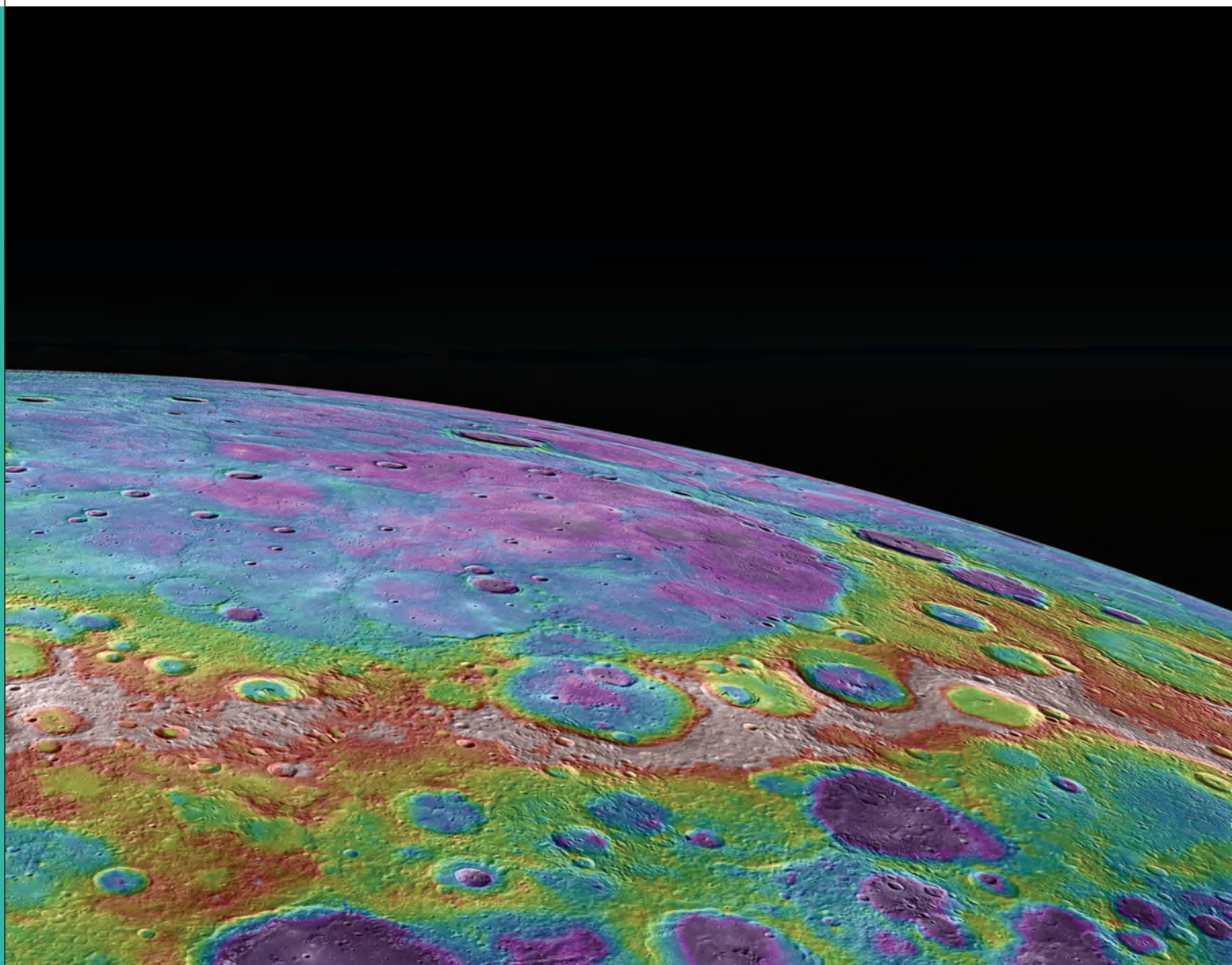
Carnegie Year Book

CARNEGIE SCIENCE

Fiscal Year July 2023 – June 2024



CARNEGIE SCIENCE

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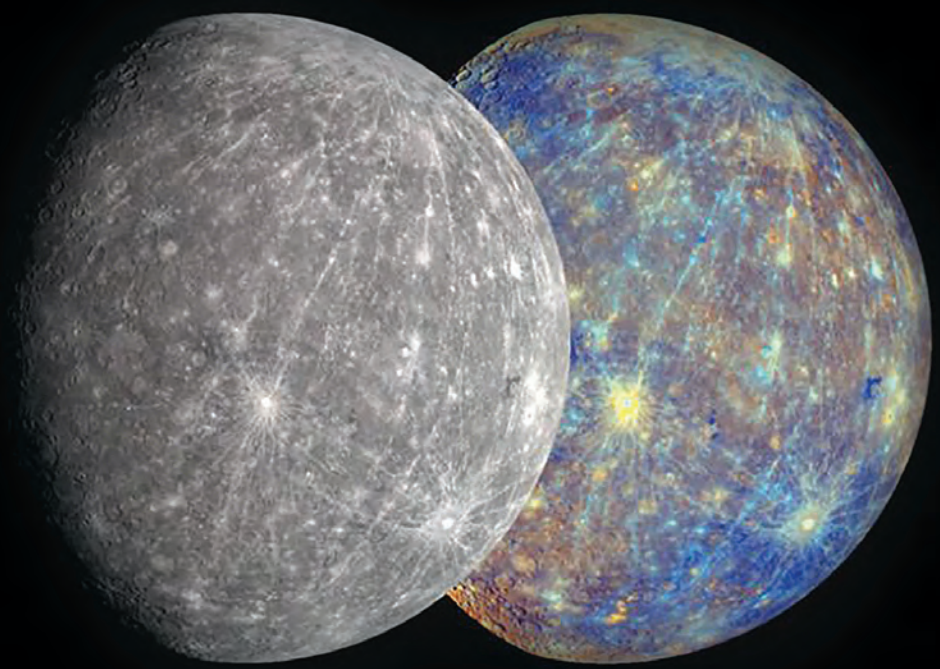
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The color view of Mercury was produced using images from the color base map imaging campaign during MESSENGER's primary mission.

This publication is a selection of materials from our complete Year Book, which is online at: carnegiescience.edu/yearbook/2024.

A Message from Our President

When I introduce myself and Carnegie Science to new friends and neighbors, the conversation typically, and quickly, moves toward talking about the future: new postdocs, cascading breakthroughs, innovations in instrumentation. I understand the impulse. Our mission is to advance humankind, and every leap forward in society has been powered by science and technology.



John Mulchaey

But the nature of our research—seeking to understand who we are and how we got here—requires us to also keep one foot in the past and a firm grasp on the present. We are scientists, yes, but also historians, storytellers, philosophers, and visionaries. From genomes to ecosystems, moments to millennia, we are masters of scale. This holistic approach, entwined with our spirit of transformational discovery, is a defining feature of Carnegie Science. For 123 years, this strength has fueled discoveries that continue to shape the world. And it's alive and well today.

At the Earth and Planets Laboratory (EPL), where generations have explored our planet's geologic history and the mysteries of worlds beyond our own, a new cohort of scientists, like geochronologist Jennifer Kasbohm and isotope geochemist Andrea Giuliani, are using advanced tools to explore enduring questions that remain: where did we come from, and how can ancient building blocks inform a more sustainable future?

Understanding life and the minute-by-minute processes that sustain it is key to answering those questions. Carnegie biologist Arthur Grossman, a staff scientist for more than four decades, was recently elected to the National Academy of Sciences for his pioneering work in photosynthesis. Arthur's multidisciplinary approach is an inspiration for the next generation of Carnegie scientists, and a testament to the flexibility and creativity at the heart of our institutional model.

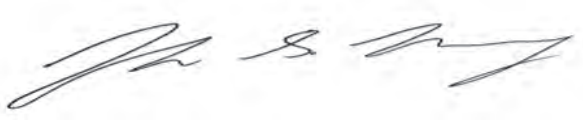
Meanwhile, our astronomers at the Carnegie Science Observatories are joining those at EPL in reaching ever deeper into the expanding universe with next-generation instruments and telescopes. From revealing the composition of exoplanet atmospheres to illuminating the first stars and galaxies, they are building a stronger foundation of knowledge about the universe and our place within it.

Of course, instruments are only as powerful as the people behind them. Our reputation for bold research—past, present, and future—is rooted in the brilliance and dedication of individual researchers and leaders. This year, we lost two such giants: former Carnegie Science President Maxine Singer and trailblazing cell biologist Joseph Gall. Their scientific achievements were matched only by their unwavering commitment to mentoring others and nurturing new generations of scientific talent.

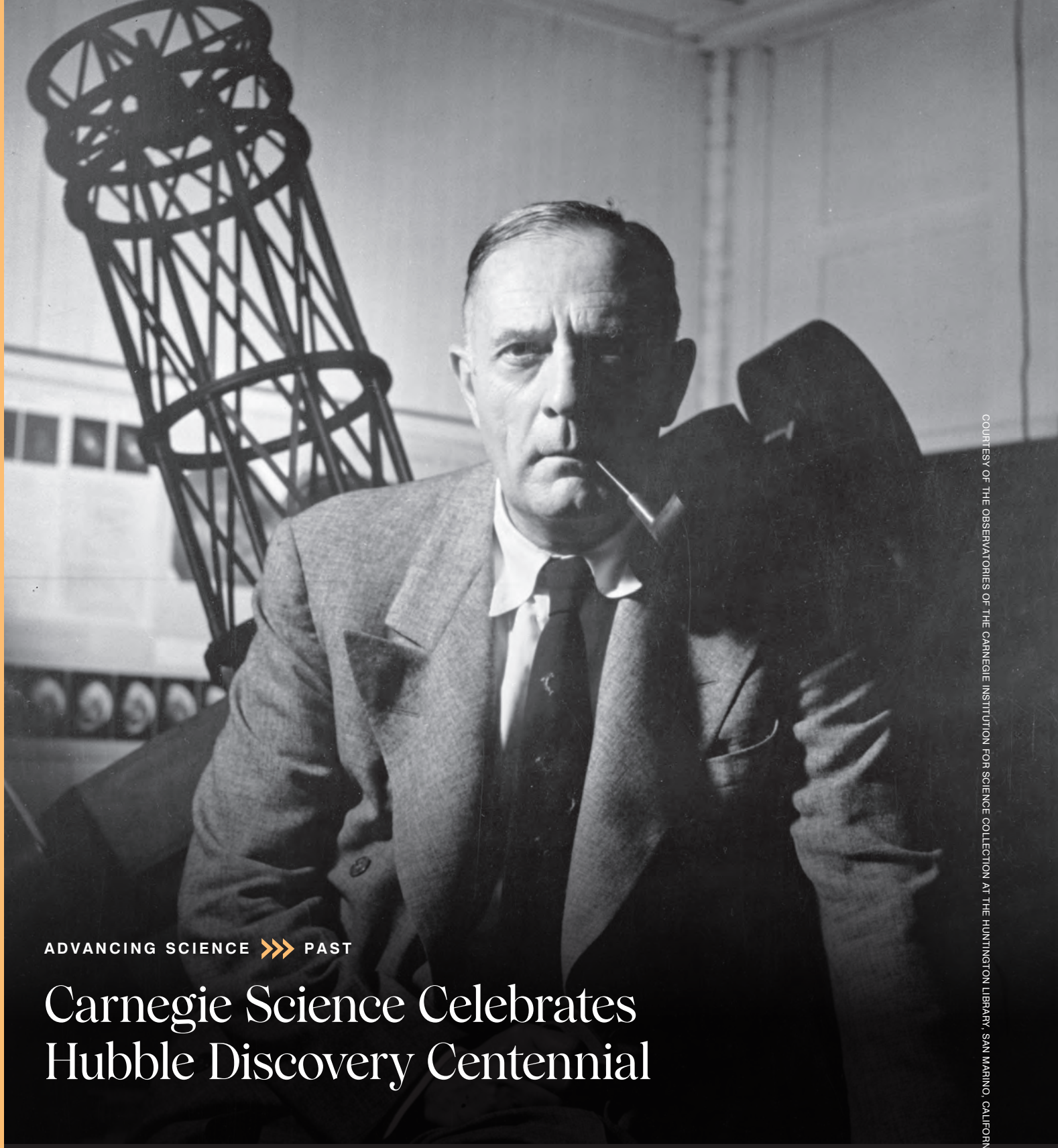
I invite you to explore and celebrate another year of excellence at Carnegie Science. Learn about the people at the heart of our work. Commemorate milestones like the 20th anniversary of the MESSENGER mission. Discover the advancements in instrumentation across our campuses. And join us now in recognizing those supporters whose generosity is propelling us into the future.

Thank you for being a part of Carnegie Science's past, present, and future.

Sincerely,



John Mulchaey
President, Carnegie Science



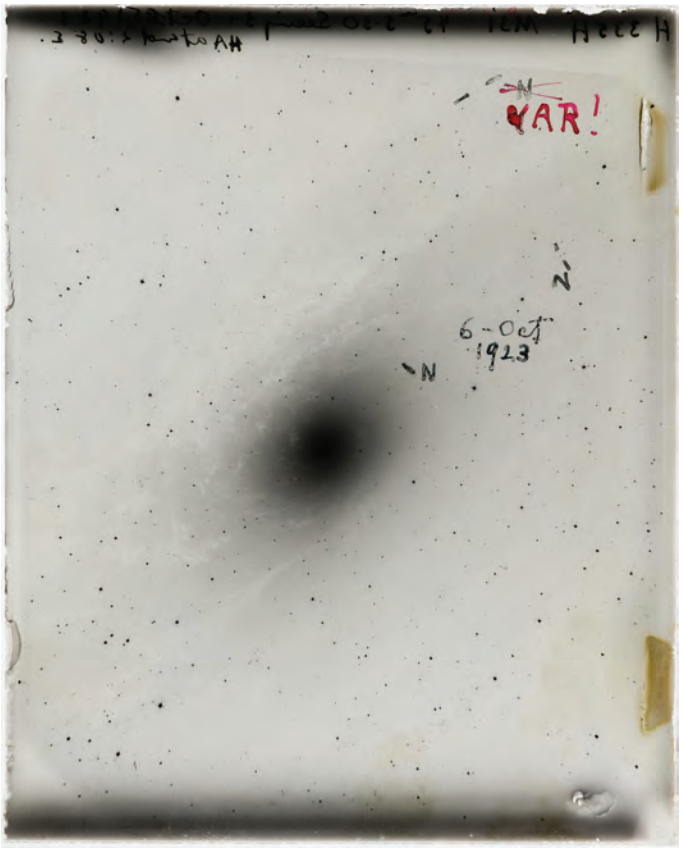
COURTESY OF THE OBSERVATORIES OF THE CARNEGIE INSTITUTION FOR SCIENCE COLLECTION AT THE HUNTINGTON LIBRARY, SAN MARINO, CALIFORNIA

ADVANCING SCIENCE PAST

Carnegie Science Celebrates Hubble Discovery Centennial

The skies above Los Angeles are more hazy today than they were in October 1923, when Edwin Hubble looked through the eyepiece of the 100-inch Hooker Telescope—at the time the world's largest observing facility—and changed the course of human history. Light and air pollution have transformed Carnegie Science's historic Mount Wilson Observatory from the crown jewel of astronomical innovation into a historic, and captivating site for education and outreach in recent decades. But 100 years ago, the mountaintop facility enabled one of the most transformational discoveries in modern astronomy when Hubble discovered Andromeda.

A seasoned astronomer, Hubble was granted the rare opportunity to work on what was then the most advanced telescope technology in the world, conceptualized by George Ellery Hale and funded by Carnegie Science. One wonders what he thought that night, and in the days and weeks that followed, as he employed the mathematical techniques pioneered by Harvard University "computer" Henrietta Swan Leavitt to confirm the distance of a far-away, pulsating Cepheid variable star. If anyone could understand the gravity such a discovery would have on the course of astronomical study, it was Hubble, whom Hale had recruited on the basis of his extraordinary promise. Though the dividends of that investment are now well-known, and the facts of the discovery clear, the only



Glass side of the photographic plate H335H, known as the VAR! plate, created by Edwin Hubble with the Hooker 100-inch telescope of the Mount Wilson Observatory

indication we have of Hubble's emotional reaction to that pivotal moment of revelation is a "VAR!" written in a shaky hand on a cloudy glass plate.

That exclamation point was a harbinger of the long tail and consequences of the discovery. Following its public announcement at the American Astronomical Society's Annual Meeting in January 1925, it would come to inspire generations to explore the unseen forces beyond our atmosphere, like the dark matter revealed by Carnegie's Vera Rubin, and the search for planets beyond the Milky Way, pioneered by several Carnegie scientists and alumni. Even for Hubble, it would form the basis of his later revelation that the universe is continually expanding.

We are proud to have been a professional home to Hubble, Hale, Rubin, and so many scientists who have pushed the boundaries of knowledge.

For his contributions to astronomy at large, NASA designated Hubble as the namesake of its 1990 space telescope, which has itself captured countless images that have helped to further unravel mysteries of the deep universe and captivated the public imagination. While Hubble's legacy lives on in that telescope and the data it continues to collect, his reputation was forged on individual, compounding discoveries that are each worthy of celebration in their own right. And in observing the Andromeda discovery centennial, Carnegie Science used that singular occasion to zoom out and explore the past, present, and future of space exploration.

The 16-month celebration kicked off in October 2023 with a VIP reception, educational presentation, and viewing of Hubble's famous plate in the Observatories' library in Pasadena. Understanding that Carnegie Science's long legacy in astronomy continues with field-defining research in Pasadena and at the Las Campanas Observatory in Chile, donors and guests also toured the bespoke instrumentation facilities and learned about current technology employed by our astronomers today.

The next day, President John Mulchaey and Staff Scientist Juna Kollmeier offered a public presentation at the Los Angeles County Museum of Art, a sneak preview of the museum's *Mapping the Infinite:*



John Mulchaey speaks at the Los Angeles County Museum of Art's (LACMA) exhibit Mapping the Infinite: Cosmologies Across Cultures. The exhibition explores the relationship to the cosmos of more than a dozen civilizations.

Cosmologies Across Cultures exhibition, for which the Hubble plate was on display from October 2024 to March 2025.

And closing an extraordinary kickoff weekend of events, the Observatories Open House welcomed the public to explore our facilities and see the "VAR!" plate in its home archive. Mulchaey delivered a presentation on the history of the plate and the trajectory of the Andromeda discovery, and Carnegie astronomers were on hand to answer questions about the institution's work.

The following year brought plenty of chances to observe with the anniversary celebration, including the annual Astronomy Lecture Series, an Ode-win Hubble poetry contest, a Hubbleween pumpkin carving contest, and other engagement opportunities across Carnegie's communications platforms.

And, of course, the LACMA exhibit officially launched and brought thousands of visitors to learn about Hubble's work and the long line of stargazers of which he is a member. The plate was on view alongside scores of centuries-old artifacts and cultural objects from more than a dozen civilizations, including a floor-to-ceiling projection of video of a survey of galaxies by the Sloan Digital Sky Survey's fifth generation, of which Kollmeier serves as director, and an image of the Milky Way's central region captured by a team of scientists, including Carnegie Science postdoc Allison Matthews using the MeerKAT radio telescope in South Africa. The exhibition was presented as part of the Getty Foundation's *PST ART: Art & Science Collide initiative*.

The celebration culminated at the American Astronomical Society's Annual Meeting in January 2025 with a reception to honor Hubble and all of the astronomers—including Carnegie staff and alumni—who have built on his work to shape and expand our understanding of the universe. Carnegie Observatories astronomer and Outreach Coordinator Jeffrey Rich made a public statement regarding the centennial of Hubble's public announcement in a joint press conference with the AAS that featured additional presentations by scientists from NASA's Jet Propulsion Laboratory, Rhodes College, Duke University, and the University of Arizona. Rich and the other presenters fielded questions from reporters and attending scholars following the presentation. The event garnered media attention from outlets including *Space.com* and *Smithsonian Magazine*.

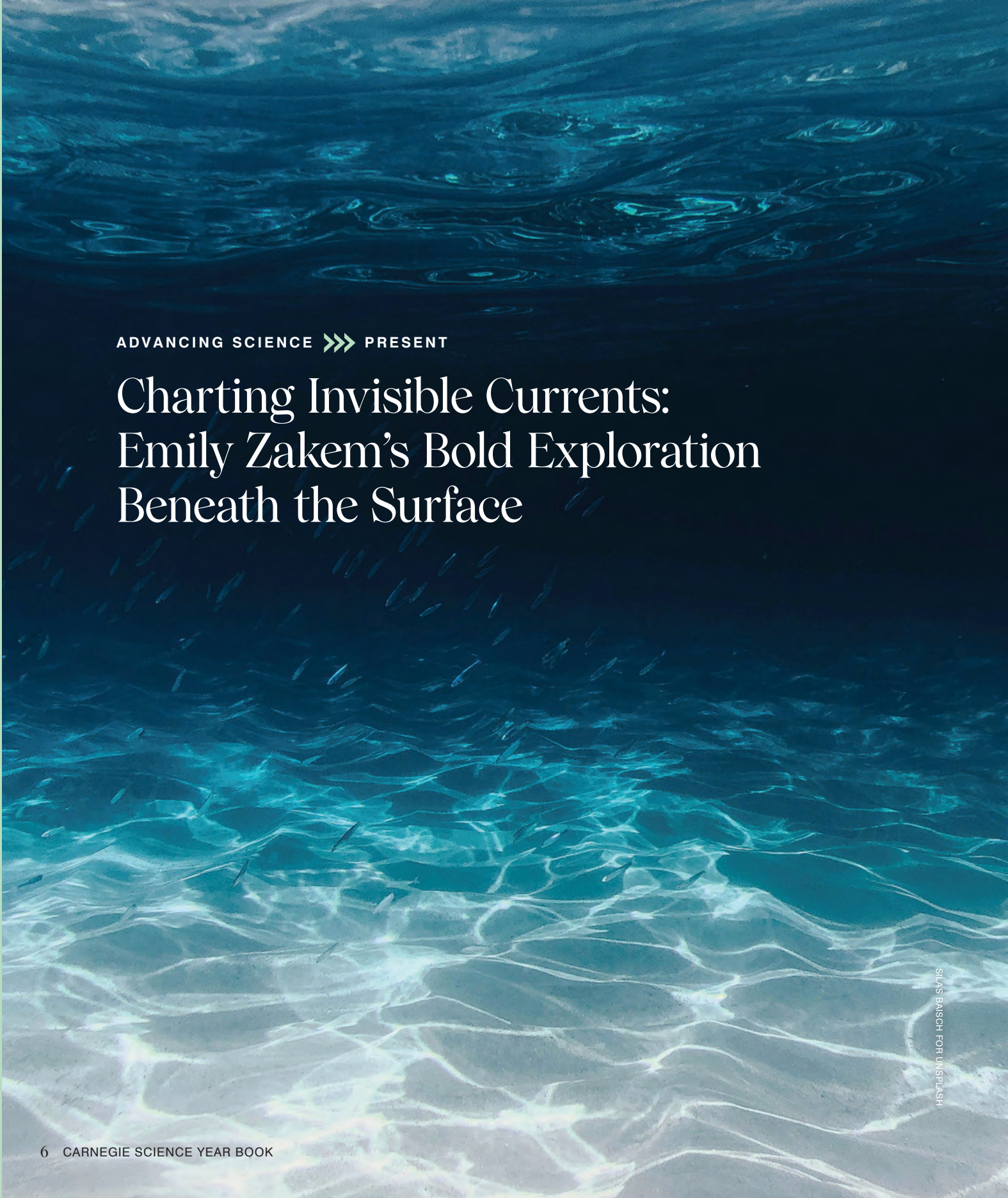


Juna Kollmeier speaks with LACMA CEO Michael Govan and a colleague in front of the floor-to-ceiling video projection of a survey of galaxies by the Sloan Digital Sky Survey's fifth generation.

It's difficult to imagine the last century of astronomy had Hubble not had the tools and facilities made available to him on Mount Wilson. Carnegie Science is inextricable from the revolutionary advancements in science—not only in observational astronomy, but deep-space exploration and planetary science—that have come to shape the United States' scientific reputation over the past century. We are proud to have been a professional home to Hubble, Hale, Rubin, and so many scientists who have pushed the boundaries of knowledge, and to continue to be so for the scientists who walk boldly in their footsteps and push those boundaries still further.

ADVANCING SCIENCE PRESENT

Charting Invisible Currents: Emily Zakem's Bold Exploration Beneath the Surface



SILAS BAISCH FOR UNSPLASH

Using theory and mathematical modeling, she brings order to microbial chaos, searching for patterns that can explain the biogeochemistry of the ocean and its connection to the climate system above.


Emily Zakem

In 2024, the Simons Foundation recognized Staff Associate Emily Zakem's bold vision and exceptional promise, naming her one of just five recipients of the Early Career Investigators in Aquatic Microbial Ecology and Evolution award. This prestigious three-year grant is supporting her trailblazing efforts to unravel how marine microbes influence the global nitrogen cycle and adapt to the growing threat of low-oxygen "dead zones."

Her approach is equal parts science and vision. Zakem uses theory and mathematical models to build connections between microbial ecosystems, the biogeochemistry of the ocean, and the climate system. Her work hypothesizes that microbial activity is sufficiently predictable to provide insight into large-scale biogeochemical features.

The exciting research Zakem will pursue with the Simons award is focused on how marine microbial communities shape the nitrogen cycle and can contribute to and thrive in dangerous low-oxygen dead zones. Although bacterial species that don't require oxygen experience explosive growth in these environments, fish and other marine organisms are unable to survive. These regions are believed to be expanding due to climate change, a major concern for fisheries.

Zakem is part of Carnegie's prestigious Staff Associate program, which was designed to empower outstanding early career scientists, enabling them to pursue the kind of bold, creative research laid out in our founding mission. Her work reflects the very spirit of Carnegie Science—asking daring questions and crafting innovative methods to pursue them.

The Early Career Investigators in Aquatic Microbial Ecology and Evolution grants are funded by the Simons Foundation and Simons Foundation International and administered by the Simons Foundation.

Honoring a Legacy of Discovery: Maxine Singer and Joseph Gall Remembered



Carnegie Science president Maxine Singer with students during a First Light field trip to the NIH.



Joe Gall at the microscope. Banner created for Gall's retirement symposium.

In late 2024 and early 2025, the Carnegie Science community came together to celebrate the lives and legacies of two towering figures in modern biology—Maxine Singer and Joseph Gall. Through heartfelt stories and scientific reflections, we honored their groundbreaking discoveries and their deep humanity, mentorship, and vision.

Singer and Gall helped write the playbook for 20th- and 21st-century biology—from cracking the human genetic code to unveiling the hidden architecture of the cell. Their work laid the foundation for fields that didn't even exist when they first undertook biological scholarship, and their impacts are still felt by researchers, educators, policymakers, and science historians around the world.



Gall at the presentation of his 2006 Albert Lasker Special Achievement Award in Medical Science with former graduate student Elizabeth Blackburn and her former mentee Carol Grieder.

Carnegie's memorial events offered Singer and Gall's friends, family, and colleagues a chance to reflect on all they gave to science—and to Carnegie—and to ensure their stories continue to inspire future generations.

"Carnegie Science recently lost two luminaries whose contributions to science and society will continue to guide us for decades to come," said Carnegie Science President John Mulchaey. "My predecessor Maxine Singer shaped not only our institution, but our understanding of heredity. And Joe Gall similarly revolutionized his field, helping to usher in the modern genomic era of biology."



Singer at the rotunda of Carnegie Science's former P Street administration building.

Remembering Maxine Singer

On December 14, 2024, the scientific community paid tribute to the extraordinary life of President Emerita Maxine Singer—a trailblazer who redefined the role of science in society and transformed our organization.

The memorial symposium illuminated every facet of Singer's influence: her pioneering research in molecular biology, her transformative leadership, her fierce commitment to scientific ethics, and her tireless advocacy for STEM education. Through every story and tribute, one truth came through clearly—Singer didn't just guide science forward, she imagined and built its future.

Singer, who died in July 2024 at age 93, left her mark across the scientific spectrum. As Carnegie's leader, she championed the construction of the twin Magellan telescopes at our Las Campanas Observatory in Chile, paving the way for revolutionary advances in astronomy. Former Observatories Director Wendy Freedman and Staff Scientist Alycia Weinberger praised her bold decisions and visionary foresight—years ahead of her time.

"It took tremendous prescience in 2000 and 2001 to start hiring people interested in exoplanets when there were hardly any of them."

— *Alycia Weinberger, Staff Scientist, Carnegie Science*

But her reach extended far beyond the stars. Singer was a molecular biology trailblazer who helped define the field, advancing our understanding of the nucleic acids that form the backbone of genetic material. She was also a key organizer of the landmark Asilomar Conference on recombinant DNA—an event that set the global standard for research ethics.

"She was a primary model to the world of why science is done—and how it should serve society."

— *Rush Holt, former chief executive officer of the American Association for the Advancement of Science and Carnegie Science Trustee Emeritus*

Equally inspiring was her work in education. Singer helped launch initiatives like the Carnegie Academy for Science Education and Math for America DC, opening doors for generations of students and teachers.

Singer's scientific legacy is profound. But just as enduring is the human legacy she left behind—one defined by courage, clarity, and an unwavering belief in the potential of others.

"We weren't just individuals, we were a team, and Maxine was our coach."

— *Derrick Simmons, Math for America alumnus and teacher, McKinley Technology High School*

Remembering Joseph Gall

On March 1, 2025, friends, family, colleagues, and mentees gathered to remember the "father of modern cell biology" Joseph Gall, who spent more than four decades advancing molecular biology from Carnegie's campus in Baltimore.

Gall revolutionized our understanding of chromosome organization. He and mentee Mary Lou Pardue developed a technique called *in situ hybridization*, which allows researchers to map the locations of genes on a chromosome. This was among the first tools for connecting individual nucleic acid sequences with the genome as a whole.

"For more than 40 years he continued working at the bench and thrilling biologists with his new discoveries and insights. … For many of us, myself included, Joe Gall epitomized the scientist that we wanted to be."

— *Allan Spradling, Director Emeritus, Carnegie Science Department of Embryology and Howard Hughes Medical Institute Investigator.*

Later, Gall's work with mentee Elizabeth Blackburn revealed the structure of telomeres, a repetitive segment of DNA at the end of each chromosome that protects the genetic material from damage and ensures it is fully copied before cell division.

Throughout his career, Gall continued to advance our understanding of activities in the nucleus with research about many aspects of genome transcription and processing. His success was underpinned by his lifelong curiosity and his deep knowledge of invertebrate biology—an expertise that began with his teenaged adventures in microscopy and continued into his final years.

"Joe had an extraordinary number of different organisms in his lab. As a naturalist he knew their many properties and so he could always select the best organism to suit the biological question at hand."

— *Susan Gerbi, George D. Eggleston Professor Emerita of Biochemistry, Professor of Molecular Biology, Cell Biology and Biochemistry, Brown University*

Gall stood out from many of his peers in the 1960s and 1970s for mentoring and championing women. His lab was recognized as one of the few places where burgeoning women biologists could get serious training and not be sidelined by male peers. Several of his former students and postdocs have gone on to acclaim of their own.

"I wouldn't be here if it hadn't been for Joe Gall accepting me into his lab that first summer and then somehow orchestrating my switching from medical school into a graduate program and I shall be eternally grateful. … What I owe to Joe is an entire lifetime in science."

— *Joan Steitz, Sterling Professor of Molecular Biophysics and Biochemistry, Yale School of Medicine*

Honors & Awards

Peter Gao awarded Scialog grant for biosignature research

Peter Gao is one of 19 researchers from across the U.S. and Canada who were awarded a $50,000 Scialog grant. The initiative was launched by the Research Corporation for Science Advancement (RCSA), the Heising-Simons Foundation, the Kavli Foundation, and NASA to advance interdisciplinary research that will progress the search for life beyond Earth by deploying a basic science approach. The Scialog program, short for "science + dialog" was created in 2010 by RCSA to support new research directions. Together with Renyu Hu of the Jet Propulsion Laboratory and Chenguang Sun of the University of Texas at Austin, Gao studies how geologic processes in the interiors of exoplanets may help us detect and determine their atmospheres.

Will Ludington wins second Scialog grant to study brain-microbe interactions

William Ludington is co-leading one of eight research teams from across the U.S. and Canada that were awarded a $50,000 Scialog grant. Together with Karthik Shekhar of UC Berkeley, Ludington investigates how signals from the gut can activate glial cells, which support healthy neuron function, into an inflammatory and neurotoxic state. In order to better understand this phenomenon, they will probe the gut-brain axis using a variety of molecular and computational tools.

Shaunna Morrison recognized by AGU for early career excellence

Carnegie mineralogist Shaunna Morrison was awarded the American Geophysical Union's Ronald Greeley Early Career Award in Planetary Sciences, which recognizes significant contributions from researchers within six years of receiving their Ph.D. Morrison combines her expertise in crystallography and crystal chemistry with cutting-edge machine learning and data visualization methods. As a co-investigator on NASA's Curiosity Mars Rover mission, Morrison applies her expertise to predict the location of previously unknown mineral deposits and Mars analog environments on Earth, and to uncover mineralogical signs of life.

Ryan Hulett recognized by HHMI for early career excellence

Ryan Hulett was selected by the Howard Hughes Medical Institute for the 2023 cohort of Hanna Gray Fellows, a group of 25 outstanding early-career researchers in the biomedical sciences. The fellowship provides financial support of up to $1.5 million for up to eight years, which is intended to extend from postdoctoral training through the early period of a faculty position. Working in Phillip Cleves' lab at Carnegie, Hulett uses symbiotic marine invertebrates, like anemones and corals, which take up algae into their own cells, to understand how intracellular microbes reprogram their host cells' responses to heat stress conditions.

Anirudh Prabhu recognized for early career excellence

Carnegie Research Scientist Anirudh Prabhu was recognized for early career excellence in Earth and space science informatics by the European Geosciences Union (EGU). The EGU selects one researcher in the Earth and Space Science Informatics division to honor with the annual Outstanding Early Career Scientists Award. Prabhu's research focuses on advancing data science by developing and applying analytics and machine learning techniques to answer some of the biggest questions in science.

New Staff Scientists Bring Bold Vision to Earth and Planets Laboratory

In the summer of 2024, Carnegie Science's Earth and Planets Laboratory (EPL) welcomed two exceptional new Staff Scientists whose research will not only shape the future of the division, but also help redefine the field of geology. With expertise that spans the inner workings of our planet to its tectonic surface history—and even to the minerals that power our modern world—Jennifer Kasbohm and Andrea Giuliani bring complementary perspectives and a shared commitment to advancing Earth science through cutting-edge methods, multidisciplinary collaboration, and inclusive leadership.

Jennifer Kasbohm, a self-described "Earth historian," specializes in using isotopic ratios to develop timelines of key geologic events, offering insight into how Earth's interior, surface, oceans, and atmosphere have interacted across time. At Carnegie, she uses fieldwork and laboratory techniques to investigate paleoclimatology, volcanism, and tectonics—helping to answer foundational questions about Earth's past and how it informs the present. Her current research explores the climate effects of large igneous provinces, Earth's magnetic field history, and ancient tectonic dynamics.

Andrea Giuliani, isotope geochemist comes to EPL from a senior scientist role at ETH Zurich, and joined Kasbohm in August of 2024. Giuliani's research focuses on the deep Earth—studying how carbon and other volatile elements move through the planet over time—and the formation of mineral deposits critical to technologies supporting the global energy transition. His prior work includes leading a diamond research group at the University of Melbourne, where he earned his Ph.D.

Giuliani's investigations encompass the origin and evolution of mantle-derived magmas, the genesis of economically significant metals like gold and nickel, and the isotopic "fingerprints" that reveal how Earth's interior has changed over geologic time. He is also developing innovative techniques for measuring isotopic abundances in minerals, pushing the boundaries of geochemistry and cosmochemistry.

With Kasbohm and Giuliani now part of its distinguished team, the Earth and Planets Laboratory is poised to deepen our understanding of Earth's history and future—across scales, disciplines, and generations.

Lorenzo Rosa recognized for early career excellence

Carnegie Staff Associate Lorenzo Rosa was recognized by the Leonardo da Vinci Society for his contributions to science and society in the field of engineering. The Leonardo da Vinci Award was created in 2019 on the 500th anniversary of the famous scientist and artist's death to honor Italian and Italian American early career researchers in the San Francisco Bay Area. Rosa's work aims to analyze environmental challenges and solutions in our food, water, and energy systems.

Four Observatories summer interns recognized for exemplary student research

Four alumni of the Carnegie Astrophysics Summer Internship (CASSI) program were recognized by the American Astronomical Society for exemplary undergraduate student research. The Chambliss Astronomy Achievement Student Awards and Honorable Mentions are given to undergraduate and graduate students who present posters at one of the society's meetings.

The 2024 AAS awardees include Theodore Chawla of Evergreen Valley College (2023); Tiffany Liou of the University of California San Diego (2022); and Kendra Nguyen of Pomona College (2021). Domani Sharkey of Caltech (2023) also received an honorable mention.

Lab manager and technician selected for annual Service to Science Award

Carnegie Science relaunched its long-standing Service to Science awards in 2023, after a brief hiatus due to the Covid-19 pandemic. This prize honors individuals in administrative, technical, or support roles who play a pivotal part in advancing the institution's scientific mission. The 2023 awardees highlighted the contributions of Timothy D. Mock, the Mass Spectrometry Laboratory Manager at Carnegie's Earth and Planets Laboratory, and Lynne Hugendubler, a Lab Technician at the Baltimore campus of Carnegie's Biosphere Sciences and Engineering division.

For 26 years, Mock was instrumental in managing the array of cutting-edge instrumentation at Carnegie's D.C.-based mass spectrometry facility. His expertise solidified the organization's global leadership in the chemical analysis of geologic and cosmic samples. Further, Mock's mentorship and training of generations of scientists ensured the lab's continued success well into the future.

Hugendubler, a cornerstone of Staff Scientist Yixian Zheng's lab for more than 12 years, excels in meticulous lab management and the care of the lab's diverse array of animals—including innovative new model species like the Xenia genus of soft coral. Her dedication to ensuring the lab runs smoothly fosters a positive research environment and empowers scientists to confidently explore bold questions about life on our planet.

Alan Spradling's pioneering stem cell research recognized with Wiley Prize

Allan Spradling, whose research pioneered major advances in stem cell science and reproductive biology, is one of three recipients of the 2024 Wiley Prize in Biomedical Science. The three investigators are recognized for their discovery of the stem cell niche—a micro-environment that controls stem cell identity.

Arthur Grossman recognized for career contributions by the American Society of Plant Biologists and elected to National Academy of Sciences

Arthur Grossman is a plant scientist with expertise ranging from plant biology to marine biology and from microbiology to eukaryotic genomics. He was

recognized by the American Society of Plant Biologists (ASPB) with The Bograd Award as one of more than 18 prizes presented by the ASPB in honor of "meritorious research and service in plant biology." It was established in 2005 to honor its namesake's pioneering photosynthesis research. He was also selected as one of 120 new members of the National Academy of Sciences in recognition of distinguished and continuing achievements in original research. This is one of the highest honors bestowed within the scientific community.

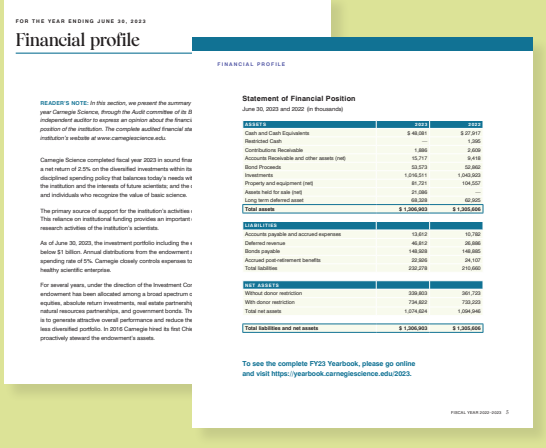
Sara Seagar wins Kavli Prize

MIT Professor and previous Carnegie Science EPL Staff Scientist Sara Seager was a recipient of the 2024 Kavli Prize in Astrophysics. She shared the award with Harvard University's David Charbonneau. They were selected for their groundbreaking work on the discovery and characterization of exoplanets and their atmospheres.

The Kavli Prize is a partnership among The Norwegian Academy of Science and Letters, The Norwegian Ministry of Education and Research, and The Kavli Foundation (USA). Three one-million-dollar prizes are awarded every other year in each of the three fields.

Adrien Burlacot spotlighted by the American Society of Plant Biologists

Adrien Burlacot was one of five early career scientists selected to give spotlight presentations at the American Society of Plant Biologists' centennial annual meeting in the summer of 2024. The ASPB Scholars program honors future leaders in the field who are advancing novel science directions. The recognition highlights those whose work focuses on topics that are unique to plant science, including photosynthesis, plant cell biology, plant genomics, plant cell wall formation, and more.


FOR THE YEAR ENDING JUNE 30, 2023

Financial profile

FINANCIAL PROFILE

Statement of Financial Position

June 30, 2023 and 2022 (in thousands)

	2023	2022
ASSETS		
Cash and Cash Equivalents	$ 46,091	$ 27,917
Restricted Cash	—	1,395
Contributions Receivable	1,886	2,609
Accounts Receivable and other assets (net)	15,717	9,418
Bond Proceeds	53,573	52,992
Investments	1,016,511	1,049,922
Property and equipment (net)	91,721	104,557
Assets held for sale (net)	21,086	—
Long term deferred asset	69,308	62,505
Total assets	$ 1,306,903	$ 1,305,606
LIABILITIES		
Accounts payable and accrued expenses	13,612	10,782
Deferred revenue	46,812	26,886
Bonds payable	146,926	146,885
Accrued post-retirement benefits	22,926	24,107
Total liabilities	232,276	210,660
NET ASSETS		
Without donor restriction	339,803	361,723
With donor restriction	734,822	733,223
Total net assets	1,074,624	1,094,946
Total liabilities and net assets	$ 1,306,903	$ 1,305,606

To see the complete FY23 Yearbook, please go online and visit https://yearbook.carnegiescience.edu/2023.

FISCAL YEAR 2022–2023 3

Financial Profile

Each year Carnegie Science, through the Audit Committee of its Board of Trustees, engages an independent auditor to express an opinion about the financial statements and the financial position of the institution.

The financial profile is made available at: carnegiescience.edu/yearbook/2024.



ADVANCING SCIENCE FUTURE

New Tools, Timeless Questions

Carnegie expands EPL's research capabilities.

If rocks could talk, the ones at Carnegie's Earth and Planets Laboratory would have some incredible stories to tell—from the birth of the Solar System to the forces shaping our planet's interior today. Whether they're analyzing ancient meteorites, tracing the chemistry of deep mantle magmas, or simulating the conditions of planetary interiors, EPL scientists are uncovering the narratives hidden in planetary materials, one element at a time.

Above, Laboratory Engineer, Javier Rojas, tunes and calibrates the 110-ton Rockland multi-anvil press as Instrumentation Engineer Joseph Lai and Anne Pommier look on.

That kind of discovery takes more than curiosity—it takes access to some of the most advanced scientific tools in the world. At EPL, researchers are empowered to follow their boldest ideas, thanks in part to the division's unparalleled suite of instrumentation.



Javier Rojas works with the Paris-Edinburgh press.

> ...understanding a planet's past isn't just about knowing when things happened—it's also about understanding how. That's where EPL's legacy in high-pressure experimentation comes in.

Now, two ambitious initiatives aim to push those capabilities even further: a major renovation of EPL's Geochemistry Building and the construction of a one-of-a-kind experimental press. These upgrades represent more than new equipment—they're strategic investments in discovery, designed to ensure that scientists have the tools they need to explore bold new ideas.

"These investments aren't simply about new equipment or labs," says EPL Director Michael Walter. "They continue more than a century of Carnegie's leadership in experimental geology, petrology, geochemistry, and planetary science—now amplified to tackle a new generation of challenges." Building on two of Carnegie's deepest scientific traditions—isotope geochemistry and high-pressure experimentation—these enhancements will enable researchers to better uncover the when and how of our planet's past.

Precision: Unlocking Earth's History with Atomic Clocks

At EPL, rocks aren't just storytellers—they're timekeepers. With the right tools, scientists can read the isotopic signatures hidden inside minerals and meteorites like they're timestamps, revealing when and how they formed. This allows researchers to reconstruct key events across Earth's history: from mass extinctions and volcanic cataclysms to the formation of continents and the chemistry of the early Solar System.

Carnegie is a longstanding leader in the fields of geochemistry and cosmochemistry, pioneering analytical techniques that revealed water in Apollo Moon rocks, traced Earth's deepest diamonds, and analyzed grains of dust older than our Sun. That work continues today—and is about to get a powerful upgrade.

A major renovation of EPL's Geochemistry Building, led by EPL's newest Staff Scientists, Andrea Giuliani and Jennifer Kasbohm, will usher in an era of geochronology research at Carnegie. Geochronology—the science of telling time in rocks by quantifying radioactive decay occurring inside minerals—allows scientists to report on the timing, duration, and rate of changes over deep time. Outfitted with advanced clean labs and state-of-the-art mass spectrometers, the facility will support research that quantifies rates of past climatic shifts, plate



Cyclotron Building on the Broad Branch Road Campus.

tectonics, volcanic eruptions, mantle processes, and how quickly life on Earth responded to these events.

"Carnegie Science has a long legacy of contributing major innovations in geochronology and isotope geochemistry, and Andrea and I are thrilled to continue this work," says Kasbohm. "Our new clean lab and thermal ionization mass spectrometer will make EPL one of 15 or so labs in the world that produce ages for rocks with incredibly high precision, allowing us to disentangle cause-and-effect relationships across the Earth system."

But understanding a planet's past isn't just about knowing when things happened—it's also about understanding how. That's where EPL's legacy in high-pressure experimentation comes in.

Pressure: Seeing Rocks Under Pressure—in a Whole New Light

For over a century, Carnegie scientists have pioneered high-pressure research, replicating the intense conditions found deep within Earth and other rocky planets. These experiments reveal how minerals transform at depth, how fluids migrate through the mantle, and how planetary interiors change as they cool.

Now, experimental geophysicist Anne Pommier is building on that legacy in a bold new way. She's leading the development of a first-of-its-kind press that will allow researchers to apply extreme pressures and temperatures to rock samples while simultaneously measuring their electrical conductivity, seismic wave velocities, and chemical transformations. What sets this press apart is its integrated suite of tools: X-ray imaging, electrical impedance measurements, and Raman spectroscopy. Together, they will enable scientists to observe both structural and chemical changes in real time as samples respond to conditions mimicking those of planetary interiors.

While some of these measurements are possible at specialized research facilities known as

EPL Staff Scientists





From left to right: Anne Pommier, Jennifer Kasbohm, and Andrea Giuliani.

synchrotrons—massive circular particle accelerators that generate powerful X-rays to probe geomaterials—they come with challenges. Experiments must be scheduled far in advance, access to the instruments is limited to a few days, and researchers often need to transport and test as many samples as they can to make the most of their time.

Carnegie's new press will eliminate those logistical hurdles by bringing these capabilities together in-house for the first time, making complex experiments with multiple probes more accessible, efficient, and reproducible. "What we're building at EPL will allow us to do all of it—seismic, electrical, chemical—in one experiment, in our own lab," said Pommier. "It changes the scale of what we can discover."

If all goes to plan, the new press will allow researchers to work on experiments over the course of days, weeks, and even months without the pressure of a ticking clock. It will also have the added benefit of opening up time for Carnegie researchers to better train the postdoctoral fellows who work with them. "It's truly the best way to conduct high-quality research," says Pommier.

Generously supported by The Brinson Foundation, this interdisciplinary project combines EPL's unique cross-disciplinary expertise in geophysics, seismology, and petrology. "Anne's work precisely aligns with our mission to support innovative, high-risk research with extraordinary potential," says Jamie Bender, Senior Program Officer at The Brinson Foundation. "This instrument could revolutionize high-pressure geophysical research across the globe."

Possibility: Turning Curiosity into Discovery

The renovated geochemistry facilities are expected to be operational by early 2026, with the high-pressure instrument partially online by the end of 2025 and fully operational by the end of 2026.

Once in place, these transformative upgrades will expand EPL's capabilities for generations of scientists to come. They'll empower researchers to follow their curiosity wherever it leads and move faster from spark to discovery. Because at Carnegie Science, our experts aren't afraid to ask big questions—or build the tools to answer them.

Carnegie Champions

Together we can shape the future of science.

Carnegie Science has been at the forefront of transformative discovery for over a century, unlocking the secrets of genomes, ecosystems, planets, and the cosmos. But even the boldest science needs champions.

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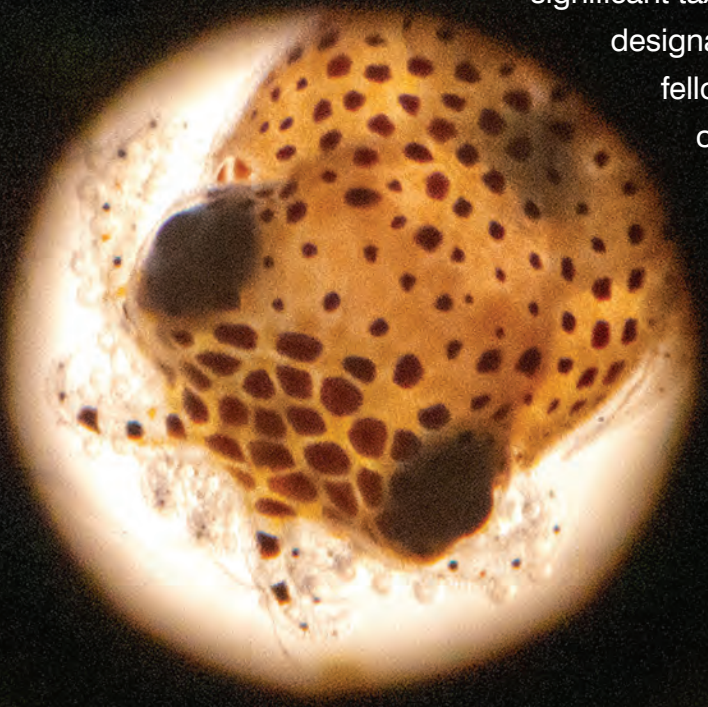
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