RESEARCH CORPORATION
for SCIENCE ADVANCEMENT

Creating Inclusive Communities

2023 Annual Report

Letter from the President

Research Corporation has long strived to advance the scientific enterprise through collaboration across what are all too often disciplinary and methodological barriers. We do this by creating and fostering networks of faculty in chemistry, physics, astronomy, and overlapping fields, and by providing opportunities for these scientists to share ideas on research and teaching. Through the conferences and collaborations we support, we see colleagues with different perspectives and approaches combining to tackle important problems in novel ways, questioning assumptions that might limit new thinking, and stimulating each other to tackle more daring projects in research and in helping students learn.

The questions asked and the perspectives brought to bear on research and teaching greatly depend on the backgrounds of the individuals involved. What someone finds curious or important might not have initially triggered the imagination of someone else. In communities in which everyone can participate equally, creativity can be sparked through conversations that share ideas, and what seemed too risky might become more feasible to pursue when scientists who complement (and compliment) each other get together.

As a foundation that aims to develop these communities, we feel it is our responsibility to identify and support a wide range of faculty in the physical sciences. We want to see broad representation around the table, and a spirit of openness that encourages everyone to propose new directions and collaborations. Diversity (in its many meanings) and inclusion (helping everyone in the community feel confident that their ideas are welcome) are essential. The most significant challenges are too large and too complex to do otherwise.

In 2023, RCSA began two new efforts to broaden participation in our programs. In February, we named the inaugural recipients of our Holland Award, in memory of former Board Director Bob Holland, to recognize outstanding scientists who share our values of more diverse and inclusive physical sciences communities. In December, we launched the RCSA Fellows initiative, which aims to promote the transition of underrepresented scientists from postdoctoral training to independent teacher-scholar positions. We thank the groups of Cottrell Scholars who first proposed the Holland Award, and those who thought of and tested out the initial components of the RCSA Fellows program through a collaborative project.

We are excited and fully expect that our communities of Cottrell Scholars (including Holland Awardees), Scialog Fellows, and now RCSA Fellows will help transform both science and the ways we do science in research and teaching. This annual report highlights many of the advances made in these programs over the past year and should give us confidence about the years ahead.

Daniel Linzer
President & CEO
Research Corporation for Science Advancement

RCSA Fellows Initiative: Addressing a Critical Transition

For students who envision careers in the physical and life sciences, the pathway is long: Undergraduate studies are typically followed by graduate school and one or more appointments as a postdoctoral fellow, positions in which trainees are guided by established scientists. At each step, experienced teachers act as mentors and role models.

But for the biggest leap – the transition from supervised to independent research – early-career scientists are typically on their own.

Applying for faculty positions, interviewing, negotiating appointment details, often moving to a new city and institution, and setting up a research group can be exhilarating but can also be extremely stressful for postdoctoral scholars. Imposter syndrome can take hold. Making decisions, after years of final authority resting with a supervisor, can be daunting.

Those on faculty search committees or those formulating offers might expect the best future scientists and faculty colleagues to be the best prepared at this transition stage, and that – especially in the sciences – this is a highly meritocratic process. Certainly, many postdocs shine brightly, are hired, and go on to tremendous success. Others with talent and drive might not present themselves as compellingly, however, and might be left on the sidelines of a playing field that is not as level as in an ideal world.

The hiring process can be riddled with unwritten rules, and not every candidate has access to the same professional networks or comes from an institution that traditionally launches academic careers.

The interview process can present further pitfalls for institutions trying to hire faculty who will excel as independent scientists. Self-confidence in an interview is not necessarily the same as ability; success on a project designed by a senior scientist might not predict who will identify and pursue promising new research directions; and cultural "fit" with a department might not be immediately evident.

Various initiatives have aimed to address the challenges of this critical transition, including a **Cottrell Scholar Collaborative** project that RCSA funded in 2019. Led by CS 2006 **Keivan Stassun**, Physics, Vanderbilt University, the project provided postdoctoral fellows in the physical sciences from underrepresented backgrounds – those for whom the playing field is often least level – with the opportunity to go through a full mock faculty interview at another institution. At the same time, it gave host departments the incentive to consider how they do or do not create welcoming environments for potential colleagues, and to translate those analyses into procedural and cultural change if needed.

Based on the promise of the collaborative project, RCSA began accepting applications in December 2023 for the first cohort of participants in its **RCSA Fellows** initiative, a new effort to increase faculty diversity in the physical sciences in the U.S. and Canada through job search preparation and community building.

The initiative, led by Program Director and CS 1995 **Eileen M. Spain**, will support the academic career advancement of a group of postdoctoral scholars over a multi-year trajectory as they are preparing to look for faculty positions, as they are actively interviewing, and during their first year as newly independent tenure-track faculty investigators.

Year one of the initiative will include mock interviews and structured feedback, with the addition of an annual meeting. Year two will provide mentoring throughout the search and negotiation process, with year one and year two fellows coming together at the annual meeting. In year three and beyond, first-year, tenure-track assistant professors who have participated in year one and two will serve as peer mentors to those following them. RCSA will guide participating host institutions in sharing their challenges and best practices in working toward inclusivity.

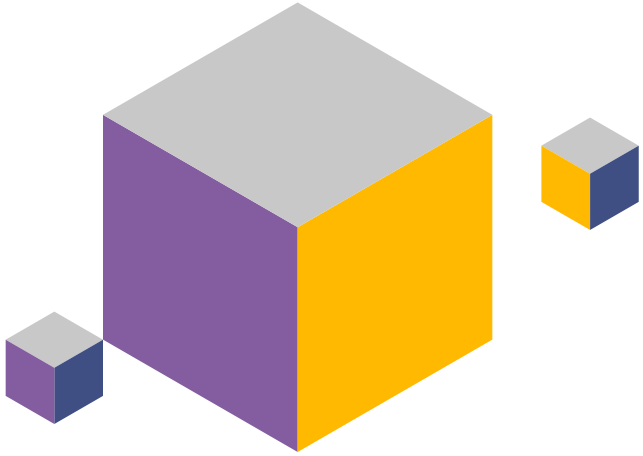
All too often, underrepresented faculty can feel isolated in a new department. RCSA's aim is to create cohorts of promising teacher-scholars who can turn to each other as part of a mutual support network that will enhance their ability to progress in – and fully enjoy – their independent academic careers.

2023 Awards

In 2023, Research Corporation for Science Advancement supported early career scientists at colleges and universities in the United States and Canada through two core programs: the Cottrell Scholar Program and Scialog.

The **Cottrell Scholar Program** develops outstanding teacher-scholars recognized by their scientific communities for the quality of their research programs, innovation in education, and potential for academic leadership. In 2023, Cottrell Scholar Program funding included $2,600,000 for 26 initial Cottrell Scholar Awards, $100,000 for Cottrell Scholars Collaborative Awards, and $215,000 for Cottrell Plus Awards, which include the competitive SEED, STAR and IMPACT awards. The inaugural year of our new Holland Awards welcomed six senior scholars to the Cottrell Scholar Community with awards totaling $30,000, while the second year of our Cottrell Postbac Awards supported seven Cottrell Scholars with awards totaling $350,000. One Cottrell Scholar received $5,000 to fund a regional meeting.

Scialog promotes dialogue and community building to catalyze transformational science through collaborative, interdisciplinary research. In 2023, RCSA awarded $1,049,000 to early career scientists for research through Scialog Collaborative Innovation Awards. Partner philanthropies – which in 2023 included the Azrieli Foundation, the Paul G. Allen Frontiers Group, the Canadian Institute for Advanced Research (CIFAR), the Chan Zuckerberg Initiative, ClimateWorks Foundation, the Frederick Gardner Cottrell Foundation, the Heising-Simons Foundation, The Kavli Foundation, NASA, the PCLB Foundation, the Alfred P. Sloan Foundation, the U.S. Department of Agriculture, and Walder Foundation – contributed a further $5,244,500 toward Scialog awards.

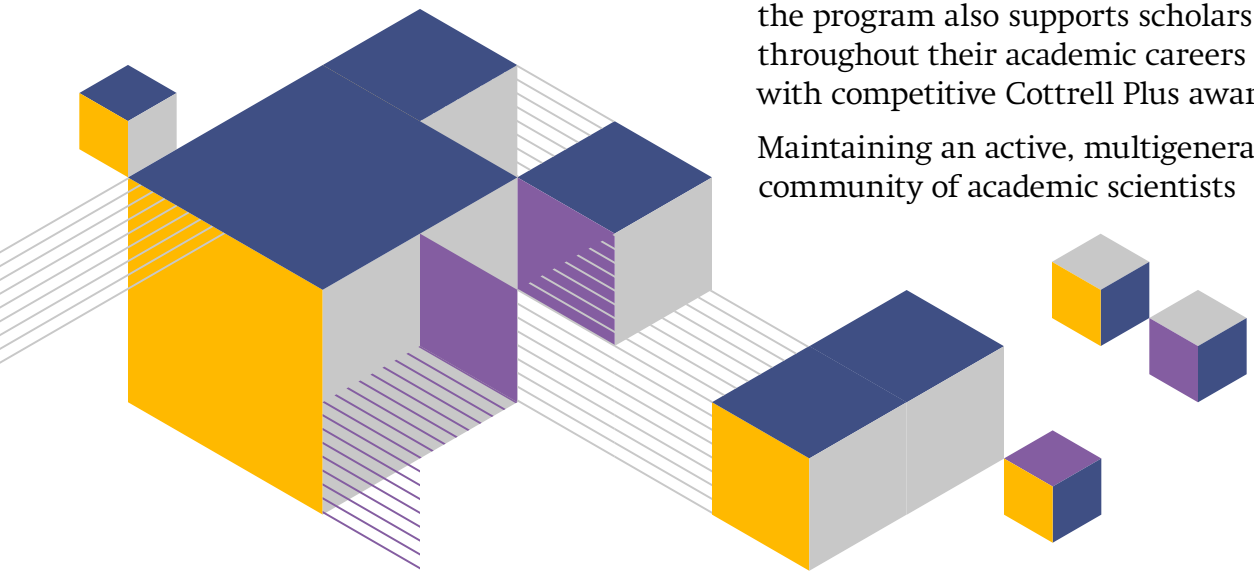


Cottrell Scholar Program

The Cottrell Scholar Program, started in 1994, champions the very best early career teacher-scholars in chemistry, physics, and astronomy by providing significant discretionary awards for research and by nurturing a community of outstanding leaders in science, education, and academia. Although the Cottrell Scholar Award is the entry point to this interdisciplinary community, the program also supports scholars throughout their academic careers with competitive Cottrell Plus awards.

Maintaining an active, multigenerational community of academic scientists is a unique aspect of the Cottrell Scholar program. Cottrell Scholars engage in an annual networking event, providing them an opportunity to share insights and expertise through the Cottrell Scholars Collaborative.

In 2023, the Cottrell Scholar community welcomed six senior scientists as the inaugural recipients of RCSA's new Robert Holland Jr. Award for Research Excellence and Contributions to Diversity, Equity, and Inclusion.



"This community offers many opportunities for leadership. I wouldn't be in my current position without having been a Cottrell Scholar."

Cottrell Scholar 2003 **Mike Hildreth**, *Dean of the Graduate School, Associate Provost and Vice President for Graduate Studies, and Professor of Physics and Astronomy at the University of Notre Dame*

Cottrell Scholar Awards

$100,000 is awarded to each scholar for a total of $2,600,000

Daniel Anglés-Alcázar
Astronomy,
University of Connecticut
Multi-Scale Physics of Supermassive Black Hole Growth and Feedback in Galaxies and Fundamental Implications in Cosmology

Ambika Bhagi-Damodaran
Chemistry, University of Minnesota Twin Cities
Reprogramming Hypoxia Signaling in Laboratory and Inorganic Chemistry Education in Classrooms

Christopher Durr
Chemistry,
Amherst College
Exploring the Synthesis and Mechanism of Single-Site and Cationic Group V Catalysts for the Production of Biodegradable Polymers

Sarah Ballard
Astronomy,
University of Florida
A Window into Day and Night: Constraining Nodal Precession of Temperate Planets Around Small Stars

Matthew Caplan
Physics,
Illinois State University
Impacts of Central Primordial Black Holes on Stellar Evolution

Megan Fieser
Chemistry, University of Southern California
Controlling the Product Selectivity for the Catalytic Dechlorination of Poly (Vinyl Chloride)

Cacey Bester
Physics,
Swarthmore College
Creep Across Scales: The Role of Disturbances on Creep in Disordered Media

Javier Duarte
Physics, University of California, San Diego
Building a Better Foundation: Teaching Physicists and Machines How to Learn from Data

Ronit Freeman
Chemistry, University of North Carolina at Chapel Hill
Forming Connections: From Interacting Self-Assembled Hubs to TACtICS (Teaching Convergence to Increase Innovation in Science) for Undergraduates

Graham Giovanetti

Physics,
Williams College

A Study of Single Electron Backgrounds in a Low-Threshold Argon Detector

Mark Herzik

Chemistry, University of California, San Diego

Next-Generation Electron Microscopy—Visualizing Enzymes in Action and Development of Hands-On Curriculum

Lydia Kisley

Physics, Case Western Reserve University

Imaging the Physical Dynamics of Analytes in Commercial Separation Materials and Using Core Facilities in the Classroom

Vera Gluscevic

Astronomy, University of Southern California

Discovering Dark Matter with Cosmology

Mark Ilton

Physics,
Harvey Mudd College

The Physical Principles Governing High-Rate and Large Deformation Elastic Recoil

David Leitch

Chemistry,
University of Victoria

Building Universal Quantitative Models for Catalysis from the Bottom Up, and Building Connections in Undergraduate Organic Chemistry Education

Ling Hao

Chemistry, George Washington University

Capturing Molecular Communications Using Mass Spectrometry and Enhancing Science Communication in Chemistry Education

Sarah King

Chemistry,
University of Chicago

Directing Energy and Charge Transfer in Molecular Moiré Materials

Allegra Liberman-Martin

Chemistry,
Chapman University

Broadening Applications of the Weakly Coordinating Triflimidate Anion in Main Group Catalysis

Kristen McQuinn

Astronomy,
Rutgers University

The Smallest Galaxies Hold the Biggest Clues for Understanding Galaxy Formation and Cosmology

Chanda Prescod-Weinstein

Physics,
University of New Hampshire

Searching for a Vibrant Dark Sector

Julian West

Chemistry,
Rice University

Sustainable Difunctionalization of Alkenes Via Bio-Inspired Radical Ligand Transfer and Training Scientists to Engage with the Greater Public

Alison Patteson

Physics,
Syracuse University

Soft Matter Physics of Biofilm Growth: A New Role of Substrate Viscoelasticity in Biofilm Growth

Noel Richardson

Astronomy, Embry-Riddle Aeronautical University

Massive Binaries Have an Important Impact on Both Their Environments and on Undergraduate Education

Christopher Whidbey

Chemistry,
Seattle University

Illuminating the Dark Proteome: ABPP for High-Throughput Experimental Characterization of Proteins

William Pfalzgraff

Chemistry,
Chatham University

Enhancing Reactivity and Selectivity at Polarized Interfaces

Daniel Tabor

Chemistry,
Texas A&M University

Intelligent Optimization of Organic Photophysical Chemical Spaces

Cottrell Scholars Collaborative Awards

At the annual Cottrell Scholar Conference, participants are encouraged to form teams and develop collaborative projects with potential national impact in science education. Through the Cottrell Scholars Collaborative program, RCSA gave awards of $25,000 each to four projects in 2023 focused on the conference theme of incentivizing cultural change in academia.

Academic Leadership Training 2.0 (ALT)

A 2014 Cottrell Scholars Collaborative grant helped launch a unique and well-regarded series of leadership workshops to help participants advance through their paths in the physical sciences as department chairs, deans, provosts, or center directors. **Academic Leadership Training** workshops were held in person annually at the American Chemical Society headquarters in Washington, D.C., from 2016 to early 2020, and virtually in 2021. This project aims to restart the popular workshops by piloting a new "host institution" model, built from a consortium of universities and colleges who see the value in academic leadership development, putting the training program on a long-term path to sustainability.

Lead Cottrell Scholar:

Rigoberto Hernandez
Chemistry, Johns Hopkins University

Co-Leads:

Karen Bjorkman
Astronomy, University of Toledo

Peter Dorhout
Chemistry, Iowa State University

In collaboration with additional Cottrell Scholars:

Stephen Bradforth
Chemistry, University of Southern California

Seth Cohen
Chemistry, University of California, San Diego

Jen Heemstra
Chemistry, Washington University in St. Louis

Michael Hildreth
Physics, University of Notre Dame

Adam Leibovich
Physics, University of Pittsburgh

George Shields
Chemistry, Furman University

CONTOUR-A: Cross-Organizational Network for Tools to Optimize Undergraduate Research in Astronomy

Unprecedented growth in the number of astronomy and physics majors at colleges and universities across the country has challenged the ability of STEM faculty to provide inclusive access to genuine, in-depth undergraduate research experiences, and to support students in building the valuable skills, such as coding and public speaking, that research naturally develops. This collaboration of Cottrell Scholars in astronomy and physics from research universities and primarily undergraduate-serving institutions aims to evaluate and curate a repository of teaching materials and resources that can be shared widely to help stretched-thin faculty accommodate growing student needs.

Lead Cottrell Scholar:

Rachel Bezanson
Astronomy, University of Pittsburgh

In collaboration with additional Cottrell Scholars:

Darcy Barron
Physics, University of New Mexico

Laura Blecha
Physics, University of Florida

Laura Chomiuk
Astronomy, Michigan State University

Ilse Cleeves
Astronomy, University of Virginia

Kate Follette
Astronomy, Amherst College

Carla Fröhlich
Physics, North Carolina State University

Eilat Glikman
Physics, Middlebury College

Vera Gluscevic
Astronomy, University of Southern California

Britt Lundgren
Astronomy, University of North Carolina at Asheville

Noel Richardson
Astronomy, Embry-Riddle Aeronautical University

Leslie Rogers
Astronomy, University of Chicago

Ryan Trainor
Astronomy, Franklin & Marshall College

Jessica Werk
Astronomy, University of Washington

Gail Zasowski
Astronomy, University of Utah

Hidden Figures in Physics and Astronomy: Highlighting Scientists from Marginalized Backgrounds in Course Lectures

Learning about the contributions of historically marginalized physicists and astronomers can help foster a sense of belonging among students from those groups, increasing their retention in STEM studies. It can also create a more holistic and diverse view of scientists among people outside STEM fields. This collaborative aims to create an online, searchable catalog of information about diverse role models in science to help instructors at the high school and college levels more easily incorporate into their lectures the contributions of Black, brown, women, LGBTQ+, people with disabilities, and others who may not be well known.

Lead Cottrell Scholar:

Javier Duarte
Physics, University of California, San Diego

In collaboration with additional Cottrell Scholars:

Kathy Aidala
Physics, Mount Holyoke College

Mario Affatigato
Physics, Coe College

Wen-fai Fong
Astronomy, Northwestern University

Mark Ilton
Physics, Harvey Mudd College

Catherine Kealhofer
Physics, Williams College

Lydia Kisley
Physics, Case Western Reserve University

Ryan Trainor
Astronomy, Franklin & Marshall College

Gail Zasowski
Astronomy, University of Utah

Lead Better, Disrupt Barriers, and Have an Impact

Bringing change to academia can be a slow and complex process, but Cottrell Scholars Collaboratives and leadership workshops have helped advance the community's efforts. Over the years, many Cottrell Scholars have taken on positions of administrative leadership, while others have become academic leaders with networks and abilities to get things done. This project aims to craft a book on best practices of leadership, leveraging the experience and promoting the values of the Cottrell Scholar community. The book will be publicly available for download on the RCSA website and distributed at RCSA-supported workshops.

Lead Cottrell Scholar:

Jennifer Ross
Physics, Syracuse University

In collaboration with additional Cottrell Scholars and Holland Awardees:

Kathy Aidala
Physics, Mount Holyoke College

Penny Beuning
Chemistry, Northeastern University

Karen Bjorkman
Astronomy, University of Toledo

Linda Columbus
Chemistry, University of Virginia

Charlie Doret
Physics, Williams College

Carla Fröhlich
Physics, North Carolina State University

Jason Gillmore
Chemistry, Hope College

Boyd Goodson
Chemistry, Southern Illinois University Carbondale

Theodore Goodson
Chemistry, University of Michigan

Natalie Gosnell
Physics, Colorado College

Jen Heemstra
Chemistry, Washington University in St. Louis

Rigoberto Hernandez
Chemistry, Johns Hopkins University

Mike Hildreth
Physics, University of Notre Dame

Malika Jeffries-EL
Chemistry, Boston University

Adam Leibovich
Physics, University of Pittsburgh

Jane Liu
Chemistry, Pomona College

Gina MacDonald
Chemistry, James Madison University

Alison Patteson
Physics, Syracuse University

Rae Robertson-Anderson
Physics, University of San Diego

Claire Till
Chemistry, Humboldt State University

Rory Waterman
Chemistry, University of Vermont

Amanda Wolfe
Chemistry, University of North Carolina at Asheville

2023 Cottrell Scholars and Holland Awardees in Tucson.

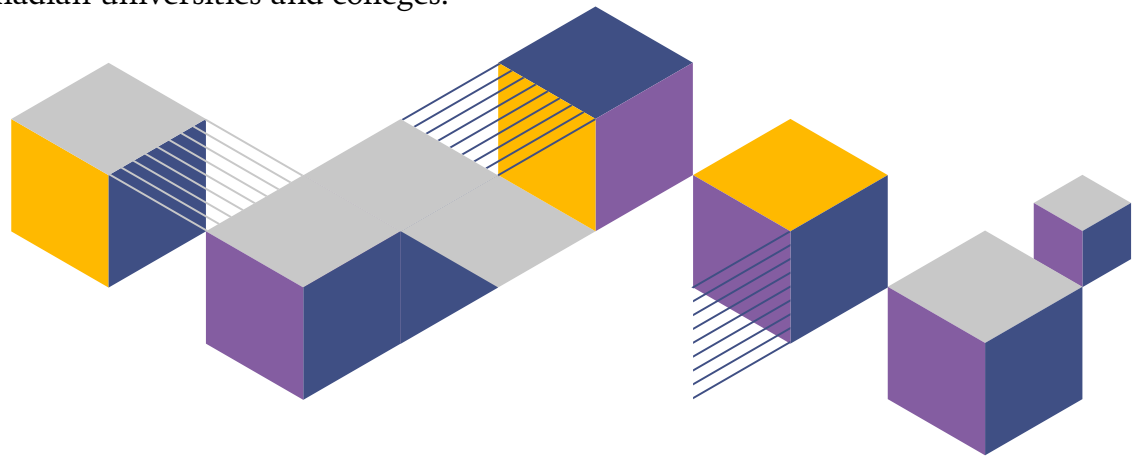
Cottrell Plus Awards

As their scientific careers advance, Cottrell Scholars are eligible to receive post-tenure Cottrell Plus Awards to further support their research and educational activities. In 2023, SEED, STAR, and IMPACT awards were given.

SEED (Singular Exceptional Endeavors of Discovery) Awards are competitive grants to launch new projects in research at $50,000 each or education at $25,000 each. In 2023, all SEED awards were for research.

STAR (excellence in Science Teaching and Research) Awards of $5,000 recognize the outstanding research and educational accomplishments of Cottrell Scholars and encourage the improvement of science education at American and Canadian universities and colleges.

IMPACT Awards of $5,000 recognize the work of a Cottrell Scholar who has had a national impact in science through their leadership and service activities.



Cottrell Plus Awardees

SEED

Tamara Bogdanović
Cottrell Scholar 2016
Astronomy, Georgia Institute of Technology
Risk and Rewards: Pushing Boundaries with RMHD Simulations of Multimessenger Massive Black Hole Binaries

SEED

Mary Putman
Cottrell Scholar 2007
Astronomy,
Columbia University
Mapping Magnetic Fields with Atomic Filaments in Nearby Galaxies

STAR

Linda Columbus
Cottrell Scholar 2010
Chemistry,
University of Virginia

SEED

Henriette Elvang
Cottrell Scholar 2013
Physics,
University of Michigan
Pushing Boundaries: Unitarity and Coupling Renormalization

SEED

Sergei Urazhdin
Cottrell Scholar 2008
Physics,
Emory University
Are Correlated Metals Failed Superconductors?

STAR

T. Daniel Crawford
Cottrell Scholar 2003
Chemistry,
Virginia Polytechnic and State University

IMPACT

Mark Bussell
Cottrell Scholar 1994
Chemistry,
Western Washington University

Robert Holland Jr. Awards

Six senior scientists with impressive records of scholarship, leadership, and impact received the inaugural **ROBERT HOLLAND JR.** Award for Research Excellence and Contributions to Diversity, Equity, and Inclusion. The awards welcome recipients as full members of the Cottrell Scholar community and come with a $5,000 cash prize.

Raychelle Burks
Chemistry,
American University

Ted Goodson
Chemistry,
University of Michigan

Luis Colón
Chemistry,
University at Buffalo

Malika Jeffries-EL
Chemistry,
Boston University

Robert Gilliard
Chemistry,
Massachusetts Institute of Technology

Jane Liu
Chemistry,
Pomona College

Cottrell Postbac Awards

In 2023, RCSA offered a second year of these awards to strengthen Cottrell Scholar research programs disrupted by the pandemic. Seven Cottrell Scholars received awards of $50,000 to provide undergraduate seniors working under their supervision the opportunity to continue a research project for a year after graduation.

Fadi Bou-Abdallah (postbac **Maximilian Beyer**)
Chemistry, SUNY Potsdam
Development of a Colorimetric Sensor Based on Gold Nano-particles for the Detection of Proteins and Toxic Metals

David Egolf (postbac **Nicolas Bocock**)
Physics, Georgetown University
Nonlinear Dynamical Analysis of Epiphanies in Deep Learning

John Gibbs (postbac **Kodie Rodman**)
Physics, Northern Arizona University
Topologically Induced Surface Plasmon Resonances in Hybrid Nanomaterials

Lelia Hawkins (postbac **Eleanor Bentley**)
Chemistry, Harvey Mudd College
Supporting the Creation of the US Atmospheric Science and Chemistry mEasurement NeTwork (ASCENT)

Aaron Leconte (postbac **Marcell Simon**)
Chemistry, Scripps College
High-Throughput Approaches to Biochemically Characterizing the C-terminal Domain of Firefly Luciferase

Tyler Luchko (postbac **Noah Pishaki**)
Physics, California State University, Northridge
Investigating the Effects of Low Ion Concentration on RNA Stability with Hybrid Monte Carlo and the Molecular Theory of Solvation

Rae Robertson-Anderson (postbac **Maya Hendija**)
Physics, University of San Diego
Interdisciplinary Collaborative Research to Create Force-Generating Bio-Synthetic Materials and Build a Foundation for a Career in Industry

Cottrell Scholar Regional Meetings

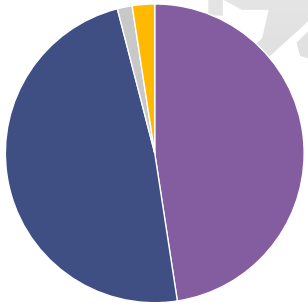
RCSA makes funds available to Cottrell Scholars who wish to host one-day regional meetings at their institutions to discuss research, teaching, and career development. In 2023, RCSA awarded $5,000 for one regional meeting.

Rae Robertson-Anderson
Physics, University of San Diego
Frontiers of Soft Matter and Macromolecular Networks

Cottrell Scholar Awards
2019-2023

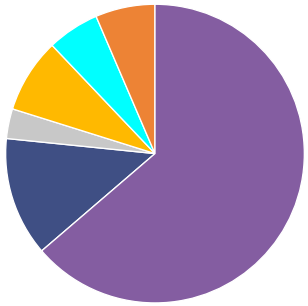
Gender

- Female **47.58%**
- Male **48.39%**
- Decline or not collected **1.61%**
- Other **2.42%**



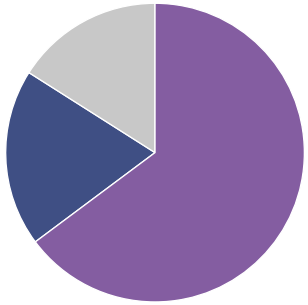
Ethnicity

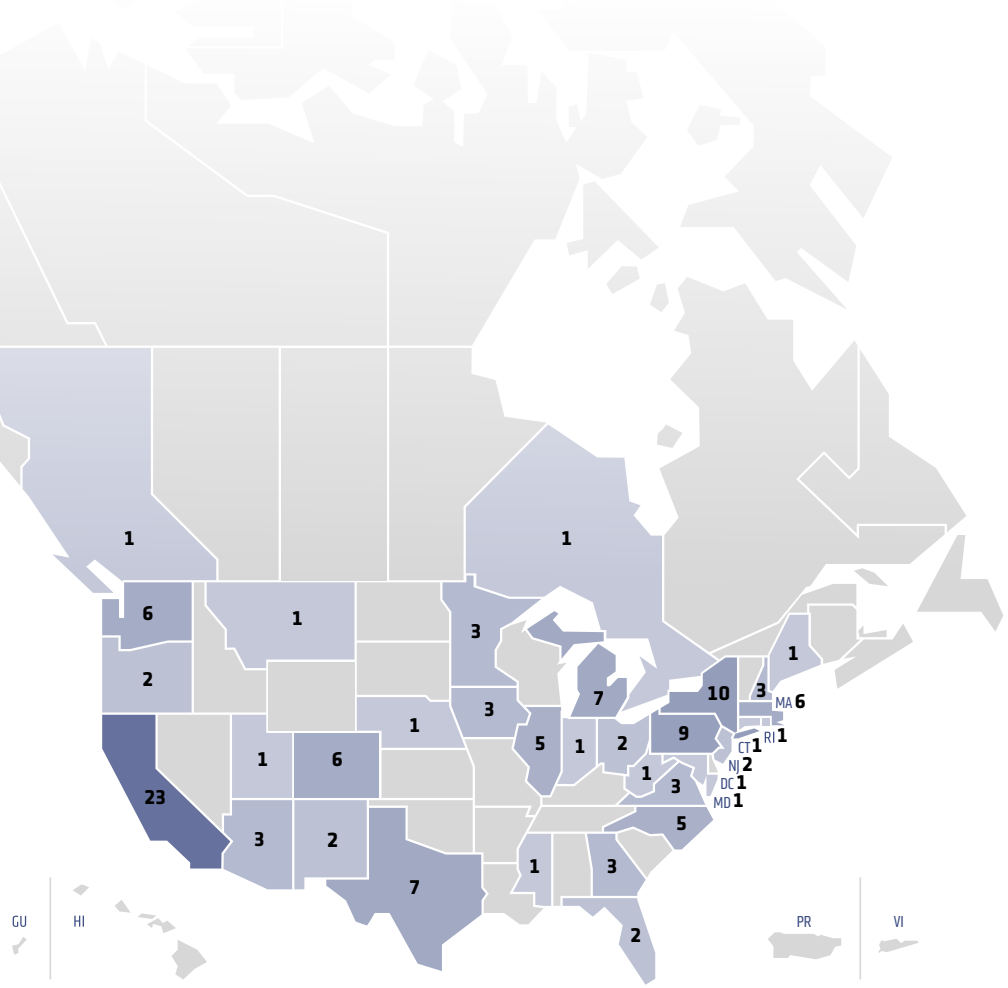
- White **63.71%**
- Asian **12.90%**
- Decline or not collected **3.23%**
- Hispanic or Latino **8.06%**
- Black or African American **5.65%**
- Mixed/Other **6.45%**
- American Indian / Alaskan Native / Native Hawaiian / Indigenous Pacific Islander **0%**



Institution Type

- Research 1 University **81**
- Other **24**
  Includes R2, R3, Comprehensive, and NA
- Primarily Undergraduate Institution **20**





Geographical Distribution

Arizona **3**
British Columbia **1**
California **23**
Colorado **6**
Connecticut **1**
Florida **2**
Georgia **3**
Illinois **5**
Indiana **1**
Iowa **3**
Maine **1**
Maryland **1**
Massachusetts **6**
Michigan **7**
Minnesota **3**
Mississippi **1**
Montana **1**
Nebraska **1**
New Hampshire **3**
New Jersey **2**
New Mexico **2**
New York **10**
North Carolina **5**
Ohio **2**
Ontario **1**
Oregon **2**
Pennsylvania **9**
Rhode Island **1**
Texas **7**
Utah **1**
Virginia **3**
Washington **6**
Washington DC **1**
West Virginia **1**

Scialog

The Scialog program was created in 2010 by RCSA, which oversees its administration. Scialog—short for "science + dialog"—funds early career scientists to pursue transformative research with their fellow grantees on crucial issues of scientific inquiry. Scialog initiatives are a multi-year thematic investment, in which around 50 early career Scialog Fellows, facilitated by a group of leading scientists, convene annually to discuss cutting-edge multidisciplinary themes and propose high-risk collaborative projects.

"To me, Scialog is best described as the mashup of a scientific conference, round table discussion, poster session, speed dating event with algorithmic matching, and Shark Tank episode. It's great fun."

Josh Brake, 2022 ABI Awardee

Scialog Collaborative Innovation Awards

$6,293,500 awarded to early career scientists for research through these six multi-year programs.

RCSA convened six in-person Scialog conferences in 2023. RCSA along with its funding partners provided a total of $6,293,500 in seed funding for collaborative team projects. Individual awards are $50,000 each in direct costs.

Signatures of Life in the Universe

Goal: To catalyze cutting-edge research with the potential to transform our understanding of the habitability of planets, of how the occurrence of life alters planets and leaves signatures, and of how to detect such signatures beyond Earth.

Funding: Provided by RCSA, the Heising-Simons Foundation, The Kavli Foundation, and NASA.

Microbiome, Neurobiology and Disease

Goal: To catalyze interdisciplinary teams including chemists, physicists, biologists and neurophysiologists to collaborate on new projects to advance fundamental understanding of the gut-brain axis and the roles microbiota play in neurodegenerative disorders.

Funding: Provided by RCSA, the Paul G. Allen Frontiers Group, the Frederick Gardner Cottrell Foundation, and Walder Foundation.

Advancing BioImaging

Goal: To catalyze early career chemists, physicists, biologists, bioengineers, and medical imaging specialists to collaborate on new and innovative projects to accelerate the development of the next generation of imaging technologies.

Funding: Provided by RCSA, the Chan Zuckerberg Initiative, the Frederick Gardner Cottrell Foundation, and Walder Foundation.

Mitigating Zoonotic Threats

Goal: To catalyze multidisciplinary teams of early career scientists to launch new research in the detection and mitigation of emerging animal-borne infectious diseases.

Funding: Provided by RCSA and the U.S. Department of Agriculture.

Molecular Basis of Cognition

Goal: To catalyze teams of researchers working across disciplines, including neurobiology, neuroscience, and related cognitive sciences, to devise new ways to probe the chemistry, biology, physics, and computational science that underlie memory and other cognitive processes.

Funding: Provided by RCSA, the Frederick Gardner Cottrell Foundation, the Azrieli Foundation, The Kavli Foundation, and Walder Foundation.

Negative Emissions Science

Goal: To catalyze chemists, engineers, environmental scientists and those in related fields to collaborate on innovative projects to advance fundamental understanding of capturing and utilizing or sequestering carbon and other greenhouse gases in the atmosphere and oceans.

Funding: Provided by RCSA, the Alfred P. Sloan Foundation, and ClimateWorks Foundation.

Signatures of Life in the Universe
Year 3

Morgan Cable[4]
Planetary Science Section, NASA Jet Propulsion Laboratory / California Institute of Technology

Nagissa Mahmoudi[1]
Earth & Planetary Sciences, McGill University
The Power is in the Poop: Experimental Investigation of Microbially-Generated Organics as a Biosignature for Ocean Worlds

Jennifer Bergner[1]
Chemistry, University of California, Berkeley

Christopher Glein[1]
Space Science Division, Southwest Research Institute

Renyu Hu[4]
Astrophysics & Space Sciences, Jet Propulsion Laboratory
A Close Look at the Habitability of Water Worlds

Marc Neveu[4]
Astronomy/Planetary Environments Laboratory, University of Maryland/NASA Goddard Space Flight Center

Malena Rice[1]
Astronomy, Yale University

Leslie Rogers[1]
Astronomy & Astrophysics, University of Chicago
Investigating the Biological Potential of Moons in the Uranus System

Peter Gao[1]
Earth and Planets Laboratory, Carnegie Institution for Science

Renyu Hu[4]
Astrophysics & Space Sciences, Jet Propulsion Laboratory

Chenguang Sun[1]
Geological Sciences, University of Texas at Austin
Constraining Volatile Budgets in Small Exoplanets through Coupled Petrological and Atmospheric Modeling and Observations

Greg Fournier[1]
EAPS, Massachusetts Institute of Technology

Morgan Raven[2]
Earth Science, University of California, Santa Barbara
Sulfur Assimilation: A Novel Proxy for Redox Transitions in the Early Biosphere

Bradford Foley[2]
Geosciences, Pennsylvania State University

Sukrit Ranjan[3]
Planetary Sciences, University of Arizona

Rebecca Rapf[3]
Chemistry, Trinity University

Morgan Raven[2]
Earth Science, University of California, Santa Barbara
Constraining the Abiotic Sulfur Cycle on Temperate Terrestrial Planets

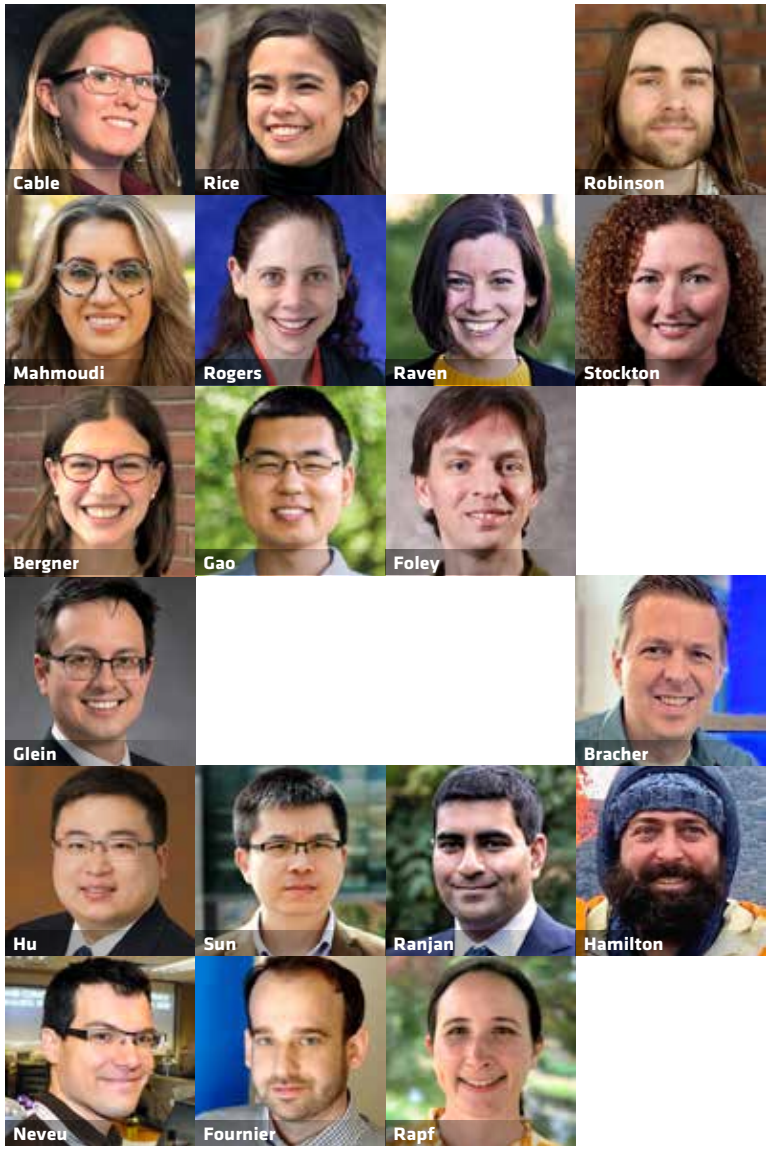
Tyler Robinson[2]
Lunar and Planetary Laboratory, University of Arizona

Amanda Stockton[2]
Chemistry and Biochemistry, Georgia Institute of Technology
Irradiated Sea Spray Aerosol Generation and Analysis Under Early Earth Atmospheres

Paul Bracher[1]
Chemistry, Saint Louis University

Christopher Hamilton[1]
Lunar and Planetary Laboratory, University of Arizona
Rocky Roads: Flow Pathways and Chemical Evolution in Vesicular Lava and Pumice

Funding provided by:
[1] Heising-Simons Foundation
[2] RCSA
[3] The Kavli Foundation
[4] NASA



Microbiome, Neurobiology and Disease
Year 3

Abhishek Shrivastava
Life Sciences, Arizona State University

Kai Zhang
Biochemistry, University of Illinois at Urbana-Champaign

Could Feces be Used as a Natural Time Capsule for Mapping of Signal-Generating Hubs within the Gut?

Will Ludington
Embryology, Carnegie Institution for Science

Karthik Shekhar
Chemical & Biomolecular Engineering/Helen Wills Neuroscience Institute, University of California, Berkeley

How Does the Microbiome-Gut-Brain Cascade Activate Glia? A Single-Cell Transcriptomic and Functional Roadmap in the Fruit Fly

Mei Shen
Chemistry, Neuroscience Program, Beckman Institute, University of Illinois at Urbana Champaign

Heather Bean
Life Sciences, Arizona State University

Yanjiao Zhou
Medicine, UConn Health

Investigating the Influence of Air Pollution VOCs on Alzheimer's Disease-Like Pathology

Chun-Jun Guo
Medicine, Weill Cornell Medical College

Yanjiao Zhou
Medicine, UConn Health

Annie Ciernia
Biochemistry & Molecular Biology, University of British Columbia

Decipher the "Molecular Language" between Microbiota-Microglia Crosstalk Using a Genetically Tractable Microbiome

Annie Ciernia
Biochemistry & Molecular Biology, University of British Columbia

Christopher Whidbey
Chemistry, Seattle University

Identification of Microglial Receptors for Microbiota Derived Metabolites

Stephanie Cologna [1]
Chemistry, University of Illinois Chicago

Leah Pyter
Psychiatry, Ohio State University

The Role of Gut Metabolites in "Chemobrain"

Sarah MacEachern
Pediatrics, University of Calgary

Kendall Corbin
Horticulture, University of Kentucky

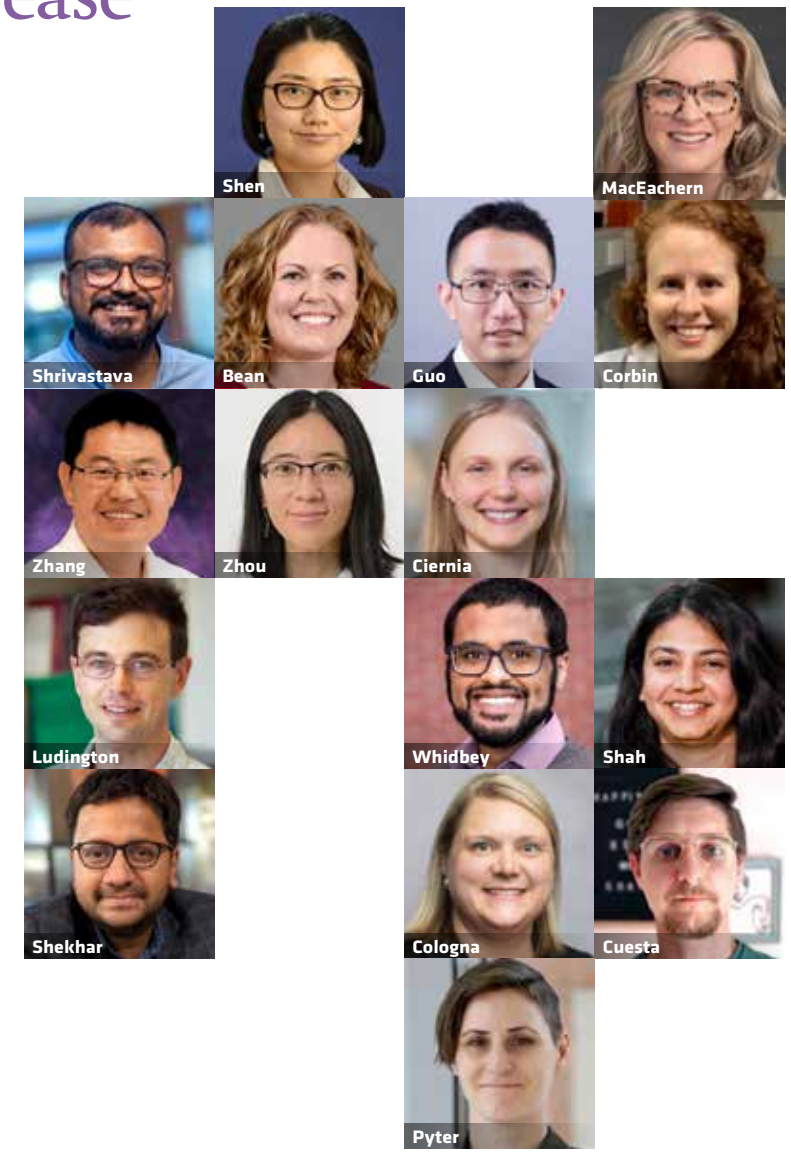
Heather Bean
Life Sciences, Arizona State University

Embracing Complexity: Exploring the Connections between Chronic Fatigue, Behavior, and Gut Microbiome Dysbiosis in Children with Neurodevelopmental Disorders

Dhara Shah
Mathematical & Natural Sciences, Arizona State University

Santiago Cuesta
Cell Biology and Neuroscience, Rutgers University

Gut Catecholamine Levels as Modulators of Addiction Behaviors



Funding provided by:
[1] Walder Foundation
Others by RCSA, the Paul G. Allen Frontiers Group, and the Frederick Gardner Cottrell Foundation

Advancing BioImaging
Year 3

Eszter Boros[1]
Chemistry, University of Wisconsin—Madison

Shiva Abbaszadeh[1]
Electrical and Computer Engineering, University of California, Santa Cruz
PETinIVIS: A Modular PET Insert to Enable Simultaneous Acquisition of Optical and PET Imaging Data in Small Animals

Shwetadwip Chowdhury[2]
Electrical and Computer Engineering, University of Texas at Austin

Heather M. Whitney[3]
Radiology, University of Chicago
Developing Multi-Angle Synthesized Ultrasound Tomography

Dylan McCreedy[1]
Biology, Texas A&M University, College Station

Fanny Chapelin[1]
Bioengineering, University of California, San Diego
Specific and Quantitative MRI Imaging for Longitudinal Cell Fate Tracking

Seunghyun (Seu) Sim[1]
Chemistry, University of California, Irvine

Ruixuan Gao[3]
Chemistry and Biological Sciences, University of Illinois Chicago

Shawn Davidson[1]
Medicine, Northwestern University
Quantitative, Spatially Resolved Analysis of Single-Cell and Single-Organelle Metabolism

Yi-Chih Lin[2]
Chemistry, University of Texas at Austin

Nick Galati[2]
Biology, Western Washington University

Lingyan Shi[2]
Bioengineering, University of California, San Diego
Exploring the Mechano-Metabolic Landscape of a Beating Ciliary Array

Dylan McCreedy[2]
Biology, Texas A&M University, College Station

Meghan Driscoll[2]
Pharmacology, University of Minnesota Twin Cities
Sketch-Based Retrieval and Clustering of Neurons in Large Microscopy Data

Scott Cushing[2]
Chemistry and Chemical Engineering, California Institute of Technology

Jing Liu[2]
Physics, Purdue University
Quantum-Enhanced Fluorescent Imaging with Entangled Photons

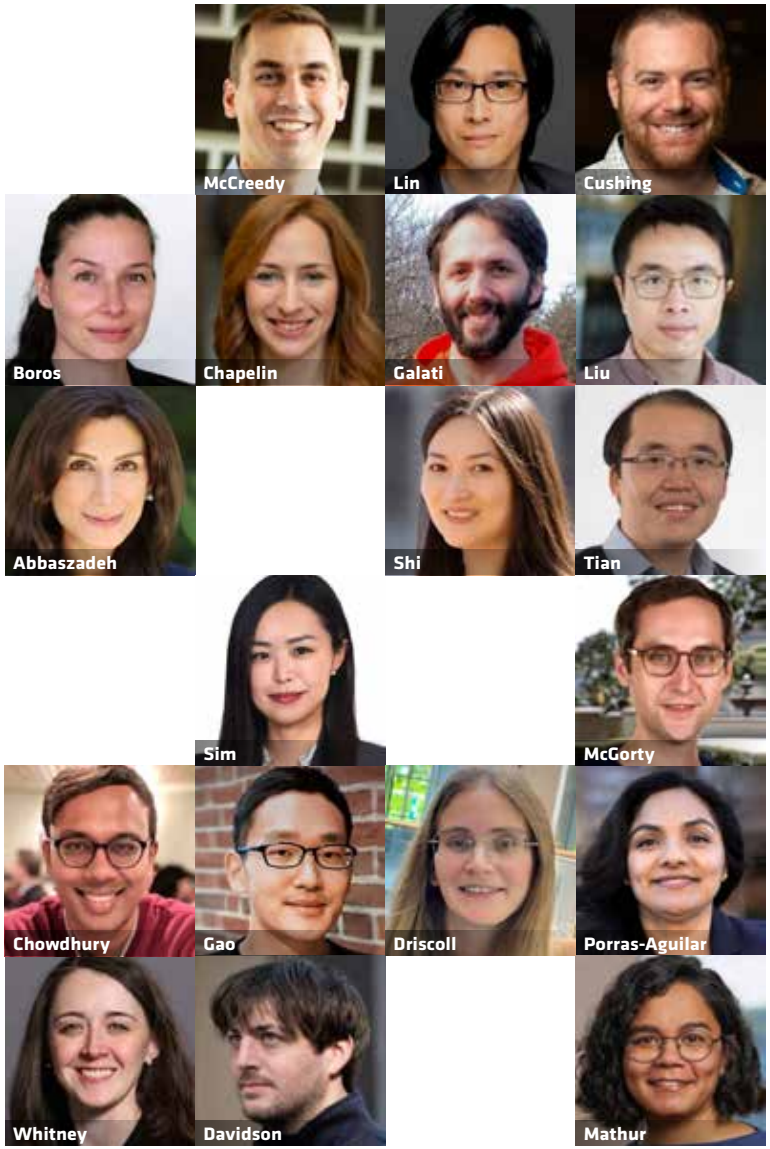
Lei Tian[2]
Electrical and Computer Engineering, Boston University

Ryan J. McGorty[2]
Physics and Biophysics, University of San Diego
3D Dynamics Quantification with Differential Dynamic Light-Field Microscopy

Rosario Porras-Aguilar[1]
Physics & Optical Sciences, University of North Carolina at Charlotte

Divita Mathur[1]
Chemistry, Case Western Reserve University
Beam Shaping Metasurfaces Using DNA Alignment and Liquid Crystals

Funding provided by:
[1] RCSA and the Frederick Gardner Cottrell Foundation
[2] Chan Zuckerberg Initiative
[3] Walder Foundation



Mitigating Zoonotic Threats
Year 3

Tavis Anderson
Virus and Prion Research Unit, USDA/ARS

Louise Moncla
Pathobiology, University of Pennsylvania

Nicholas DeFelice
Environmental Medicine & Public Health, Mount Sinai School of Medicine

When Pigs Fly: Animal Movement Networks to Project Spillovers

Angela Arenas
Veterinary Pathobiology, Texas A&M University, College Station

Nicholas Wu
Biochemistry, University of Illinois at Urbana-Champaign

Crystal Reid
Center for Veterinary Biologics –Virology, USDA/APHIS

From Discovery to Field: Improving Diagnostic Assay Accuracy by Protein Engineering

Dan Peach
Savannah River Ecology Lab & Department of Infectious Disease, University of Georgia

Stacey Scroggs
Arthropod Borne Animal Diseases Research Unit, USDA/ARS

Gonzalo Vazquez-Prokopec
Environmental Sciences, Emory University

Nectar of the Gods: Impact of Flower Nectar on Mosquito Longevity and Virus Transmission

Michael Schulz
Chemistry, Virginia Polytechnic Institute and State University

Louise Moncla
Pathobiology, University of Pennsylvania

To Catch a Virus: Decoy Polymers and Influenza's Evolutionary Response

Nsa Dada
Life Sciences, Arizona State University

Bethany McGregor
Arthropod Borne Animal Diseases Research Unit, USDA/ARS

Patricia Calvo
Chemistry, Kansas State University

Novel Insecticide Delivery and Formulation for Resistance Management in Zoonotic Disease Vectors

Liliana Salvador
Animal and Comparative Biomedical Sciences, University of Arizona

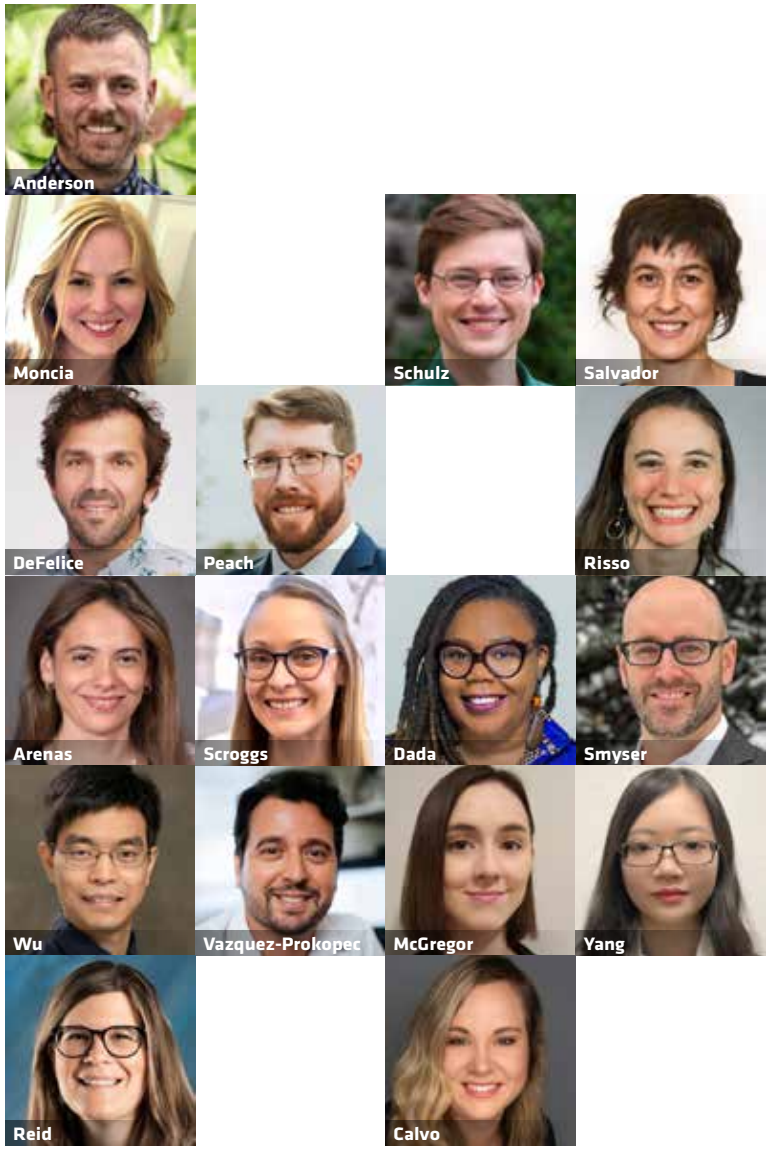
Catalina Picasso Risso
Large Animal Clinical Sciences, Michigan State University

Timothy Smyser
National Wildlife Research Center, USDA/APHIS

Anni Yang
Geography and Environmental Sustainability, University of Oklahoma

Development of an Integrative Approach to Enhance Surveillance Sensitivity Systems for Wildlife Spillover of Bovine Tuberculosis: Wild Pig Case Study

Funding provided by:
RCSA and USDA



Molecular Basis of Cognition
Year 2

Yao Chen
Neuroscience, Washington University in Saint Louis

Michael Economo
Biomedical Engineering, Boston University

Illuminating the Molecular Mechanisms of Memory Formation During Behavior

Anna Schapiro
Psychology, University of Pennsylvania

Megan Peters
Cognitive Sciences, University of California, Irvine

Marcelo Mattar
Psychology, New York University

Investigating the Conscious Accessibility of Neural Replay

Timothy Machado
Neuroscience, University of Pennsylvania

Kate Hong
Biological Sciences, Neuroscience Institute, Carnegie Mellon University

Michael Economo
Biomedical Engineering, Boston University

FLEX: Fluorescent Light Examination of eXtensors (and Other Muscles)

Lucas Pinto
Neuroscience, Northwestern University

Benjamin Scott
Psychological and Brain Sciences, Boston University

Yao Chen
Neuroscience, Washington University in Saint Louis

Understanding the Multiple Timescales of Neuromodulation Using Three Photon Instant FLIM

Daniel Burnston
Philosophy/Brain Institute, Tulane University

Wilma Bainbridge
Psychology, University of Chicago

Bob Wilson
Psychology, University of Arizona

Mapping Inner Worlds: Representational Spaces and Mental Life

Phillip Rivera
Biology, Macalester College

Alison Weiss
Neuroscience, Oregon Health & Science University

Elizabeth McNeill
Food Science and Human Nutrition, Iowa State University

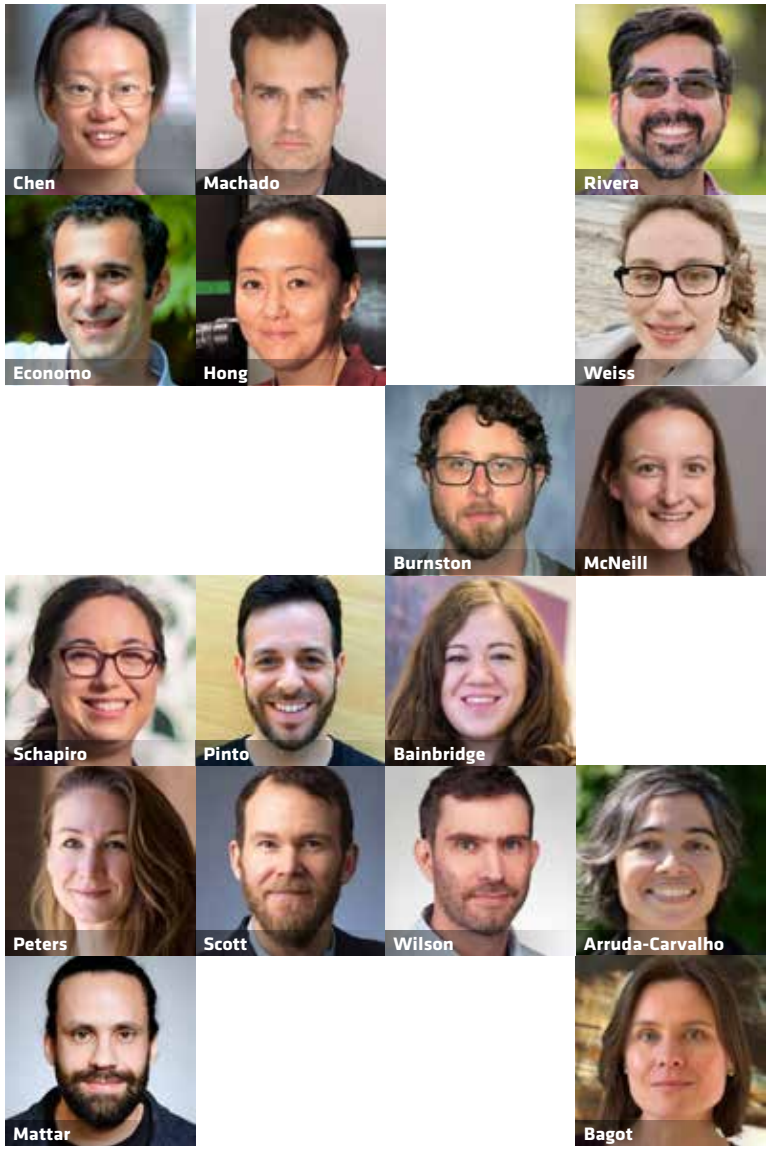
The Mystery of Heavy Drinking: Exploring the Roots of Alcohol Dependency

Maithe Arruda-Carvalho
Psychology, University of Toronto

Rosemary Bagot
Psychology, McGill University

Leveraging Development to Reveal Molecular Mechanisms of Neural Circuit Divergence

Funding provided by:
RCSA, the Frederick Gardner Cottrell Foundation, the Azrieli Foundation, The Kavli Foundation, Walder Foundation



Negative Emissions Science
Year 4

Fani Boukouvala[2]
Chemical & Biomolecular Engineering, Georgia Institute of Technology

Kyriakos Stylianou[2]
Chemistry,
Oregon State University

Liang Feng[2]
Mechanical Engineering and Materials Science,
Duke University

Understanding, Quantifying and Mitigating Adsorbent Degradation: From Fundamental Understanding to Techno-Economic Analysis

Rachel Davidson[2]
Chemistry and Biochemistry,
University of Delaware

Michael Ross[2]
Chemistry, University of Massachusetts Lowell

Wen Song[2]
Center for Subsurface Energy and the Environment,
University of Texas at Austin

ML-ROCKS: Machine Learning Reaction Optimization of Carbonation KineticS

Douglas Reed[3]
Chemistry,
University of Washington

Eva Nichols[3]
Chemistry, University of British Columbia

Xin Xu[3]
The Polytechnic School,
Arizona State University

Gas Capture by Tuning Electric Fields in Conductive MOFs

Michael Ross[1]
Chemistry, University of Massachusetts Lowell

Ariel Furst[1]
Chemical Engineering,
Massachusetts Institute of Technology

Joshua Jack[1]
Civil & Environmental Engineering, University of Michigan

Cow Burps to Butanol: Bio-Electrocatalytic Valorization of Methane to Butanol

Zhe Qiang[2]
Polymer Science and Engineering, University of Southern Mississippi

Marc Porosoff[2]
Chemical Engineering,
University of Rochester

Yuan Yao[2]
School of the Environment,
Yale University

Modular Production of Aviation Fuel from Point Source Biogas via Zoned Joule Heating

Benjamin Snyder[1]
Chemistry, University of Illinois at Urbana-Champaign

Caroline Saouma[1]
Chemistry,
Virginia Polytechnic Institute and State University

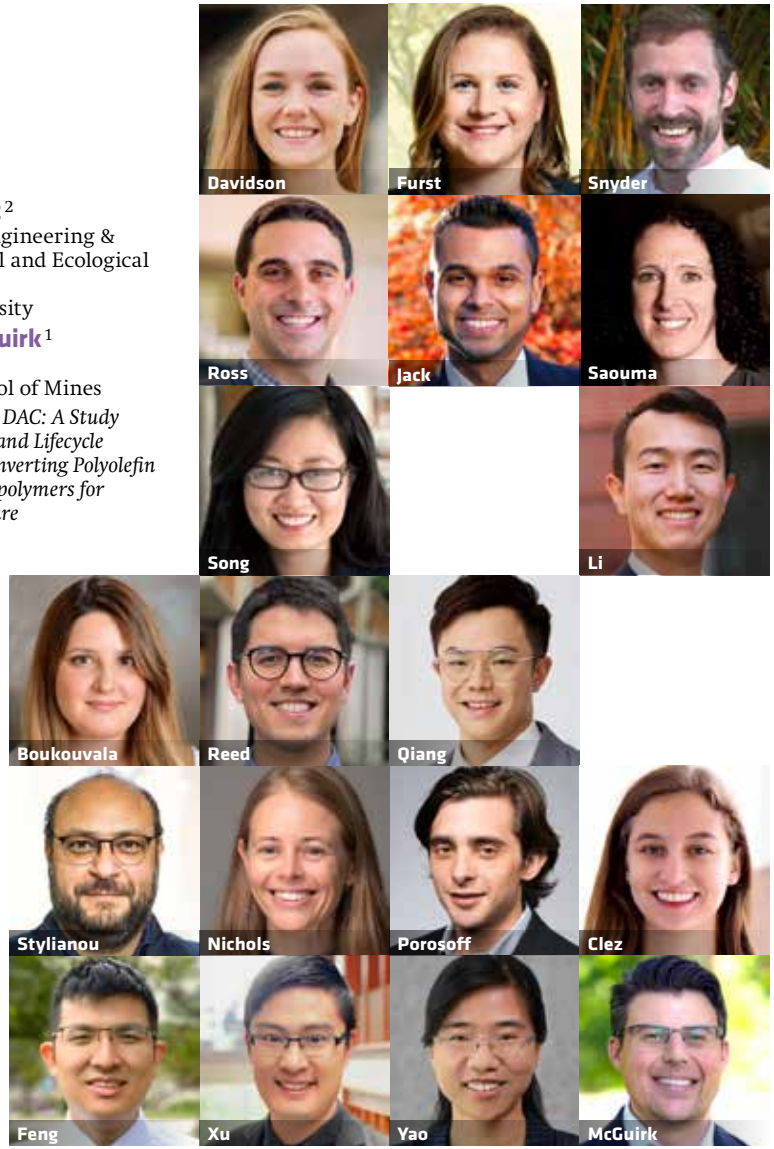
Yuzhang Li[1]
Chemical and Biomolecular Engineering, University of California, Los Angeles

Achieving Speed and Scale: Self-Amplifying Adsorbents for Negative Carbon Emissions

Rebecca Ciez[2]
Mechanical Engineering & Environmental and Ecological Engineering,
Purdue University

Michael McGuirk[1]
Chemistry,
Colorado School of Mines

Plastic Waste to DAC: A Study of the Chemical and Lifecycle Feasibility of Converting Polyolefin Waste to Aminopolymers for Direct Air Capture

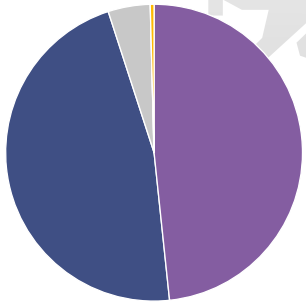


Funding provided by:
[1] RCSA
[2] The Alfred P. Sloan Foundation
[3] ClimateWorks Foundation

Scialog Awards
2019-2023

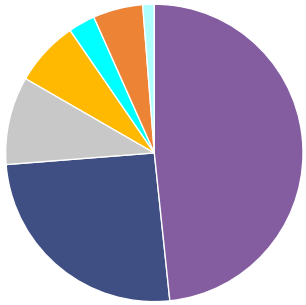
Gender

- Female **48.33%**
- Male **46.67%**
- Decline or not collected **4.58%**
- Other **0.42%**



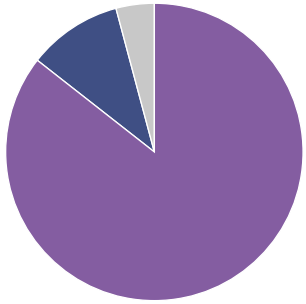
Ethnicity

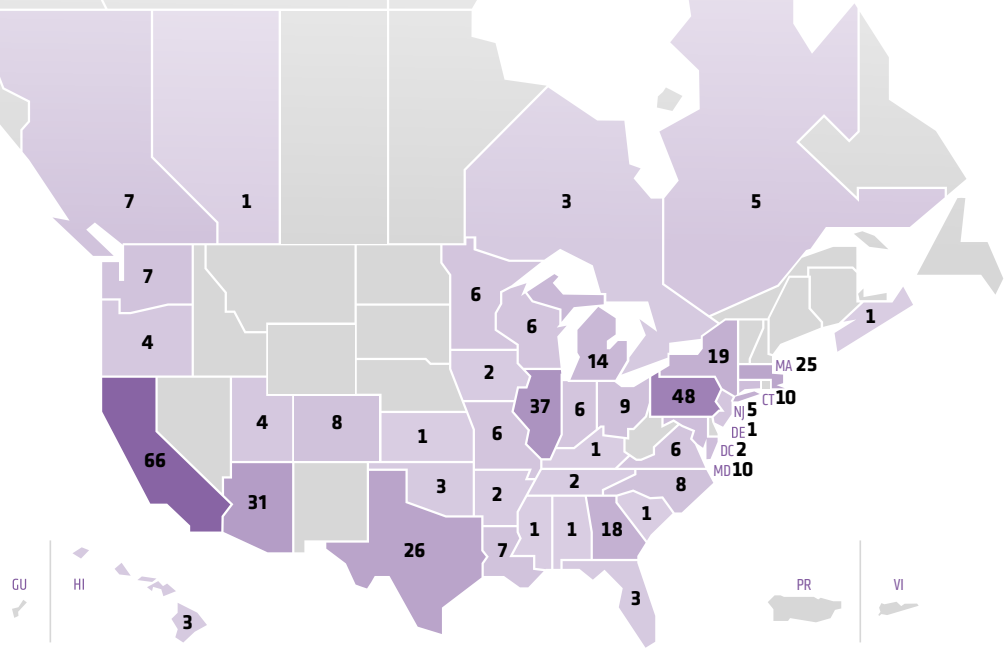
- White **48.33%**
- Asian **25.42%**
- Decline or not collected **9.58%**
- Hispanic or Latino **7.08%**
- Black or African American **2.92%**
- Mixed/Other **5.42%**
- American Indian / Alaskan Native / Native Hawaiian / Indigenous Pacific Islander **1.25%**



Institution Type

- Research 1 University **350**
- Other **42**
  Includes Government Agencies, Research Institutions, Observatories, Medical Schools, R2, R3, and Foundations
- Primarily Undergraduate Institution **17**





Geographical Distribution

Alabama **1**	Florida **3**	Maryland **10**	Nova Scotia **1**	Texas **26**
Alberta **1**	Georgia **18**	Massachusetts **25**	Ohio **9**	Utah **4**
Arizona **31**	Hawaii **3**	Michigan **14**	Oklahoma **3**	Virginia **6**
Arkansas **2**	Illinois **37**	Minnesota **6**	Ontario **3**	Washington **7**
British Columbia **7**	Indiana **6**	Mississippi **1**	Oregon **4**	Washington DC **2**
California **66**	Iowa **2**	Missouri **6**	Pennsylvania **48**	Wisconsin **6**
Colorado **8**	Kansas **1**	New Jersey **5**	Quebec **5**	
Connecticut **10**	Kentucky **1**	New York **19**	South Carolina **1**	
Delaware **1**	Louisiana **7**	North Carolina **8**	Tennessee **2**	

2023 Year in Review

January

Scialog NES Awardee **Kandis Leslie Abdul-Aziz**, Chemical and Environmental Engineering, University of California, Riverside, was interviewed on *Science Friday* about her work to create activated carbon filters from agricultural waste.

Eleven members of the RCSA community were elected 2022 Fellows of the American Association for the Advancement of Science. In astronomy: Scialog TDA Fellows **Catherine C. Espaillat**, Astronomy, Boston University, and **Saurabh W. Jha**, Physics & Astronomy, Rutgers University. In chemistry: Cottrell Scholar 2009 **Lane A. Baker**, Texas A&M University, CS 2004 **Paul Chirik**, Princeton University, CS 1995 **James W. Leahy**, University of South Florida, CS 1997 **Gina MacDonald**, James Madison University, CS 2005 **Teri W. Odom**, Northwestern University, CS 2013 **Eric J. Schelter**, University of Pennsylvania, and Scialog SEC Awardee **Frank E. Osterloh**, Chemistry, University of California, Davis. In physics: MCL Fellow **Raghuveer Parthasarathy**, Physics, University of Oregon, and CS 2010 & MCL Awardee **Jennifer L. Ross**, Physics, Syracuse University.

Cottrell Scholar 1997 **Kevan M. Shokat**, Chemistry, University of California, San Francisco, was awarded the 2023 National Academy of Sciences Award for Scientific Discovery for his pioneering breakthroughs in chemical biology to advance cancer therapy. The biennial award was endowed by RCSA and the Frederick Gardner Cottrell Foundation in honor of former RCSA president **John P. Schaefer**.

Keivan Stassun

Cottrell Scholar 2006 **Keivan Stassun**, Astronomy, Vanderbilt University, was appointed to the National Science Board. Board members help establish the policies of the National Science Foundation and serve as advisers to the U.S. president and Congress on policy matters related to science and engineering.

February

Cottrell Scholar 2005 **Chuan He**, Chemistry, University of Chicago, was named 2023 Wolf Prize Laureate in Chemistry.

Fourteen members of RCSA's community of scientists were awarded 2023 Sloan Research Fellowships: Cottrell Scholar 2021 **Justin R. Caram**, Chemistry, University of California, Los Angeles; Scialog TDA Fellow **Maria R. Drout**, Astronomy & Astrophysics, University of Toronto; CS 2023 **Javier M. Duarte**, Physics, University of California, San Diego; SLU Awardee **Kimberly V. Lau**, Geosciences, Pennsylvania State University; CMC Awardee **Brian B. Liau**, Chemistry, Harvard University; CS 2023 **Alison E. Patteson**, Physics, Syracuse University;

CS 2022 **Orit Peleg**, Physics, University of Colorado Boulder; NES Awardee **Hang Ren**, Chemistry, University of Texas at Austin; TDA Awardee **Robyn E. Sanderson**, Physics and Astronomy, University of Pennsylvania; AES Fellow **Kimberly A. See**, Chemistry and Chemical Engineering, California Institute of Technology; NES Awardee **Shaama Mallikarjun Sharada**, Chemical Engineering and Materials Science, University of Southern California; MND Awardee **Mei Shen**, Chemistry, University of Illinois at Urbana-Champaign; ABI Fellow **Lingyan Shi**, Bioengineering, University of California, San Diego; and CS 2020 and AES & NES Fellow **Jesús M. Velázquez**, Chemistry, University of California, Davis.

Cottrell Scholar 1997 **Mark Moldwin**, Physics, University of Michigan, was selected as PI for the magnetometer instrument that will map out and study the electromagnetic energy that enters the upper atmosphere from Earth's magnetosphere as part of NASA's next flagship mission, the Geospace Dynamics Constellation. Moldwin's project is related to his original CS award to understand energy flow into the space environment from above and below.

Cottrell Scholar 2017 and RCSA COVID-19 Initiative Awardee **Amanda Hargrove**, Chemistry, Duke University, was awarded the RNA Society's Elisa Izaurralde Award for Innovation in Research, Teaching and Service.

March

The third meeting of Scialog: Signatures of Life in the Universe, co-sponsored by RCSA and the Heising-Simons Foundation, with additional support from The Kavli Foundation, was held in Tucson. **Lisa Kaltenegger**, Director of the Carl Sagan Institute at Cornell University, gave the keynote talk, "Other Earth(s)—and Earth Seen as an Alien Planet."

Scialog MND Awardee and CIFAR Azrieli Global Scholar **Carolina Tropini**, Microbiology & Immunology, University of British Columbia, was named CIFAR's inaugural Alan Bernstein Fellow. The appointment recognizes Tropini's groundbreaking research into how the microbiome impacts human health.

2021 Nobel Laureate and 2001 Cottrell Scholar **David MacMillan**, Chemistry, Princeton University, gave the keynote address at the March 26 plenary session of the American Chemical Society Spring 2023 meeting: "Chemistry at the Crossroads: The Development of Asymmetric Organocatalysis and Metallaphotoredox."

Cottrell Scholar 2023 and Scialog CMC Awardee **Lydia Kisley**, Physics, Case Western Reserve University, presented the Kavli Foundation Emerging Leader in Chemistry Lecture on March 27 at the American Chemical Society Spring 2023 meeting. Her topic was "Seeing the Molecular World of Materials: Single-Molecule Microscopy at the Crossroads of Chemistry."

Why do philanthropic funders support discovery science? RCSA President & CEO **Daniel Linzer** participated in panel discussion on that question as part of the Science Philanthropy Alliance's virtual Research Institutions Meeting on March 8. He said early investment in curiosity-driven research can have long-term benefits and stressed the unique value of foundations in developing ''that culture of collaboration across institution types that keep the ecosystem of science really vital." He said foundations can bring people together across institutions, geographic locations, and disciplinary fields to "expand the inclusive environment that we want to create."

RCSA hosted the March 28-29 member's meeting of the Science Philanthropy Alliance in Tucson. Highlights of the meeting, on the theme of "Water: The Universal Solvent," included panel discussions, a chat with *Science Friday* host **Ira Flatow**, and tours of the University of Arizona's Richard F. Caris Mirror Lab and Biosphere 2.

Ira Flatow

Sandy Cummings, Charity Woodrum and Richard Wiener

The RCSA-supported documentary "Space, Hope and Charity," directed by Sandy Cummings, premiered March 31 at the Phoenix Film Festival. Shown soon after in Tucson, it tells the story of **Charity Woodrum**, a Ph.D. candidate at the University of Arizona's Steward Observatory and part of NASA's James Webb Space Telescope Near-IR Camera (NIRCam) science team, as she pursues her dream of becoming an astrophysicist.

April

The third meeting of Scialog: Microbiome, Neurobiology and Disease, co-sponsored by RCSA, the Paul G. Allen Frontiers Group and the Frederick Gardner Cottrell Foundation, with support from Walder Foundation and WoodNext Foundation, was held in Tucson. **Barbara Bendlin**, Alzheimer's Disease Research Center, University of Wisconsin, gave the keynote talk, "Gut Microbiome as a Potential Target for Intervention in Alzheimer's Disease."

Scialog SLU Fellow **Maitrayee Bose**, Earth and Space Exploration, Arizona State University, was selected to give the Geochemical Society's 2023 F. Earl Ingerson Lecture at the Goldschmidt Conference in Lyon. Her topic: "Exploring Volatiles in Chondritic Materials."

2013 Cottrell Scholar and Scialog SEC Awardee **Gordana Dukovic**, Chemistry, University of Colorado Boulder, was named a 2023 Guggenheim Fellow.

A 120-year-old calculation developed by RCSA's founder, chemist **Frederick Gardner Cottrell**, is helping today's scientists turn CO_2 into a useful product. New research by Cornell University scientists using the equation was published March 28 in the journal *ACS Catalysis*. The equation, which the authors call "classic electrochemistry," enables identification and control of experimental parameters that allow for the conversion of carbon dioxide into a useful carbon product such as ethylene, ethane, or ethanol.

May

The final meeting of Scialog: Advancing BioImaging, sponsored by RCSA, Chan Zuckerberg Initiative and the Frederick Gardner Cottrell Foundation, with support from Walder Foundation, was held in Tucson. CS 1994 **Brad Smith**, Chemistry, Director of the University of Notre Dame's Integrated Imaging Facility, kicked off discussions with his keynote talk, "Smart Molecules for Imaging, Therapy and Health."

Cottrell Scholar 2014 **Mircea Dincă**, Chemistry, Massachusetts Institute of Technology, was among seven mid-career researchers selected to receive the prestigious 2023 Brown Investigator Award for innovative basic research in chemistry and physics.

Two Cottrell Scholars were among 120 new members elected to the National Academy of Sciences in recognition of their achievements in original research: CS 1994 and 2022 SEED Awardee **Nancy Makri**, Chemistry, University of Illinois at Urbana-Champaign, and CS 2005 **Teri Odom**, Chemistry, Northwestern University.

The COMPASS: Career and Occupational Mentoring for the Professional Advancement of Science Students workshop, sponsored by RCSA and the

Scialog ABI Conference

National Science Foundation, was held remotely May 17-19. The workshop, which grew out of a 2017 Cottrell Scholars Collaborative project, introduced faculty to career planning and mentoring resources and provided training on using those resources at their own campuses.

Ten Cottrell Scholars and Scialog Fellows were selected as 2023 Camille Dreyfus Teacher-Scholars: CS 2021 **Vinayak Agarwal**, Chemistry, Georgia Institute of Technology; Scialog ABI Awardee **Eszter Boros**, Chemistry, Stony Brook University; CS 2022 & Scialog CMC Awardee **Stephen Fried**, Chemistry, Johns Hopkins University; Scialog NES Fellow **Jarad Mason**, Chemistry and Chemical Biology, Harvard University; Scialog NES Awardee **Phillip Milner**, Chemistry and Chemical Biology, Cornell University; Scialog CMC Fellow **Allie Obermeyer**, Chemical Engineering, Columbia University; CS 2022 **Zachariah Page**, Chemistry, University of Texas at Austin; Scialog AES Fellow **Kimberly See**, Chemistry and Chemical Engineering, California Institute of Technology; CS 2021 **Alexandra Velian**, Chemistry, University of Washington; and Scialog CMC Awardee & MND Fellow **Wenjing Wang**, Chemistry and Life Sciences Institute, University of Michigan.

Cottrell Scholar 2017 **Nathaniel Gabor**, Physics, University of California, Riverside, published a Quick Study in *Physics Today* on his research into how plants absorb light from a noisy energy spectrum to produce a consistent power output. These principles could be useful in designing grids to harvest solar energy. (Gabor is also a Scialog AES and SLU Fellow.)

Shana Stoddard, associate professor of chemistry at Rhodes College in Tennessee, was chosen as the 2023 recipient of the Council on Undergraduate Research's Silvia Ronco Innovative Mentor Award. The award, established in 2022 by a gift from RCSA in honor of CUR past president and current RCSA Senior Program Director **Silvia Ronco**, recognizes a tenure-track faculty member within 10 years of their first faculty appointment who demonstrates success in chemical sciences and whose mentoring practices have supported undergraduate research. Stoddard is the founding director of The STEM Cohort Mentoring Program at Rhodes.

Shana Stoddard

Deven Estes

Mount Holyoke College's Rachel Brown Fellowship Fund, established with an original RCSA gift of $200,000 by RCSA in 1977, is still helping women advance in science. Since the fund was established, Mount Holyoke has given more than $2 million to 70 Rachel Brown Scholars – undergraduate scholarships for women majoring in the physical or biological sciences, or fellowships for women graduating from Mount Holyoke with majors in the physical or biological sciences. **Rachel Brown** was a 1920 graduate of Mount Holyoke who, along with her research partner **Elizabeth Hazen**, developed the antifungal drug nystatin in 1950.

June

The German-American Fulbright Commission awarded its 2023 Fulbright-Cottrell Award for excellence in research and teaching to **Deven Estes**, a chemistry professor at the University of Stuttgart. The award is based on RCSA's Cottrell Scholar Award.

2009 Cottrell Scholars **Duncan Lorimer**, Astronomy, and **Maura McLaughlin**, Physics, West Virginia University, shared the Shaw Prize in Astronomy 2023 for the discovery of fast radio bursts. In a 2007 paper, they and their collaborators found the first of these elusive events, deduced many of their properties, and highlighted their potential as cosmological probes. Almost a thousand have now been discovered.

July

RCSA published a new book, which grew out of a Cottrell Scholars Collaborative project to help create more inclusive STEM learning spaces. *Inclusivity in Introductory STEM Courses: A Guide to Improving Student (and Instructor!) Mindsets* is authored by Cottrell Scholars: Cottrell Scholar 2018 **Lou Charkoudian**, Chemistry, Haverford College; CS 2014 **Carla Fröhlich**, Physics, North Carolina State University; CS 2003 **Mike Hildreth**, Physics, University of Notre Dame; CS 2019 **Kerstin Perez**, Physics, Columbia University; CS 2019 **Shahir Rizk**, Chemistry, Indiana University South Bend; CS 2010 **Jennifer Ross**, Physics, Syracuse University; CS 1995 **Tom Solomon**, Physics, Bucknell University; and CS 2019 **Kana Takematsu**, Chemistry, Bowdoin College. It also has contributions from **Mica Estrada**, University of California, San Francisco; **Chandralekha Singh**, University of Pittsburgh; and **Terrell Morton**, University of Missouri.

Cottrell Scholars met July 19-21, 2023, at the 29th Annual Cottrell Scholar Conference in Tucson to network, welcome new members, and share ideas on creating a scientific community that is more diverse, more inclusive, and more human. The community welcomed recipients of RCSA's inaugural Robert Holland Jr. Award and heard talks from STAR and IMPACT awardees. Sparking lively discussions were keynote talks by CS 2019 **Kerstin Perez**, Physics, Columbia University, on "Building Lifeboats without Sinking Yourself: Cultural Change on the Tenure Track" and **Holden Thorp**, Editor-in-Chief, *Science*, on "Truth During Chaos: Science in a Time When Facts Don't Matter."

Two Cottrell Scholars were quoted in national newspapers following the publication of NANOGrav research in the *Astrophysical Journal Letters*. CS 2021 **Marcelle Soares-Santos**, Physics, University of Michigan, was interviewed by the *New York Times*, and CS 2009 **Maura McLaughlin**, Physics, West Virginia University, by the *Washington Post*.

Cottrell Scholar 2014 **Shannon Boettcher**, Chemistry, University of Oregon, was named one of three 2023 winners of the Blavatnik National Awards for Young Scientists. Also among 28 finalists for the awards: CS 2018 **Garret Miyake**, Chemistry, Colorado State University; CS 2019 **Alison Narayan**, Chemistry, University of Michigan; Scialog MND Fellow **Noah Palm**, Yale; CS 2017 & Scialog AES Fellow **Yogesh Surendranath**, Chemistry, Massachusetts Institute of Technology; Scialog MND Fellow **Harris Wang**, Systems Biology, Columbia University; CS 2020 **Jessica Werk**, Astronomy, University of Washington; and Scialog ABI Fellow **Sheng Xu**, Nanoengineering, Bioengineering, and Electrical and Computer Engineering, University of California, San Diego.

Cottrell Scholar Conference

August

Cottrell Scholar 2013 **Zachary Schultz**, Chemistry, Ohio State University, and CS 2023 & Scialog CMC Fellow **Ronit Freeman**, Chemistry, University of North Carolina at Chapel Hill, published a new paper in the journal *Sensors & Diagnostics*. The research detailed in "From the Lab to the Field: Handheld Surface Enhanced Raman Spectroscopy (SERS) Detection of Viral Proteins" is an outcome of funding they received from RCSA's COVID-19 Initiative in April 2020.

September

The third meeting of Scialog: Mitigating Zoonotic Threats, sponsored by RCSA and the U.S. Department of Agriculture, with additional support from Walder Foundation, was held in Tucson. **Sara Cherry**, Pathology and Laboratory Medicine, University of Pennsylvania, got the conversations started with her talk, "Antiviral Discovery Pipeline for Emerging and Re-emerging Viruses."

Cottrell Scholar 2001 **Bert Chandler**, Chemistry, Pennsylvania State University, was corresponding author of a new paper in *Nature Catalysis* explaining how hydrogen spillover works: "The Role of Surface Hydroxyls in the Entropy-Driven Adsorption and Spillover of H_2 on Au/TiO_2 Catalysts." This research, which could lead to better hydrogen storage for clean energy, was supported by Chandler's 2016 SEED Award.

Rachel Narehood Austin, Barnard College, was named recipient of the 2024 American Chemical Society Award for Research at an Undergraduate Institution, sponsored by RCSA.

Eight RCSA scientists received 2024 national awards from the American Chemical Society: Cottrell Scholar 2005 **Paramjit S. Arora**, New York University, Ralph F. Hirschmann Award in Peptide Chemistry; CS 2012 **Suzanne C. Bart**, Purdue University, F. Albert Cotton Award in Synthetic Inorganic Chemistry; Nobel Laureate and 1997 RCSA Research in Innovation Awardee **Carolyn Bertozzi**, Priestley Medal; Scialog CMC Awardee **Jefferson Chan**, University of Illinois at Urbana-Champaign, preceptor of student **Melissa Lucero**, winner of the Nobel Laureate Signature Award for Graduate Education in Chemistry; CS 2020 **Song Lin**, Cornell University, Arthur C. Cope Scholar Award; Scialog NES Fellow **Jarad A. Mason**, Harvard University, ACS Award in Pure Chemistry; Scialog SEC Fellow **James K. McCusker**, Michigan State University, Josef Michl ACS Award in Photochemistry; and Scialog AES Fellow **V. Sara Thoi**, Johns Hopkins University, Harry Gray Award for Creative Work in Inorganic Chemistry by a Young Investigator.

Scialog MBC Awardee **Megan Peters**, Cognitive Sciences, University of California, Irvine, was among the authors of a report proposing a list of measurable qualities that could be used to assess the consciousness of an AI system like ChatGPT. Peters was quoted in a *New York Times* article about the report.

Scialog SLU Awardee **Zachary Adam**, Geoscience, and Fellow **Betül Kaçar**, Molecular and Cell Biology/Astronomy, both of the University of Wisconsin-Madison, co-authored a study in the *Journal of the American Chemical Society*. "Assessment of Stoichiometric Autocatalysis across Element Groups" describes the kinds of reactions and conditions required for self-sustaining repetition, called autocatalysis, that could help focus the search for life on other planets.

2010 Cottrell College Science Award recipient and Scialog SEC Awardee **Yohannes Abate**, Physics, University of Georgia, was awarded a $1.25 million grant from the Gordon and Betty Moore Foundation Experimental Physics Investigators Initiative. The funding will enable Abate's research team to further explore fundamental properties of nanometer-scale oxide material devices that behave like biological synaptic systems. "I am always proud and grateful what Research Corporation did for me when I was at the beginning of my career," he said.

A Scialog: Negative Emissions Science team whose 2021 collaborative project for a novel membrane to pair direct ocean capture of CO_2 with desalination was awarded a $1.4M Marine Carbon Dioxide Removal Award from the Office of Naval Research through the National Oceanic and Atmospheric Administration's National Oceanographic Partnership Program. **Katherine Hornbostel**, Mechanical Engineering & Materials Science, University of Pittsburgh, will be PI of the two-year project, along with her Scialog collaborators **Matthew Green**, Chemical Engineering, Arizona State University, and **Jennifer Yang**, Chemistry, University of California, Irvine. Also involved in the project, *Coupling Desalination with Novel mCDR Membranes*, are **Mou Paul** and **Abhishek Roy** of the National Renewable Energy Laboratory.

K. Hornbostel

Matthew Green

Jennifer Yang

1995 Cottrell Scholar and 2016 SEED Awardee **Martin Gruebele**, James R. Eiszner Endowed Chair in Chemistry and a professor of Physics, was named to co-lead the Beckman Institute's new NSF Science and Technology Center for Quantitative Cell Biology at the University of Illinois at Urbana-Champaign. Supported by a $30 million grant from the National Science Foundation, the center will develop whole-cell models to bring an entire simulated cell cycle to life on a computer and will partner with the 3D video game Minecraft to enable interactive learning experiences exploring full living cells. Gruebele said his 2016 SEED award, "Revealing Whole-Cell Diffusion and Reaction Using Fluorescence Correlation Anti Correlation Microscopy," contributed to research that this project will build upon. "It really WAS a seed!" he said.

October

Scialog: Molecular Basis of Cognition, cosponsored by RCSA, the Frederick Gardner Cottrell Foundation and CIFAR, with support from The Kavli Foundation and Walder Foundation, held its second meeting in Tucson. **Jacob Hooker**, Massachusetts General Hospital Research Scholar and Director of Radiochemistry, Martinos Center for Biomedical Imaging, gave the keynote talk, "Mapping Molecular Associations to Cognition with Neuroimaging."

Seven Scialog Fellows were among 58 early career investigators selected to receive 2023 New Innovator Awards from the National Institutes of Health: ABI Awardee **Benjamin Bartelle**, Biological and Health Systems Engineering, Arizona State University; MBC Awardee **Antonio Fernandez-Ruiz**, Neurobiology & Behavior, Cornell University; NES Fellow **Ariel L. Furst**, Chemical Engineering, Massachusetts Institute of Technology; ABI Awardee **Ruixuan Gao**, Chemistry and Biological Sciences, University of Illinois Chicago; MBC Awardee **Christina K. Kim**, Center for Neuroscience & Department of Neurology, University of California, Davis; MBC Awardee **Matthew Lovett-Barron**, Neurobiology, University of California, San Diego; and ABI Fellow **Danielle L. Schmitt**, Chemistry and Biochemistry, University of California, Los Angeles.

Three Scialog Fellows were among 20 innovative early career researchers named 2023 Packard Fellows for Science and Engineering: NES Fellow **Yuzhang Li**, Chemical and Biomolecular Engineering, University of California, Los Angeles; NES Awardee **Yayuan Liu**, Chemical and Biomolecular Engineering, Johns Hopkins University; and ABI Awardee **Lisa Poulikakos**, Mechanical and Aerospace Engineering, University of California, San Diego.

Second meeting of Scialog: Molecular Basis of Cognition

The American Physical Society's 2024 Prize for a Faculty Member for Research in an Undergraduate Institution, sponsored by RCSA, was awarded to **Lars Q. English**, Dickinson College, for "innovative experiments involving undergraduate students on nonlinear patterns in electrical lattices and networks." English received RCSA's Cottrell College Science Award in 2007. "Winning the RCSA (Cottrell College) award was so instrumental in this," he said. "It really gave me the boost I needed early in my career."

The American Physical Society elected its Fellows for 2023, including seven members of the RCSA community: Scialog MCL Awardee **Moumita Das**, Physics and Astronomy, Rochester Institute of Technology; Scialog CMC Awardee **Davide Donadio**, Chemistry, University of California Davis; Scialog MCL Awardee **Kerwyn Casey Huang**, Bioengineering, Stanford University; Scialog MCL Awardee **Pankaj Mehta**, Physics, Boston University; Cottrell Scholar 2014 **Andriy Nevidomskyy**, Physics, Rice University; CS 2021 **Marcelle Soares-Santos**, Physics, University of Michigan; and Scialog MCL Fellow **Sarah Veatch**, University of Michigan, Ann Arbor.

November

Cottrell Scholar 2021 **Rachel Bezanson**, Astronomy, University of Pittsburgh, was among the authors of a paper in *The Astrophysical Journal Letters* detailing the mass and distance of the galaxy containing the most distant supermassive black hole ever found. The paper was in support of a primary paper announcing the black hole's discovery using two NASA space telescopes, the Chandra X-ray Observatory and the James Webb Space Telescope.

Scialog SLU Awardee **Malena Rice**, Astronomy, Yale University, was profiled in *Forbes*' "30 Under 30" list for 2023. Rice has developed a new machine-learning algorithm to search for distant solar system objects by combining hundreds of images from NASA's TESS satellite.

A Scialog: Advanced Energy Storage team built on the success of their 2019 project, producing five publications advancing basic understanding of operation and degradation mechanisms in solid-state batteries, as well as expanding their collaboration to win a $9 million DARPA project in 2022 and a $11 million DOE Energy Frontier Research Center in 2023 focused on solid-state batteries and chemo-mechanics. **Neil Dasgupta**, Mechanical Engineering, University of Michigan, **Matthew McDowell**, Materials Science and Engineering, Georgia Institute of Technology, and **Partha Mukherjee**, Mechanical Engineering, Purdue University, won a Scialog team award funded by the Alfred P. Sloan Foundation for their 2019 project, *Recharge, Re-liquify, Re-wet (Re3): Self-Healing Interfaces for Solid-State Batteries*. The project evolved into a larger collaborative effort investigating fundamental and applied aspects of solid-state electrochemical interfaces involving another Scialog Fellow, **Kelsey Hatzell**, Mechanical and Chemical Engineering, Princeton University.

December

Scialog SLU Awardee **Marc Neveu**, NASA Goddard Space Flight Center/University of Maryland, published a Quick Study on the water-rich asteroid Ceres in *Physics Today*.

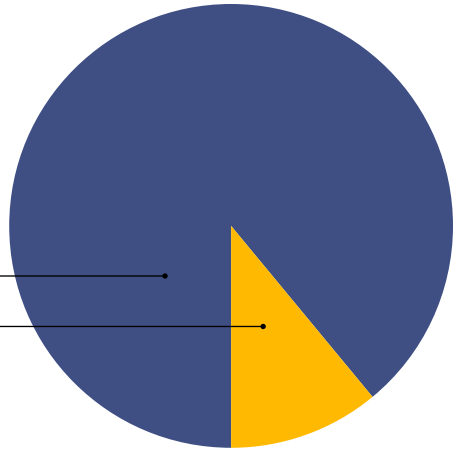
Two Cottrell Scholars were among eight new Henry Dreyfus Teacher-Scholars for 2023: CS 2018 **Tim Kowalczy**k, Chemistry, Western Washington University, and CS 2017 **Amanda Wolfe**, Chemistry, University of North Carolina Asheville.

Scialog AES Awardee **Partha Mukherjee** was named the lead principal investigator for a new $4.5 million Purdue University collaboration with the Electrochemical Safety Research Institute to study battery safety.

In Memoriam

2015 Cottrell Scholar **Jeffery Byers**, Chemistry, Boston College.

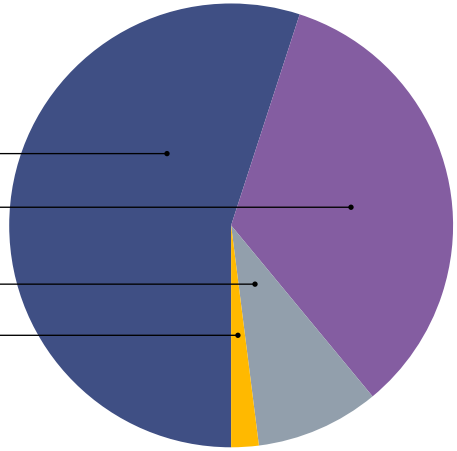
2023 Financial Summary



Program Expenses, including Grants and Awards **89%**

General and Administrative Costs **11%**

Total Expenses $13M



Scialog Collaborative Awards (*includes $3M in partner-funded awards administered by RCSA and excludes $2M in non-administered partner-funded awards*) **55%**

Cottrell Scholar Awards **34%**

Cottrell Career Advancement, Collaborative Awards, Holland Awards **9%**

Discretionary Grants and Special Initiatives **2%**

Grants and Awards $8M

Net Assets at Beginning of Year **$189M**
Net Assets at End of Year **$219M**

The financial activities of Research Corporation for Science Advancement were audited by Keegan Linscott & Associates, PC. For the complete audited financial statements, please visit our website at **rescorp.org**.

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