Scientist, an Adjunct Professor, a Professor, a Vice-chair, Chair, and now Professor Emeritus. It has been a time of great personal satisfaction at having accomplished some interesting and novel science and joy at having the privilege (and fun!) of working with many talented and dedicated people: faculty, researchers, students, and staff. I am deeply grateful to UCLA, especially to my colleagues in the ion probe lab, and to the taxpayers of the United States for the opportunities to pursue some of my intellectual interests. My farewell will be gradual – until I finally fade away into the mist of the Pacific Northwest to spend more time with family. Thank you all!

MARK HARRISON

34 Years | Professor



THANKS UCLA FOR PROVIDING me with extraordinary resources and opportunities over the past 34 years, the epitome of which was giving me playmates like An Yin and Kevin McKeegan. For me, retirement means I'll be able to continue to do those parts of the job that bring me joy and cease doing the others. Our many hires over the past half dozen years or so are superb and I leave the ladder faculty secure in knowing they're poised to lead the department to a bright future. We're all deeply saddened by An's sudden loss but grateful for the simple model he left us of the ideal Bruin scholar; there's no substitute for hard work and clear thinking in science!

ROBERT J. STRANGEWAY

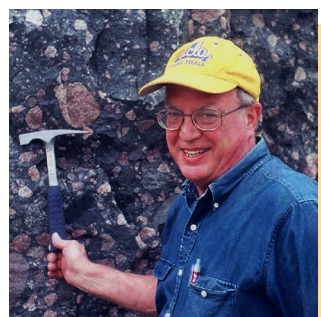
39 Years | Researcher



I FIRST JOINED UCLA in 1983 as Assistant Research Geophysicist in Prof. Maha Ashour-Abdalla's Space Physics theory group, where I was privileged to work with Dr. Phil Pritchett on a theory on the source of aurora-related radio emissions. These emissions have counterparts on Jupiter and Saturn, and, in general, make planets bright radio-astronomical objects. A few years later the late Dr. Fred Scarf took a position at UCLA, and I became involved in analyzing plasma wave data acquired by the Pioneer Venus Orbiter. This in turn increased my interactions with Prof. Chris Russell, and he invited me to join his research group. I enjoyed my time over the years as Prof. Russell allowed me to indulge my (not so secret) preference for space plasma theory, allowing me to write the more theoretical chapters in the Russell et al. Space Physics textbook. Working at UCLA also allowed me to meet and marry my wife Patty, and we have three wonderful children of whom I am very proud. They all live in Northern California, and I plan to spend more time visiting them during my retirement.

J. WILLIAM (BILL) SCHOPF

55 Years | Professor



IN 1968, AS A freshly-minted PhD, I joined the department. Now, after 55 years — more than half a century! — I have retired. Over this period the department has evolved, not only in its name (from "Geology," to "Geology and Geophysics," and on and on to its current moniker, "Earth, Planetary, and Space Sciences") but in the breadth of its scholarly pursuits. Coupled with this, the department has increased in size, in the number of students served, and in its gender and racial diversity. In short, the department has evolved in tandem with the science, the university, and the society. My "take-away" from this wondrous experience is simple: For me, every single day at UCLA has been "Yet another day in Paradise!" Hooray for EPSS! The future is bright!

CHRISTOPHER RUSSELL

57 Years | Professor



CHRISTOPHER RUSSELL RECENTLY CELEBRATED his 80th birthday with almost 60 EPSS friends, students, alumni, and colleagues. During his time with EPSS, he has made extraordinary contributions to various topics within space science; a symposium honoring his academic career and achievements is being planned for 2024. In the meantime, he is continuing to conduct his research and write papers. To read more about his birthday celebration and awards, see page 15!

PAUL DAVIS

40 Years, Retired 2019 | Professor



AFTER POST-DOCS IN EDMONTON and Cambridge studying geophysical implications of plate tectonics, in 1979 I accepted a post-doc at UCLA with Dave Jackson, before planning to return to Australia. But this was not to be. After being appointed Harold Rubey Assistant professor I was offered a permanent position, from which I retired 40 years later

in 2019. Back then it soon became apparent that both the academic climate and geographic climate at UCLA were incomparable. The seismology group had the leading theoreticians. Knopoff recognized earthquakes were fractal before the term was invented. Jackson was bringing rigorous statistics to inverse theory. The space science group, led then by Paul Colman, was building equipment that went from the laboratory bench on the 6th floor to other planets. But even still, they loaned their engineers and lab to help me build magnetometers and seismometers for geophysical experiments. Geology was unraveling the San Andreas fault. All this and more in one university department was pervaded with friendly co-operation, cushioned by a remarkable staff who also reflected the California warmth. UCLA is exceptional. Its global ranking while charging students a quarter of what the private universities do, is a testament to public education. It is wonderful to sit back and see how the Department continues to excel as it has moved with the times. Many, like me, have also chosen to stay at UCLA. Now, in retirement, after traveling the world with seismic arrays, I have enjoyed analyzing seismic data from a new planet, Mars, where someone else carried and installed the instruments. In addition, with my wife, I study the Earth from my Roadtrek Sprinter Van, in which, as geologic/cultural nomads, we have driven from home to Homer, Alaska in the west, to Nova Scotia, Canada in the east (where I am writing this). What a country. Did plate tectonics really do all of this?

Department Hellos

With farewells come new beginnings: say hello to our new hires!

HAO CAO

Assistant Professor

DR. CAO'S RESEARCH FOCUSES on the interior structure, dynamics, and evolution of planetary bodies, emphasizing that planetary magnetic fields are essential for understanding the host planets. His research experience encompasses space magnetometer data analysis, analytical and numerical magnetohydrodynamics (MHD) modeling of planetary dynamos, and theoretical calculation of planetary gravity fields. He is a member of the Cassini magnetometer (MAG) team, a member of the Juno Interior Working Group, and a Co-Investigator of the JUICE MAG team.



PENG NI

Assistant Professor

DR. NI IS AN experimental planetary scientist specializing in the application of isotopes as tracers of physicochemical processes that shape bodies in our Solar System. He works at the interface between experimental petrology and isotope geochemistry and cosmochemistry, with projects ranging from the chemistry of planetesimal metal cores to the formation and evolution of the Moon.



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