100 Years Funding Research and Supporting Early Career Scientists
Rayleigh-Benard Convection

An image of the Rayleigh-Benard Convection that shows the streamlines (i.e., the path a particle would take if placed there) for a cylindrical convection container (diameter = depth here). The fluid is air (Prandtl number = 0.7) and the flow is turbulent (Rayleigh number = 5*10^7). The color corresponds to the speed of the fluid at that point, so blue is for lower speed and yellow is for higher speed. The image is from research done by Janet Scheel (CCSA 2008), Assistant Professor of Physics, Occidental College.

Ring Nebula

In this composite image, visible-light observations by NASA's Hubble Space Telescope and infrared data from the ground-based Large Binocular Telescope in Arizona reveal a dramatic view of the well-known Ring Nebula. Credit: NASA, ESA, C.R. Robert O'Dell (Vanderbilt University), G.J. Ferland (University of Kentucky), W.J. Henney and M. Peimbert (National Autonomous University of Mexico). Credit for Large Binocular Telescope data: David Thompson (University of Arizona).

V2O5 Nanostars

V2O5 nanostars with octahedral symmetry are prepared using VO as a template through a combination of chemical vapor transport and hydrothermal recrystallization. Sarbajit Banerjee (CS 2010), associate professor, Department of Chemistry, University of New York at Buffalo, will be modifying these materials by intercalating cations to facilitate photocatalytic water splitting. The six arms provide sites for tethering quantum dots that can harvest light and then inject holes into the modified V2O5 nanostructures.
# Table of Contents

2 Milestones
3 Leadership Comments
7 Washington, D.C., Gala
8 Centennial Gala Committee
10 Congressional Briefing
10 May in New York
11 The John P. Schaefer Award
13 Cottrell Scholars Awards
16 Cottrell College Science Awards
22 Scialog
25 Arizona Partners in Science
26 RCSA-Funded National Awards
29 Financial Summary
30 Board of Directors
31 Presidential Advisory Committee
32 Science Advisory Committee
32 Scialog Review Panel
Staff
Milestones

Frederick Gardner Cottrell, who had been a brilliant physical chemist at the University of California, Berkeley, founded Research Corporation on February 16, 1912. Cottrell, a true progressive in the early 20th-century sense of that term, dedicated the proceeds of an invention, his electrostatic precipitator, to the nascent foundation. The precipitator was the first successful device to remove ash and other particulate matter from industrial smokestacks. It eventually came into widespread use. Subsequently, Cottrell spent much of his life identifying and supporting scientists with great ideas, especially those early in their careers. When these ideas occasionally became commercially viable, a few scientists returned the favor, designating Research Corporation the beneficiary of their patent rights, thus building the foundation’s endowment.

In 1937 the foundation entered into an agreement with MIT to manage all of the school’s scientific patents; agreements with other institutions followed. Research Corporation became America’s first technology transfer organization. The Internal Revenue Service eventually took issue with a nonprofit foundation operating a potentially profit-generating business and this function was discontinued in 1987 with the spin-off of a wholly independent business, Research Corporation Technologies.

Over the years, Research Corporation has supported the work of 18,000 scientists, including the early career research of 40 scientists who became Nobel laureates, the first in 1934 and the most recent in 2010.

RCSA has provided early career support for teacher-scholars in the physical sciences at major research universities, primarily undergraduate universities, and liberal arts colleges in all 50 states.

From the 1940s through the 1970s, the foundation supported pioneering research through its Williams-Waterman Fund for the Combat of Dietary Disease. The Fund’s accomplishments include pioneering the enrichment of flour, cornmeal and other cereal grains internationally.

In 1950 Rachel Brown and Elizabeth Hazen, research partners in mycology at the New York State Department of Health, developed the antifungal drug nystatin. RCSA helped them patent and license their discovery as Mycostatin. The profits from this drug were given to RCSA to create the Brown-Hazen Research Fund to support independent research projects in mycology from 1956 to 1978.

In 1992 RCSA became a partner in the international consortium that built the Large Binocular Telescope in Arizona, one of the most advanced telescopes in the world.

The foundation created a nonprofit corporation to manage the collaboration of more than 100 scientists and engineers and to raise private and agency funding for construction of the Large Synoptic Survey Telescope in Chile. Site excavation began in earnest in 2011 with construction expected to take five years.

For more information: please go to www.rescor.org.
Or contact: Research Corporation for Science Advancement
4703 East Camp Lowell Drive, Suite 201, Tucson, Arizona 85712
Phone 520.571.1111 Fax 520.571.1119

Renowned scientists who received research support from RCSA include:

Robert Goddard
the father of modern rocketry

Ernest Lawrence
inventor of the cyclotron atom smasher

Isidor Rabi
whose discoveries led to magnetic resonance imaging (MRI)

Grote Reber
a pioneer of radio astronomy

Robert Van de Graaff
creator of the Van de Graaff generator

Robert Woodward
prominent 20th-century organic chemist

Dudley R. Herschbach
contributor to our understanding of chemical reaction dynamics

John Atanasoff
builder of the first digital computer

Thomas R. Cech
discoverer of the catalytic properties of RNA molecules

Carl Wieman
member of the team that produced the first Bose-Einstein condensate

Ei-ichi Negishi
member of the team that developed palladium-catalyzed coupling in chemistry

In medicine, RCSA funds helped:

Barnett Rosenberg
discoverer of the anti-cancer drug Cisplatin

George Beadle
discoverer of the role of genes in regulating biochemical events within cells

Edward Kendall
synthesizer of cortisone

Carl Djerassi
developer of the first oral contraceptive
In early January 2013 James M. Gentile retired as Research Corporation for Science Advancement (RCSA) president and CEO to return to his academic roots as a professor and dean of the sciences at Hope College in Holland, MI.

The RCSA Board of Directors appointed former RCSA Vice President Jack Pladziewicz to serve as interim president and CEO effective January 14, 2013.

Gentile joined RCSA in 2005 after 29 years as a professor and dean at Hope College. Highlights of his eight-year tenure at RCSA include: the creation of Scialog®, a major, multi-year, grant program designed to accelerate breakthroughs in 21st-century science by funding scientists to pursue transformative multi-disciplinary collaborative research, addressing crucial issues facing society; continued support for the hugely innovative LBT and LSST telescopes; the celebration in 2012 of RCSA’s centennial—100 years of advancing science in America; and his tireless advocacy of excellence in science education and dissemination of best practices in teaching and research to help America maintain its scientific and technological preeminence.

Interim President Jack Pladziewicz first joined RCSA as a program officer in 2003 and served as the vice president from 2008 until his retirement in 2010. Before joining RCSA, he was professor of chemistry and department chair at the University of Wisconsin-Eau Claire where he was on the faculty from 1973 to 2002 and is now professor emeritus.
We are proud of our history of funding scientists for 100 years. As we have learned, it can take many decades to see the full impact of funding innovative, early career scientists.

The arc of discovery—the timeline from the pursuit of an untested, curiosity-driven idea of no apparent practical value to the development of a phenomenal, highly impactful technological device—is often forty years or more. These advancements are founded on decades of curiosity-driven inquiry by hundreds of scientists—true exploration and discovery of the unknown purely for the sake of knowing. It rests upon the belief in the value of knowledge for its own sake.

For example, curiosity-driven research was the foundation of the modern-day medical MRI, which was first available commercially in the 1980s, 50 years after the start of Isidor Rabi’s molecular beam experiments at Columbia University. Between 1931 and 1940 RCSA funded Rabi five times at the start of his career at Columbia—in 1931 for molecular beam research; in 1937, 1938, 1939 and 1940 for research on the magnetic dipole moment of the atom. These experiments culminated in his observation of nuclear magnetic resonance—the work led to the Nobel Prize for Rabi in 1944 “for his resonance method for recording the magnetic properties of atomic nuclei.”

Likewise RCSA funded Felix Bloch four times—in 1939 for his low-voltage generator and in 1946, 1947 and 1948 for nuclear induction and its application to polarized neutrons. RCSA also funded Edward Purcell, in 1946 and 1948, for research on resonance absorption by nuclear magnetic moments. They shared the Nobel Prize in 1952 “for their development of new methods for nuclear magnetic precision measurements and discoveries in connection therewith.”

Magnetic resonance imaging (MRI) is founded on this basic research that, at the time, had no known commercial value.

RCSA also funded Robert Goddard in 1923. Three years later he launched the world’s first liquid fuel rocket: leading 46 years later, in 1969, to “one small step for man, one giant leap for mankind” and the multifaceted and broad-reaching technological advancements that came with space travel.

Many other examples of RCSA’s initiation of the arc of discovery are highlighted in this centennial year report... and the “arc” is just beginning for many of our more recent awards—stay tuned! Moreover, funding the innovative ideas of early career scientists aids in the development of their careers and those of their students, building the intellectual capital required for further discovery.

While it is easy to recognize the impact of Nobel Prize winners, we know that their advances were built on the shoulders of hundreds of other scientists whose work provided the scientific foundation for their successes. This spirit was evident when Cottrell made his gift of his electrostatic precipitator company to start Research Corporation in 1912. He specifically stated that no one can take credit (nor should benefit financially in an extraordinary
way) from advancements that were built on the work of so many others. This relationship is implicit in the words of J. Paul Flory (1974 Nobel Prize in Chemistry) when he said: “Knowledge in depth and breadth is the prerequisite to discovery lest the spark of genius find nothing to ignite.” That “knowledge” comes from the experiments and observations of many other scientists over preceding decades.

As other funders have appeared, RCSA has evolved from funding throughout a scientist’s career to highly selective early career funding. As we look to the future, the challenge is to continue to be catalytic and impactful in initiating the arc of discovery, but in a very different funding environment than the one that faced the foundation early on. When RCSA started—before the existence of federal agencies and other private foundations dedicated to funding science—it was nearly alone on the science funding landscape. Today federal funding of research totals nearly $140 billion, including over $30 billion for basic research; with private foundations providing more than $2 billion more.

As RCSA selects a new president and does strategic planning for its future, it is focused on re-examining where we can have impact, what the most important science funding problems are and where it has a “comparative advantage” relative to other funders. As a small foundation, our ability to have an impact is directly related to our ability to be selective in who and what we fund. RCSA sees its role as a catalytic one, to fund testing of early stage exploratory research ideas of early career academic scientists and thereby catalyze the advancement of fundamental knowledge, provide the starting point for future technology and build the intellectual capital necessary for the United States to remain the world leader in science and technology. The arc of discovery can only be initiated if funders like RCSA continue to take chances on untested, curiosity-driven ideas without the expectation of financial reward.

Finally, I’d like to say thank you to Past President Jim Gentile on behalf of RCSA for his fine work in leading the foundation from 2005 through its centennial year. Dr. Gentile successfully continued RCSA’s tradition of a small foundation “punching above its weight.” We wish him great success as he returns to Hope College as dean of natural and applied sciences.

Jack Pladziewicz
Interim President and CEO
100 Years of Funding Research and Supporting Early Career Scientists

For the past 100 years, Research Corporation for Science Advancement has followed the vision of its founder, Frederick Gardner Cottrell.

In this Centennial year RCSA continued Cottrell’s mission by funding the most promising and creative research of early career scholars in astronomy, physics, chemistry and biochemistry. In 2012 RCSA awarded 55 individual grants and funded 11 collaborative teams representing 40 scholars. Details on scholars, their research and collaborative projects are in this report.

The foundation launched its Centennial with the announcement of the John P. Schaefer Award at a lunch in Tucson on February 16, 2012, followed by a Gala celebration and a congressional briefing in Washington, D.C., on Wednesday, March 14, and two events in New York in May.

RCSA remains steadfast in its 100-year commitment to advance the American scientific enterprise and support academic-based research that has the potential to yield breakthrough discoveries.
Washington, D.C., Gala

RCSA held its official 100th birthday party March 14, 2012 in the soaring entrance to the Smithsonian Institution’s National Air & Space Museum, in Washington, D.C. The celebration, with more than 300 guests, among them Nobel laureates and current leaders in science, science policy and academia, took place under a canopy of historically important aircraft, including Charles Lindbergh’s *Spirit of St. Louis*, suspended from the museum’s lofty ceiling. Robert Goddard’s first rocket was in the room, significant because RCSA provided a $5,000 grant to the Smithsonian, which in turn funded some of Goddard’s early work.

The black-tie event featured keynote speaker Norman Augustine, former CEO of Lockheed Martin and director of the influential *Gathering Storm* reports on American science and math education; Nobel laureates Dudley Herschbach and Carl Wieman; Ralph J. Cicerone, president of the National Academy of Sciences; Bassam Z. Shakhashiri, president of the American Chemical Society; Beverly Tatum, president of Spelman College; John P. Schaefer, former RCSA president; Gayle P.W. Jackson, RCSA board chair; and James M. Gentile, RCSA president and CEO. Ira Flatow, producer and host of *Science Friday* on NPR, was the master of ceremonies.

Mission Statement

RCSA is a foundation for the advancement of science that provides catalytic and opportunistic funding for innovative scientific research and the development of academic scientists, which will have a lasting impact on science and society.
“Good science teaching has never been more important in history than it is now. One of the things research has shown us is that to be a great teacher of science you also have to have a great understanding of what it means to think like a scientist. And that’s really something that’s only possible to do if you are doing science.”

Carl Wieman

“Science and society have what is essentially a social contract that enables great intellectual achievements, but comes with mutual expectations of benefiting the human condition and protecting our planet. I believe it’s not enough for us to be just scientists; we have a responsibility to be citizens as well. As scientist-citizens we have an obligation to use our skills for the benefit of all.”

Bassam Shakhashiri
“Scientists performing basic research provide... knowledge that could lead to solutions to many of the challenges that face our world today. These challenges include providing affordable healthcare; providing clean, sustainable, affordable energy; protecting us from terrorism; conserving our planet's natural environment; and building an economy that ensures that everyone who wants a job can have one.”

Norman Augustine

“The most important thing really is love... With love you know that whatever disappointments or struggles lie behind or ahead, you are blessed. Beyond talent and energy you can bring passion, vision, commitment to whatever you undertake. You can foster in yourself and others the awareness of opportunity, the fellowship of striving, the joy of discovery, the satisfaction of genuine service.”

Dudley Herschbach
On March 14 RCSA co-sponsored, with the American Chemical Society (ACS), a congressional briefing in the historic Kennedy Caucus Room of the Russell Senate Office Building. The panel on “STEM Education for an Innovative Workforce” featured a discussion among James M. Gentile, RCSA president and CEO; Bassam Shakhashiri, president of ACS; Hunter Rawlings III, president of the Association of American Universities; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute; and U.S. Sen. Mark Udall, D-CO. The panel was introduced by Madeleine Jacobs, ACS executive director. The discussion focused on improving attraction and retention rates of students to STEM disciplines and on raising the level of science literacy among all students in America’s research universities.

May in New York

To commemorate its 2012 centennial, Research Corporation for Science Advancement joined with Discover magazine and the New York Academy of Sciences to sponsor a discussion about world-changing research.

The May 16 Crazy or Brilliant: Betting on High-Risk, High-Reward Science event was part of Science in the City, a public series sponsored by the Academy. The wide-ranging conversation was moderated by Corey Powell, editor-in-chief of Discover. The panel featured Jon Gertner, author of The Idea Factory, recalling the history of Bell Labs; renowned theoretical physicist Brian Greene; technology investment expert Shelley Harrison; and MacArthur Genius Award-winning nanoscientist Michael Lipson.

The discussion, featured in the December 2012 issue of Discover, focused on the speakers’ personal involvement in high-risk, potentially high-reward research and the resulting outcomes.

The following evening, May 17, RCSA and the Academy jointly sponsored a dinner and another panel discussion, Innovation at 100, on the topic of how venerable institutions, both private and public, stay current and prosper through changing times.

Karin Ezbiansky Pavese, the Academy vice president for innovation and sustainability, was the moderator. Participants included Francine Berman, vice president for research at Rensselaer Polytechnic Institute; Tim Noonan, vice president of Phantom Works Ventures and Boeing Energy; Leemor Joshua-Tor, dean of the Cold Springs Harbor Watson School of Biological Sciences; and Jane Snowden, senior manager for industry solutions and emerging business, energy and environment at IBM’s T.J. Watson Research Center.

“Science is not just a collection of facts, nor is it something that happens in a laboratory. It happens in the mind. It requires flights of imagination, fancy, inspiration and innovation. And that’s how we should be teaching students.”

James M. Gentile

“Too many of our students drop out of science majors before they’re through. In fact, the attrition rate is astonishingly high—50 to 60 percent... Now that is a national problem, not just a university problem. This is a national problem of the first order.”

Hunter Rawlings III

“So today we must support fundamental research and we must start early to develop our young people... and we must do so in creative and sustained ways. To accomplish this academia, government, industry and the public must work together to improve math and science education from the very beginnings of our children’s lives. The rising generation has the imagination, the commitment and the intelligence to lead in science and engineering and math and technology, if we provide them with the preparation and education they need and deserve.”

Shirley Ann Jackson
Research Corporation has an extraordinary history of converting great ideas into practice, encouraging young people to go into science, to make new discoveries, to come up with something that no one has seen before and then turning it over for the benefit of mankind.

John P. Schaefer

At the opening event of the centennial, February 16 in Tucson, RCSA President James M. Gentile announced that the foundation would revive a distinguished tradition from its history—the awarding of a national prize to a leading scientist for breakthrough discoveries. Originally called the Research Corporation Award, it will be renamed the John P. Schaefer Award—in honor of the former president of the foundation from 1982 to 2005 and of the University of Arizona from 1971 to 1982.

The $100,000 award will be jointly endowed by RCSA and the Frederick Gardner Cottrell Foundation, an affiliate of Research Corporation Technologies, and by private donations. The first awardee will be announced in 2014.
Robert Goddard was 40 years old when he fired the first liquid-fuel rocket. His work was funded in part by Research Corporation through a grant made to the Smithsonian.
For the last two decades, Research Corporation for Science Advancement has invested significant resources to help young faculty at research universities to become both highly successful researchers and inspiring teachers. The Cottrell Scholar program was created in 1994 as a response to RCSA's perception that teaching and research activities at PhD institutions needed to be more integrated. To tackle this challenging goal, RCSA created a program that calls for research and educational plans, with special emphasis in undergraduate science courses.

Following a rigorous selection process that ends with a recommendation by RCSA's Science Advisory Committee, a new class of scholars is identified annually from a very rich pool of applications. Simply said, the Cottrell Scholar program has became an incubator of outstanding teacher-scholars, early career faculty who conduct cutting-edge research and who are committed to excellence in teaching.

Since the inception of this program, RCSA has honored over 250 Cottrell Scholars in more than 150 research universities across the country. In addition to awards, the program has a large networking component: Scholars gather annually at the summer Cottrell Scholar Conference and work on projects of national interest. In 2011 RCSA launched the Cottrell Scholar Collaborative, a new initiative that encourages collaborations aimed at improving undergraduate STEM teaching among Scholars throughout the year.

The research promise of the community we support is evidenced by numerous 2012 national awards to Cottrell Scholars. For example:

**Joshua Figueroa** (2010 CS, Chemistry, University of California, San Diego) received a prestigious Presidential Early Career Award for Scientists and Engineers (PECASE) award. PECASE awards highlight innovation in research and commitment to science education.

Early career awards from both Novartis and DuPont identified **Sarah Reisman** (2012 CS, Chemistry, California Institute of Technology) as a leader in natural product synthesis.

**Scott Snyder** (2009 CS, Chemistry, Columbia University) earned the prestigious Arthur C. Cope Scholar Award from the American Chemical Society.

Over the years a number of Scholars have become national leaders for their excellent science as well as for their educational practices. For example, Mats Selen (1996 CS, Physics, University of Illinois, Urbana-Champaign) played a major role in the educational reform of his department while pursuing research in high-energy particle physics and astrophysics. Selen’s activities had a catalytic effect and inspired other departments to follow their lead, as stated by Jairo Sinova (2006 CS, Physics, Texas A&M University) who is now heading a similar departmental reform in his own institution. “Without Mats’ help and the wonderful colloquium he delivered to our faculty, many of the reforms that we are undertaking would not have been possible,” Sinova said.
Other Cottrell Scholars have risen through the ranks and taken academic leadership positions. For example, in 2012 Peter Dorhout (1994 CS, Chemistry) became the dean of the College of Arts and Science at Kansas State University, a position that benefits from his broad expertise as a teacher-scholar. Adam Falk (1997 CS, Physics) became the 17th president of Williams College in 2010 and Karen Bjorkman (1999 CS, Astronomy) accepted a position as the dean of the College of Natural Sciences and Mathematics at University of Toledo in 2011.

2012 Cottrell Scholars

**Suzanne C. Bart**  
Chemistry  
Purdue University  
_Uranium Complexes Supported by Redox-Active Ligands for Small Molecule Activation_

**Erin Carlson**  
Chemistry  
Indiana University  
_Chemoselective Enrichment Tools for Natural Products Discovery_

**William Dichtel**  
Chemistry  
Cornell University  
_Predictable Assembly of Ordered Heterojunctions Using Covalent Organic Frameworks_

**Kingshuk Ghosh**  
Physics  
University of Denver  
_Designing Biological Toys: Genetic Switches and Clocks_

**Seth Herzon**  
Chemistry  
Yale University  
_Synthetic and Chemical Biological Studies of Lomaiviticins A and B_

**Eric Hudson**  
Physics  
University of California, Los Angeles  
_Keeping Time with the Nucleus: A Solid-State Optical Clock Based on a Nuclear Transition_

**Geoffrey Hutchison**  
Chemistry  
University of Pittsburgh  
_Molecular Piezoelectrics: Building Responsive Electromechanical Materials From the Bottom Up_

**Daisuke Nagai**  
Physics  
Yale University  
_Computational Cosmology in Classrooms and in Research_

**Sarah Reisman**  
Chemistry  
California Institute of Technology  
_The Development and Application of Heterocycle Forming Reactions in Natural Product Total Synthesis_

**Sara Skrabalak**  
Chemistry  
Indiana University  
_New Synthetic Strategies to Multi-Metal Nanocrystals with Controlled Compositions and Structures_

**J.D. Smith**  
Astronomy  
University of Toledo  
_After the Fall—Why Galaxies Die, and How_
Cottrell Scholar Collaborative Launches New Faculty Workshop in Chemistry

Thirty-eight chemistry faculty representing 30 universities attended the first New Faculty Workshop, August 8-10, 2012, at the American Chemical Society (ACS) headquarters in Washington, D.C.

The ACS-hosted workshop, which focused specifically on teaching chemistry to undergraduates, was designed and presented by members of the Cottrell Scholar Collaborative. Workshop organizers include project leaders Andrew Feig, chemistry, Wayne State University, and Rory Waterman, chemistry, University of Vermont; committee members Lane Baker, chemistry and biochemistry, Indiana University; Linda Columbus, chemistry, University of Virginia; and William Jenks, chemistry, Iowa State University.

Michael Doyle, chairman of the Department of Chemistry and Biochemistry at the University of Maryland at College Park, presented the keynote address, “Evolution of the teacher-scholar: Advising, diversity, mentoring, research, safety, teaching... Not enough time for everything.” Program officers from National Institute of Health National-Institute of General Medical Studies, National Science Foundation Division of Chemistry, Department of Energy and ACS Petroleum Research Fund participated in a panel discussion, moderated by RCSA Program Director Silvia Ronco, titled “Writing the Right Grant for the Right Agency.”

The workshop was designed to aid newly hired chemistry faculty to develop strong research and teaching programs. Sessions focused on implementation of evidence-based teaching practices in the classroom, integrating teaching and research, grant writing, student mentoring and effective time management.

The goal was to develop “teachable tidbits” that help participants move away from lectures and towards engaging students in interactive learning.

A second workshop is scheduled for 2013.

2012 Cottrell Scholar Conference

“Educating 21st-Century Scientists” was the topic of the 18th-Annual Cottrell Scholars Conference, held July 11 to 13 in Tucson, Arizona. Sixty scholar-educators shared their experiences, challenges and initiatives to reform undergraduate science teaching in America’s research universities. The conference was chaired by Rigoberto Hernandez, Chemistry, Georgia Institute of Technology, and RCSA Program Director Silvia Ronco.

Conference Keynote Speakers

- Michael Schatz, Professor of Physics, Georgia Institute of Technology, discussed challenges and opportunities in science education.
- Tobin Smith, Vice President for Policy, Association of American Universities, discussed the AAU initiative to reform undergraduate STEM education.
- Celeste Rohlfing, Deputy Assistant Director, Mathematical and Physical Sciences Directorate, National Science Foundation, presented STEM workforce issues from the NSF perspective.
- Luis Echegoyen, Robert A. Welch Professor of Chemistry, University of Texas, El Paso, discussed carbon materials and the serendipity of discovery.

Collaborative Grants

As a result of discussions and collaborations formed at the July 2012 conference, four teams received Collaborative Grants. The grants and the principal investigators are:

- **Cottrell Repository for Effective Science Teaching (CREST)**
  Mike Hildreth, University of Notre Dame
  Geoffrey Hutchison, University of Pittsburgh

- **Mobilizing the Forgotten Army: Equipping TAs with Inquiry-Based Instruction Methods**
  Jordan Gerton, University of Utah
  Michael Schatz, Georgia Institute of Technology

- **Effective Evaluation of Teaching and Learning (EETL)—Searching for New Approaches to R1 STEM Teaching Evaluation**
  Stephen Bradforth, University of Southern California
  Will Dichtel, Cornell University

- **Cottrell Comic Challenge Project (CCP): A Pilot Program for Attracting and Developing Graphic Talent for a Novel Outreach Project**
  Snezana Stanimirovic, University of Wisconsin, Madison
  Yadong Yin, University of California, Riverside
  Mike Gladders, University of Chicago
  Karen Bjorkman, University of Toledo
  Sarbajit Banerjee, State University of New York, Buffalo
The Cottrell College Science Award (CCSA) program supports high-quality research conducted by early career faculty and their undergraduate students at primarily undergraduate institutions. The principal goal of the CCSA program is to seed a sustainable program of research. Moreover, the program supports the development of outstanding teacher-scholars who bring passion about scientific discovery into their classrooms and laboratories and instill enthusiasm in their students. Through their scholarship, these teacher-scholars make significant contributions to their fields of research.

An important measure of sustainability is the ability to attract ongoing funding from other agencies. For example, the graph below shows the distribution of 304 National Science Foundation awards given under the Research at a Undergraduate Institution (RUI) program to faculty who are also eligible for the CCSA program (blue bars). The orange bars show the NSF recipients who also received early career grants from the CCSA program. Awards are grouped according to the number of years in their first faculty position. This graph shows a striking correlation between faculty who received an early career award from RCSA and those who received the larger NSF-RUI awards later in their careers. We believe that this is more than a coincidence and that an early career seed grant from RCSA is an important stepping stone to sustained funding for many PUI faculty.

Examples of Productive Careers with Sustained Funding

Polymer chemist Peter Iovine (Chemistry, University of San Diego) is following a successful upward trajectory with sustained external funding that started in 2004 with a Cottrell College Science Award. A 2008 NSF-CAREER recipient, Iovine was named a Henry Dreyfus Teacher-Scholar in 2012. According to Iovine, “It was the early CCSA funding that has propelled my research career forward. Using the results and publications produced during the award period, I was able to develop a strong NSF-CAREER proposal that was eventually funded.” Iovine adds that multiple individual RCSA awards in his department have contributed to a significantly enhanced research environment and that CCSA-sponsored summer research work has served as the foundation for USD students winning Goldwater Scholarships and NSF Graduate Research Fellowships.

Surface chemist David Patrick (1997 CCSA, Chemistry, Western Washington University) has been able to establish a productive interdisciplinary research
program in surface science. In 2010 NSF awarded Patrick’s group a prestigious SOLAR award for collaborative work with WWU colleagues Brad Johnson (Physics), Janelle Leger (Physics) and John Gilbertson (Chemistry), all former CCSA-recipients. Among Patrick’s impressive accomplishments are a PECASE award in 2000 and a Henry Dreyfus Teacher Scholar award in 2001.

RCSA’s history of helping initiate productive research goes way back. Here are a few examples of current NSF-recipients who started their careers with CCSA funding decades ago:

- Organic chemist Dale Shellhamer (1980 CCSA, Point Loma Nazarene College)
- Nuclear physicist Paul DeYoung (1986 CCSA, Hope College)
- Bioorganic chemist Moses Lee (1990 CCSA, Hope College)
- Physical chemist Helen Leung (1991 and 1997 CCSA, Amherst College)

In addition, two former CCSA recipients received major professional achievement awards in 2012:

- **David S. Hall (2001 CCSA)**, Physics, Amherst College, won the American Physical Society Prize for a Faculty Member for Research at an Undergraduate Institution.
- **David K. Lewis (numerous grants from 1973 through 1996 CCSA)**, Chemistry, Connecticut College, received the American Chemical Society Award for Research at an Undergraduate Institution.

Although RCSA provides financial support for these APS and ACS national awards, it plays no role in selection of the winners. Read more about Dr. Hall and Dr. Lewis in RCSA national award section on page 26.

**A New Generation of Excellent Teacher-Scholars**

RCSA’s history of helping develop vibrant research at primarily undergraduate institutions continues today. Examples of CCSA recipients who received prestigious federal awards in 2012 include:

- Organic chemist Timothy Clark (2007 CCSA, Chemistry, University of San Diego), NSF-CAREER
- Organic chemist Jeffrey Johnson (2008 CCSA, Chemistry, Hope College), NSF-CAREER
- Biophysical chemist Casey Londergan (2008 CCSA, Chemistry, Haverford College), NSF-CAREER
- Materials chemist Kate Plass (2008 CCSA, Chemistry, Franklin and Marshall College), NSF-CAREER
- Biophysicist Rae Anderson (2010 CCSA, Physics, University of San Diego), Air Force Young Investigator Award
2012 Cottrell College Science Awards

Multi-Investigator Cottrell College Science Award

Veronica Barone
Physics

Bradley D. Fahlman
Chemistry
Central Michigan University
Mt. Pleasant, MI
Chemical Unzipping of Doped Multi-Walled Carbon Nanotubes for Energy Storage Applications

Stephanie S. Strand
Biology

Mark J. Snider
Chemistry and Biology

Melissa M. Schultz
Chemistry
College of Wooster
Wooster, OH
Novel Computational Techniques for Investigating Gene Interaction Networks in Ichthyophthirius Multifilis and its Endosymbiotic Bacteria

Natalia V. Connolly
Physics

Alistair Campbell
Computer Science
Hamilton College
Clinton, NY
Microbial Degradation of Pharmaceuticals and Personal Care Products during Wastewater Treatment

Edward J. Crane III
Biochemistry and Chemistry

Jade Star Lachey
Geochemistry
Pomona College
Claremont, CA
An integrated Study of the Enzymology, Microbiology and Geology of Sulfur-Based Respiration: from Molecular Mechanisms to the Bio- and Geosphere

Single-Investigator Cottrell College Science Award

Heather Lynn Abbott-Lyon
Chemistry
Kennesaw State University
Kennesaw, GA
Radiation Induced Prebiotic Chemistry at Ice-Mineral Interfaces

Mehnaaz Ali
Chemistry
Xavier University of Louisiana
New Orleans, LA
Aptamer-Based Biosensors with Co-factor Modulated Enzyme Signaling

Mark R. Ams
Chemistry
Allegheny College
Meadville, PA
Molecular Torsion Balances for Probing the Distance Dependency of CH-pi Interactions

Tania Betancourt
Chemistry
Texas State University, San Marcos
San Marcos, TX
Responsive Hydrogels Based on Binary Nucleic Acid Probes for Molecular Detection and Triggered Drug Release

Mishkatul Bhattacharya
Physics
Rochester Institute of Technology
Rochester, NY
Optomechanical Rotation Sensors: Theoretically Identifying and Circumventing the Quantum Limits to their Sensitivity

Megan E. Bolitho
Chemistry
University of San Francisco
San Francisco, CA
Rational Design, Chemical Synthesis, and Biochemical Evaluation of Small-Molecule Inhibitors of the LuxS Enzyme
Michael David Bridges  
Chemistry  
California State University, Fullerton  
Fullerton, CA  
Equilibrium Dynamics and Binding  
Kinetics of Intrinsically Disordered Cancer Proteins by EPR Spectroscopy

David Joel Gorin  
Chemistry  
Smith College  
Northampton, MA  
Selectivity in Complex Contexts: Directing Chemical Reactions with DNA-Small Molecule Conjugates

Joseph Carson  
Astronomy  
College of Charleston  
Charleston, SC  
Extrasolar Planet Imaging Studies with the Hubble and Spitzer Telescopes

David Hanneke  
Physics  
Amherst College  
Amherst, MA  
Quantum Logic Spectroscopy of Charged Molecules

William Reed Collins  
Chemistry  
Fort Lewis College  
Durango, CO  
From Carbon Nanohoops to Nanotubes: New Approaches to the Chemical Synthesis, Elaboration, and Application of the [n] Cycloparaphenylene Family

Benjamin C. Gorske  
Chemistry  
Bowdoin College  
Brunswick, ME  
Synthesis of Peptoid/Thiopeptoid Hybrids as Polyproline Type II Helix Mimics

Justin K. Hines  
Chemistry  
Lafayette College  
Easton, PA  
Investigating Potential Amyloid-Membrane Interactions: The Role of an Auxilin-type Molecular Chaperone in Yeast Prion Propagation

Prashanth Jaikumar  
Physics  
California State University, Long Beach  
Long Beach, CA  
r-Mode Oscillations and Gravitational Wave Signatures of Hybrid Neutron Stars

Christian E. Laing  
Chemistry  
Wilkes University  
Wilkes-Barre, PA  
Modeling RNA Tertiary Structure by Merging SHAPE Chemistry with Comparative Sequence Alignment

Amy Lane  
Chemistry  
University of North Florida  
Jacksonville, FL  
A Genetic-Chemical Approach for Exploring Biotic Interactions as Activators of Natural Product Biosynthesis Among Marine Bacteria

Joseph Carson  
Astronomy  
College of Charleston  
Charleston, SC  
Extrasolar Planet Imaging Studies with the Hubble and Spitzer Telescopes

Klebert B. Feitosa  
Physics  
James Madison University  
Harrisonburg, VA  
Transient Glassy Dynamics of Dense Emulsions at the Particle Level

Amy Lytle  
Physics  
Franklin and Marshall College  
Lancaster, PA  
Investigation of the Effect of Counterpropagating Light on Perturbative-Regime Frequency Conversion

Klebert B. Feitosa  
Physics  
James Madison University  
Harrisonburg, VA  
Transient Glassy Dynamics of Dense Emulsions at the Particle Level

Sharon Jane Gerbode  
Physics  
Harvey Mudd College  
Claremont, CA  
Particle-Scale Dynamics of Impurity Defect Expulsion in Colloidal Crystals

Corina Maeder  
Chemistry  
Texas State University, San Marcos  
San Marcos, TX  
Regulation of the Essential Splicing Helicase Brr2 by U5 snRNP Proteins During Spliceosome Assembly

Michael David Bridges  
Chemistry  
California State University, Fullerton  
Fullerton, CA  
Equilibrium Dynamics and Binding  
Kinetics of Intrinsically Disordered Cancer Proteins by EPR Spectroscopy

David Joel Gorin  
Chemistry  
Smith College  
Northampton, MA  
Selectivity in Complex Contexts: Directing Chemical Reactions with DNA-Small Molecule Conjugates

Joseph Carson  
Astronomy  
College of Charleston  
Charleston, SC  
Extrasolar Planet Imaging Studies with the Hubble and Spitzer Telescopes

David Hanneke  
Physics  
Amherst College  
Amherst, MA  
Quantum Logic Spectroscopy of Charged Molecules

William Reed Collins  
Chemistry  
Fort Lewis College  
Durango, CO  
From Carbon Nanohoops to Nanotubes: New Approaches to the Chemical Synthesis, Elaboration, and Application of the [n] Cycloparaphenylene Family

Benjamin C. Gorske  
Chemistry  
Bowdoin College  
Brunswick, ME  
Synthesis of Peptoid/Thiopeptoid Hybrids as Polyproline Type II Helix Mimics

Justin K. Hines  
Chemistry  
Lafayette College  
Easton, PA  
Investigating Potential Amyloid-Membrane Interactions: The Role of an Auxilin-type Molecular Chaperone in Yeast Prion Propagation

Prashanth Jaikumar  
Physics  
California State University, Long Beach  
Long Beach, CA  
r-Mode Oscillations and Gravitational Wave Signatures of Hybrid Neutron Stars

Swapan Jain  
Chemistry  
Bard College  
Annandale-on-Hudson, NY  
Synthesis of Novel Purine Analogs and Evaluation of their Binding to Xanthine Phosphoribosyl Transferase (XPT) Mrna

Jun-Hyun Kim  
Chemistry  
Illinois State University  
Normal, IL  
Construction and Modification of Stimuli-Responsive Hollow Polymer Nanoparticles for Targeted Drug-Delivery Vehicles

Amy Lytle  
Physics  
Franklin and Marshall College  
Lancaster, PA  
Investigation of the Effect of Counterpropagating Light on Perturbative-Regime Frequency Conversion

Corina Maeder  
Chemistry  
Texas State University, San Marcos  
San Marcos, TX  
Regulation of the Essential Spicing Helicase Brr2 by U5 snRNP Proteins During Spliceosome Assembly

Christopher C. Marvin  
Chemistry  
Hendrix College  
Conway, AR  
Visible Light Photocatalytic Oxidation of Amines to Iminium Ions: Amine Scope and Mannich Cyclizations with Allyl and Vinyl Silanes
Andrew Mitchell  
Chemistry  
Illinois State University  
Normal, IL  
Toward the Building Blocks for the Convergent Total Synthesis of Muironolide A

Kristine A. Nolin  
Chemistry  
University of Richmond  
Richmond, VA  
Rhenium(V)-Oxo Catalyzed Addition Reactions

Abby R. O’Connor  
Chemistry  
Ramapo College of New Jersey  
Mahwah, NJ  
New Ni(II) and Pd(II) Complexes Containing Hemilabile Pendent Arene Groups to Catalyze the Polymerization of Olefins and Polar Monomers

Shannon O’Leary  
Physics  
Lewis and Clark College  
Portland, OR  
Understanding Noise from Quantum Interference for a Novel Atomic Magnetometer

Lisa E. Prevette  
Chemistry  
University of St. Thomas  
Saint Paul, MN  
Characterization of the Interaction Between Cell-Penetrating Compounds and Glycosaminoglycans

Tatiana R. Prytkova  
Chemistry  
Chapman University  
Orange, CA  
The Protein Structure and Mobility control of Electron Transfer Reactions in Ru-Modified Proteins.

David A. Rider  
Chemistry  
Western Washington University  
Bellingham, WA  
Conducting Polymer/Nanoparticle Interfacial Layers for Hydrogen Fuel Cells

Nicholas J. Robertson  
Chemistry  
Northland College  
Ashland, WI  
Synthesis of High Molecular Weight Polyester and Polyamide Architectures Derived from Biorenewable Monomers

Kerry A. Rouhier  
Chemistry  
Kenyon College  
Gambier, OH  
Defining the Role of Arabidopsis thaliana Methylmalonate Semialdehyde Dehydrogenase in Lipid Metabolism

David S. N. Rupke  
Astronomy  
Rhodes College  
Memphis, TN  
Feedback in Major Galaxy Mergers: A Comprehensive Survey of Wind Structure and Power Sources

Nicholas Salzameda  
Chemistry  
California State University, Fullerton  
Fullerton, CA  
Discovery and Optimization of Small Molecule Inhibitors for the Botulinum Neurotoxin Type E Light Chain

Kristin Michelle Slade  
Chemistry  
Hobart and William Smith Colleges  
Geneva, NY  
The Effects of Macromolecular Crowding on Enzyme Kinetics in the Mitochondria

Peifang Tian  
Physics  
John Carroll University  
University Heights, OH  
Modeling the Light Propagation in Brain Tissues using Monte Carlo Simulation with a Dynamic and Heterogeneous Tissue Model

Mike J. Twiner  
Chemistry  
University of Michigan, Dearborn  
Dearborn, MI  
Algal Toxins as Phosphatase Inhibitors: Identification of New Targets and Structure-Activity Characterization

Eric James Watson  
Chemistry  
Seattle University  
Seattle, WA  
The Synthesis and Reactivity of Novel Triple-layer Bimetallic Complexes: Model Systems for Organometallic Molecular Wires

James Wollack  
Chemistry  
St. Catherine University  
Saint Paul, MN  
Enzymatic and Chemical Synthesis of Strained Ring Containing Proteins and Oligonucleotides for use in Tetrazine Cycloaddition
Laboratory worker, circa 1939, monitors cyclotron developed by Ernest O. Lawrence with funding from Research Corporation.

100 Years of Funding Research
The Scialog program has the important but daunting goal of accelerating fundamental scientific breakthroughs which have the potential to overcome global challenges facing humankind. The first Scialog initiative is focused on basic research to enable clean, sustainable, affordable energy for a world rapidly heading toward a doubling of its energy needs by mid-century. The initiative is aimed at accelerating underlying scientific advances on the molecular and nano scales to improve the efficiency and scalability of technologies that use solar energy to produce electricity and fuels such as hydrogen.

The premise of Scialog is simple. A small but well targeted use of resources to fund highly innovative researchers with promising but untested ideas can make a big difference—especially when these researchers are brought together in a unique innovation environment and challenged to form additional collaborations based on ideas that emerge from multidisciplinary dialog in that environment.

Scialog funds ground-breaking research by recently tenured faculty, who are designated Scialog Fellows, at U.S. academic institutions. Scialog Fellows are convened annually, along with other world-class researchers, to share critical feedback on their projects and further develop research ideas. The conferences have an unusual format with a limited number of formal presentations and significant time spent in breakout sessions and other forms of dialog. Participants are challenged to form small teams and write short collaborative proposals “on the spot” for additional seed funding based on new ideas that emerge during the conference.

Since 2010, when Scialog was launched, 23 Scialog Fellows have received awards totaling $2.5 million. In addition, nine teams, composed of Scialog Fellows and other researchers, have received Collaborative Innovation Awards (CIA) totaling $900,000, based on their proposals written at Scialog conferences.

The program is young and the arc of innovation from the lab bench to commercial industries that change the world can be long. But so far Scialog is helping researchers make important advances.

A major goal of the program is to provide seed funding to allow researchers to take a highly innovative idea from the initial untested stage to a level at which the idea’s promise is demonstrated sufficiently to attract substantial additional support. Another important goal is to use dialog among researchers to hit upon additional innovative ideas and create new collaborative teams.

Scialog Fellow Hugh Hillhouse, University of Washington, received a Scialog grant in 2010 to support his study of a new class of thin-film nanomaterials, known as “double-gyroid” quantum wire arrays, in the hope of squeezing more usable energy out of each photon. This year, Hillhouse led a team that won a four-year, $1.9 million NSF Sustainable Energy Pathways (SEP) grant entitled, “Sustainable Energy Pathway to Terawatt-Scale Solution-Processed Solar Cells from Earth Abundant Elements.” The team included Scialog Fellow Daniel Gamelin and Scialog CIA recipient Christine Luscombe as co-principal
investigators and Scialog Fellow David Ginger as a collaborator, all from the University of Washington. According to Hillhouse, “Scialog played two important roles in our successful NSF SEP proposal. First, the dialog at the conference catalyzed our discussions about the key issues and bottlenecks in solar energy conversion and led to some healthy debate that really honed our NSF SEP. In addition, one of the thrusts in the SEP is an offshoot of the Scialog award.”

Scialog Fellow Ray Schaak, Pennsylvania State University, has taken an important step toward developing efficient artificial photosynthesis. A recent article presenting results of his Scialog supported work on the use of hollow nanocubes for photocatalytic carbon dioxide conversion to methane under solar irradiation was designated as a “Hot Paper” by the editors of Angewandte Chemie International Edition. According to Schaak, “Scialog was my entry point into the solar energy conversion field and the connections and interactions from this program continue to lead to new ideas and collaborations, including participation in the NSF-sponsored Powering the Planet initiative.”

Other Scialog projects are showing great promise as well. We don’t know yet if Scialog will attain its goal of catalyzing discoveries that lead to solar energy powering the world. But we do know it is worth trying.

2012 Scialog Conference on Solar Energy Conversion

The Third-Annual Scialog Conference on Solar Energy Conversion was held October 9-12 at Biosphere 2 in Oracle, Arizona. The conference, sponsored in part by the National Science Foundation, included representatives from the Department of Energy, the National Renewable Energy Laboratory, the Joint Center for Artificial Photosynthesis and the Center for Revolutionary Solar Photoconversion.

Keynote Speakers

- Neal Armstrong, Director, Center for Interface Science: Solar Electric Materials, University of Arizona
- Larry “Kaz” Kazmerski, Director, Science and Technology Partnerships, National Renewable Energy Laboratory (NREL)
- Ana Moore, Regent’s Professor of Chemistry and Biochemistry, Arizona State University
- Ramamoorthy Ramesh, Past Director, Department of Energy SunShot Initiative
- Michael Woodhouse, Solar Photovoltaic Technology and Economic Analyst, National Renewable Energy Laboratory (NREL)
Keynote Speakers from Past Scialog Solar Energy Conferences

- Nate Lewis, George L. Argyros Professor of Chemistry, California Institute of Technology, and Principle Investigator, Joint Center for Artificial Photosynthesis (JCAP)
- Arun Majumdar, Director, Advanced Research Projects Agency—Energy (ARPA-E)
- Dan Arvizu, Director, National Renewable Energy Laboratory (NREL)
- Krishnan Rajeshwar, Distinguished University Professor and Interim Associate VP for Research, University of Texas, Arlington
- Tom Peterson, Assistant Director, Directorate for Engineering, National Science Foundation (NSF)
- Eric Mazur, Balkanski Professor of Physics & Applied Physics, Harvard University
- Tom Moore, Regent’s Professor of Chemistry and Biochemistry, Arizona State University
- Roger Angel, Director, Steward Observatory Mirror Laboratory, and Regents Professor of Astronomy and Optical Sciences, University of Arizona

Scialog Collaborative Innovation Awards 2012

- BaSi2—A New Earth-Abundant Solar Cell Material—Jiangeng Xue, University of Florida; Song Jin, University of Wisconsin; and So Hirata, University of Illinois
- Supramolecular Non-Fullerene Electron Acceptors for Organic PVs—A Pathway Toward 20% Efficient Cells at a Cost Less than $0.50/W—Alan Sellinger, Colorado School of Mines; Michael Chabinyc, University of California, Santa Barbara; and Sean Shaheen, University of Denver
- Photo-induced CO₂ Reduction Using Reverse TCA Cycle Enzymes—Sean J. Elliott, Boston University and Gordana Dukovic, University of Colorado
The Arizona Partners in Science program provides summer research opportunities for Tucson-based high school science teachers in collaboration with University of Arizona faculty. The program is a partnership with the M.J. Murdock Charitable Trust, which funds a similar program in the Pacific Northwest. In addition to their research, the teachers participate in an annual Partners in Science conference. At the conclusion of the two-year program, the teachers are invited to apply for supplemental grants to purchase equipment for their high school classes.

The program attracts high-caliber teachers, including Margaret Wilch (2009 Partners), Tucson High Magnet School, who teaches honors research methods, biology and biotechnology. In 2012 she received an honorary doctoral degree from the University of Arizona, a first for any high school teacher.

Pam Tautz, University High School, received a Partners in Science award in 2010 to research the Scanning Probe Microscopy of Graphene. In 2012 she received a supplemental award to purchase a trinocular metallurgical microscope, a digital camera and other laboratory equipment to continue this research with her high school students.

2012 Arizona Partners in Science Teachers/Mentors

Stephen Murray, Catalina High School
Hermann Fasel, Aerospace and Mechanical Engineering, University of Arizona
Solar Chimney Power Plant Research—Scientific Analysis of Scaled Model

William Golden, Flowing Wells High School
Arvinder Sandhu, Physics, University of Arizona
Preparation and Spectroscopy of Graphine Nano-fragments

Kevin Horton, Cienega High School
Theodore Price, Pharmacology, University of Arizona
Novel Therapeutics for the Reversal of Chronic Pain

Taralyn Rogers, Mountain View High School (Marana)
Catharine Smith, Pharmacology and Toxicology, University of Arizona
Maximizing the Efficiency of Histone Deacetylase Inhibitors of Non-Hodgkins Lymphoma: PreClinical Studies
To recognize productive researchers at primarily undergraduate institutions, Research Corporation for Science Advancement sponsors two national awards that are managed by the American Chemical Society and the American Physical Society. Recipients are selected by a rigorous peer review process managed by the two societies.

**David S. Hall**, physics, Amherst College, was the 2012 recipient of the American Physical Society Prize for a Faculty Member for Research at an Undergraduate Institution. Hall received a Cottrell College Science Award in 2001.

The prize honors a physicist whose research has achieved wide recognition and contributed significantly to physics, and who has also contributed substantially to the professional development of undergraduate physics students.

Hall was cited for ground-breaking investigations of Bose-Einstein condensates and the dynamics of quantum vortices. Hall and his group of undergraduate researchers invented a new technique for examining the behavior of rotating matter at the coldest temperatures in the universe. The method—which involves an apparatus that refrigerates atoms to billionths of a degree above absolute zero—enabled them to create the first-ever movies of vortex motion in individual Bose-Einstein condensates. And they developed the technique in Hall’s campus laboratory.

**David K. Lewis**, Margaret W. Kelly Professor of Chemistry, Connecticut College, received the 2012 American Chemical Society Award for Research at an Undergraduate Institution. RCSA funded Lewis’ work numerous times from 1973 through 1996. His research centered on gas phase reaction kinetics; rates and mechanisms of prototype chemical reactions; ultra-high resolution molecular spectroscopy; and physics.

The award honors a chemistry faculty member whose research in an undergraduate setting has achieved wide recognition and contributed significantly to chemistry and to the professional development of undergraduate students.
Ernest O. Lawrence was 30 years old when he built the first cyclotron at the University of California, Berkeley. His work was funded by Research Corporation.
Nobel laureate Charles Townes, pictured here when he was about 40, received funding from RCSA for his work on the theory and application of the maser, which led directly to today’s laser.
The financial activities of Research Corporation for Science Advancement were audited by Keegan, Linscott & Kenon, PC. For the complete audited financial statement, please visit our website at rescorp.org.

Where Our Money Goes

**Total Expenses** $7,513,828
- Grants, Awards & Programs 64%
- Centennial Programs 16%
- General & Administrative Costs 15%
- Partnership Development & Fundraising 5%

**Grants and Awards Approved** $3,104,186
- Scialog 9%
- Cottrell College Science 53%
- Cottrell Scholar 28%
- Arizona Partners in Science 2%
- Science in the Public Interest, Discretionary Grants & Special Initiatives 8%

**Net Assets at Beginning of Year** $121,789,242

**Net Assets at End of Year** $141,324,688
Board of Directors

Gayle P.W. Jackson
Research Corporation Board Chair, President & CEO, Energy Global, Inc.

Patricia C. Barron
Lead Director of Quaker Chemical and Teleflex Corporations. Board Director on Ultralife Corporation and USAA. Past Chair, Research Corporation and a member of the Executive, Governance and Nominating and Strategic Partnerships Committees.

G. Scott Clemons
Managing Director of Brown Brothers Harriman & Co. Chair of the Finance Committee and a member of the Strategic Partnerships and Executive Committees.

Peter K. Dorhout
Dean of the College of Arts and Sciences, Kansas State University. Chair of the Audit Committee, a member of the Science Advancement Committee and the Executive Committee.

James M. Gentile
President and CEO of Research Corporation for Science Advancement. Former Dean for Natural Sciences and endowed professor in biology at Hope College in Holland, Michigan. An ex-officio member on all committees.

Robert B. Hallock
Distinguished Professor in the Department of Physics at the University of Massachusetts at Amherst. Chair of the Science Advancement Committee, a member of the Governance and Nominating Committee, the Executive Committee and the Strategic Partnerships Committee.

Jonathan Hook
Vice President and Chief Investment Officer of The Ohio State University. A member of the Audit and Finance Committees.

Brent L. Iverson
Chairman of the Chemistry & Biochemistry Department at the University of Texas at Austin. Chair of the Governance and Nominating Committee and a member of the Finance, Science Advancement and Executive Committees.

Suzanne D. Jaffe
President of S.D.J. Associates. Chair of the Strategic Partnership Committee and a member of the Finance and Executive Committees.

Elizabeth McCormack
Professor of Physics at Bryn Mawr College. A member of the Governance and Nominating and the Science Advancement Committees.

Patrick S. Osmer
Vice Provost for Graduate Studies and Dean of the Graduate School of The Ohio State University. A member of the Audit and Governance and Nominating Committees.

David L. Wenner
Retired from a 35 year professional career, most of which he spent with McKinsey & Company, the management consulting firm. A member of the Science Advancement and Strategic Partnerships Committees.

Emeritus Board Members

Robert B. Holland, Jr.
Williams Capital Partners. A member of the Audit and Strategic Partnerships Committees.

John P. Schaefer
President and Executive Chairman of the Board of Directors of REhnu. Director of Edmund Optics. RCSA Past President. A member of the Strategic Partnerships Committee.

Stuart B. Crampton
Barclay Jeomain Professor of Natural Philosophy (Emeritus) at Williams College. A member of the Finance and Science Advancement Committees.

Presidential Advisory Committee

Vicki Chandler  
Chief Program Officer  
Gordon & Betty Moore Foundation

Robert Full  
Professor of Integrative Biology  
University of California, Berkeley

Brent L. Iverson  
Chairman of the Chemistry & Biochemistry Department  
University of Texas at Austin

Eric Mazur  
Balkanski Professor of Physics and Applied Physics  
Harvard University

Elizabeth McCormack  
Professor of Physics  
Bryn Mawr College

Randy Murch  
Associate Director, Research Program Development and Adjunct Professor  
Virginia Polytechnic Institute and State University (Virginia Tech)

Cherry A. Murray  
Dean of the School of Engineering and Applied Sciences  
Harvard University

Jeanne L. Narum  
Founding Director; Senior Fellow  
Project Kaleidoscope (PKAL)

David W. Oxtoby  
President  
Pomona College

Gregory Petsko  
Gyula and Katica Tauber Markey Professor of Biochemistry and Chemistry  
Brandeis University

Geraldine Richmond  
Richard M. and Patricia H. Noyes Professorship in Chemistry  
University of Oregon

Joaquin Ruiz  
Executive Dean, Colleges of Letters, Arts and Science Dean, College of Science Professor, Geosciences  
University of Arizona
Science Advisory Committee

Mark Bussell  
Chemistry Department  
Western Washington University

Rich Carter  
Chemistry Department  
Oregon State University

Bert Chandler  
Chemistry Department  
Trinity University

Jordan Gerton  
Physics and Astronomy Department  
University of Utah

Martin Gruebele  
Chemistry Department  
University of Illinois, Urbana-Champaign

James Heyman  
Physics Department  
Macalester College

Peter Iovine  
Chemistry Department  
University of San Diego

Nicola Pohl  
Chemistry Department  
Indiana University, Bloomington

Jairo Sinova  
Physics Department  
Texas A&M University

Veronika A. Szalai  
Project Leader, Energy Research Group  
National Institute of Standards and Technology

Scialog Review Panel

Nate Lewis, Review Panel Chair  
Chemistry Department  
California Institute of Technology

Carol Bessel  
Program Director, Chemical Catalysis  
National Science Foundation

Prashant Kamat  
Chemistry and Biochemistry Department  
University of Notre Dame

Tom Moore  
Chemistry and Biochemistry Department  
Arizona State University

Teri Odom  
Chemistry Department  
Northwestern University

Dick Powell  
Vice President for Research, Emeritus  
University of Arizona

Krishnan Rajeshwar  
Chemistry and Biochemistry Department  
University of Texas, Arlington

Linda Sapochak  
Program Director  
National Science Foundation

Mats Selen  
Physics Department  
University of Illinois, Urbana-Champaign

Luping Yu  
Chemistry Department  
University of Chicago
### Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>James M. Gentile</td>
<td>President</td>
</tr>
<tr>
<td>Martha Gilliland</td>
<td>Vice President</td>
</tr>
<tr>
<td>Daniel Gasch</td>
<td>Chief Financial Officer</td>
</tr>
<tr>
<td>Silvia Ronco</td>
<td>Program Director</td>
</tr>
<tr>
<td>Richard Wiener</td>
<td>Program Director</td>
</tr>
<tr>
<td>Alicia Carina Sanchez</td>
<td>Director of Strategic Partnerships</td>
</tr>
<tr>
<td>Thomas Goodenow</td>
<td>Director of Information Technology</td>
</tr>
<tr>
<td>Elaine Nathanson</td>
<td>Communication Director</td>
</tr>
<tr>
<td>Sandy Champion</td>
<td>Lead Program Assistant</td>
</tr>
<tr>
<td>Gail Craig-Jager</td>
<td>Financial Administrator</td>
</tr>
<tr>
<td>Kathleen Eckert</td>
<td>Administrative Assistant</td>
</tr>
<tr>
<td>Barbara Gray</td>
<td>Coordinator for Science Program</td>
</tr>
<tr>
<td>Dan Huff</td>
<td>Science Writer</td>
</tr>
<tr>
<td>Dena McDuffie</td>
<td>Historian and Archivist</td>
</tr>
<tr>
<td>Sofia L. Morris</td>
<td>Office Coordinator</td>
</tr>
<tr>
<td>Linda Neefe</td>
<td>Corporate Administrator</td>
</tr>
<tr>
<td>Kathleen Parson</td>
<td>Consultant</td>
</tr>
<tr>
<td>Joan Van Houten</td>
<td>Executive Assistant to the President</td>
</tr>
</tbody>
</table>