

# Community in Science

2014 Annual Report



RESEARCH CORPORATION  
*for* SCIENCE ADVANCEMENT

*A foundation dedicated to science since 1912.*

## Initial Impressions Built on Decades of Admiration



Robert N. Shelton

“Guided by an extensive strategic planning process, we are introducing significant changes in RCSA-sponsored programs starting with the call for proposals in 2015.”

My decades-long career as an experimental physicist working in condensed-matter provided early exposure to RCSA as a unique foundation that stresses the importance of launching young faculty who are just starting their academic careers. With an emphasis on the synergy between creative research and innovative teaching, RCSA addresses an important niche and supports numerous young scholars. Over the years, these Cottrell Scholars progressed to leadership positions, including inspirational Nobel laureates and academic leaders who have transformed science education.

Building on RCSA's remarkable legacy of success in supporting unique, impactful research at universities and colleges across the nation, we now look to the future of the Foundation. Recent years have witnessed a gradual, but consistent decline in funding for basic research in the U.S. Great corporate laboratories that once incubated fundamental research that led to impactful inventions now engage predominantly in engineering processes as these companies are driven by quarterly financial reports. Funding from federal agencies, still the dominant source of research support in this country, focuses on “safe” proposals to ensure goals can be achieved and thus qualify the principal investigator for the next grant.

Within this national context, we ask ourselves, “How can RCSA use its competitive advantages to make a difference?” Guided by an extensive strategic planning process, we are introducing significant changes in RCSA-sponsored programs starting with the call for proposals in 2015. Our new Mission Statement: **The Mission of RCSA is to advance early-stage, high-potential, basic scientific research** makes clear that our priority is support of basic research, consistent with the name of our foundation and with the passion of our founder, Frederick Cottrell. We are expanding the Cottrell Scholar Program to include opportunities for early career faculty in both R1 universities and Primarily Undergraduate Institutions. With larger initial awards, multiple opportunities for career-advancement awards and a highly competitive capstone award after earning tenure, this program stresses a career-long relationship of support and innovation between the Cottrell Scholar and RCSA.

We remain committed to the power of partnerships. This dedication is manifest through our Scialog program that creates collaborative research partnerships across multiple disciplines, and through RCSA's membership in the Science Philanthropy Alliance (SPA). Scialog stresses and supports innovative, basic research on problems of high complexity that are of significant value to society. The ultimate goal of each Scialog is to stimulate quantifiable progress on these challenging topics. In pursuing this goal, Scialog offers early career researchers the opportunity to forge new collaborations across disparate disciplines that can spark innovative ideas to attract higher levels of funding. RCSA's membership in SPA is complementary to Scialog and builds on our networking opportunities. SPA offers an exciting, albeit very early stage opportunity to leverage resources and partner with some of the most respected and largest foundations dedicated to supporting basic research.

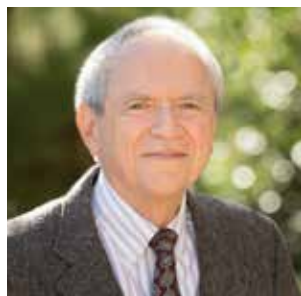
The career-long relationship that RCSA builds with each Cottrell Scholar is reflected in the sense of collegiality demonstrated within the RCSA board of directors. During their service on the board, these scientists, engineers and business leaders bring a diverse set of professional experiences in exercising their high-level guidance of the Foundation. Emeriti directors are prized for their perspective and stay connected through the scientific programs. In an accompanying essay, Emeritus Director Bob Hallock illustrates the strong sense of “family” that permeates the board.

RCSA is in good hands as we face the challenges of identifying and supporting the best young scholars of the future. I ask that you stay informed about our programs and opportunities by visiting our website [www.rescorp.org](http://www.rescorp.org) and corresponding directly with me at [rshelton@rescorp.org](mailto:rshelton@rescorp.org)

**Robert N. Shelton**

President, Research Corporation for Science Advancement

## A Wonderful Sense of Family



Robert B. Hallock, Ph.D.

In the midst of my first year as an Emeritus member of the Board of Directors, I have some mixed feelings. I appreciate the opportunity provided to me to say a few words here about why this is the case and to reflect briefly on what Research Corporation for Science Advancement represents.

I say I have some mixed feelings because I have for many years been involved with Research Corporation and admire what it strives to accomplish. My association started with a small grant in 1972, eventually included service on the Grants Advisory Panel, and subsequently grew to eleven years of service as a member of the Board of Directors, with a number of roles there, including Chair of the 2007 Strategic Plan and more recently of the Science Advancement Committee. During those years I have come to know many folks, remarkable folks, folks who have taught me a lot. It is impossible to name them all, but among them are John Schaefer, who with skill guided the organization for 23 years, many remarkable colleagues with whom I have served on the Board of Directors, the RCSA staff members that I have come to know over the years, and most recently the current President, Robert Shelton. And, I am proud to call many of these folks friends, good friends. The Board of Directors is not like many corporate boards, it is something of a hybrid. When the Board meets, there is serious business to be discussed, but there is also a wonderful sense of family. Folks in the organization and on the Board share a common mission and they care about each other. My colleagues on the board are remarkably dedicated and treat each other with enormous respect. Like a caring parent, there have been times when I have worried about RCSA and been concerned about its future. But, now is certainly not one of those times.

“My association [with RCSA] started with a small grant in 1972, eventually included service on the Grants Advisory Panel, and subsequently grew to eleven years of service as a member of the Board of Directors...”

I say mixed because, while I will really miss the opportunity to help guide the organization, I also recognize that renewal and new insights come from new Board members who will replace those who rotate off the Board. And, I really believe that the organization, enhanced recently by superb new Board members, is in very good hands. And, I also believe that our new President is an inspiring and engaged leader, one who will help to steer the organization on a course that is right for it, and do so with exceptional management skills and wide consultation.

More than once I have been asked why I have devoted so much time to the foundation. Well, the answer is complex, but is based on the fact that RCSA seeks to do substantial good by wisely investing in research and the people who excel at it. To decrease my engagement with colleagues on the Board is a difficult transition. But, to have been able to help steer such a remarkable organization has been a wonderful opportunity and rare privilege. And, it is an honor to have been asked to offer a few comments for this Annual Report.

**Robert B. Hallock, Ph.D.**

# Programs Overview for 2014

## Science + Dialog

A Research Process Aimed at Accelerating Breakthroughs

Scialog funds network building among early career scientists, encouraging them to conduct discovery research. The hypothesis is that small, but well targeted grants to highly innovative cross-disciplinary teams with high-risk, untested ideas can be highly impactful—especially when these scientists are brought together in a unique environment and challenged to form collaborations based on ideas that emerge from multidisciplinary dialog. Scialog is intended to incentivize collaborative idea generation across disciplines among carefully chosen cohorts. The goal is rapid progress in the face of important global challenges.



## Cottrell Scholar Awards

Creating a Community of Scientist-Educators

The Cottrell Scholar Award Program (CSA) funds early career faculty in the physical sciences and related fields who are committed to excellence in both undergraduate teaching and research at U.S. research universities. The premise is that the right combination of high-caliber research, integrated with modern, interactive educational tools, creates the perfect environment for scientific breakthroughs and outstanding learning outcomes for the next generation of U.S. scientists.

## Cottrell College Science Awards

Catalyzing Early Career Scientists to Begin Their Research Careers

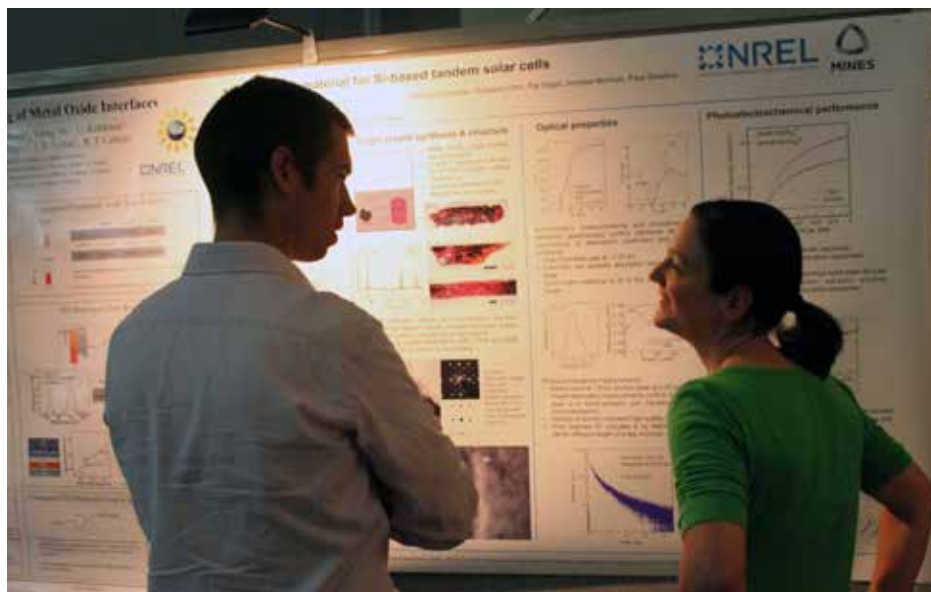
The Cottrell College Science Award Program (CCSA) supports the start of high-quality research programs conducted by early career faculty and their students at primarily undergraduate institutions. By funding cutting-edge science, the CCSA program helps initiate long-lived thriving research environments that make solid contributions to science while inspiring tomorrow's scientists.

## Partners in Science

Improving Science Education in Grades 9-12

This program provides summer research opportunities for science high-school teachers in partnership with faculty members at the University of Arizona. AZPART seeks to improve grades 9-12 science education, decrease teacher attrition, and increase the number of students who choose to pursue science careers.

Scialog fellows explore ideas for breakthrough research.



## 2014 Highlights in the RCSA Community

Our new Mission Statement: *The Mission of RCSA is to advance early-stage, high-potential, basic scientific research makes clear that our priority is support of basic research, consistent with the name of our foundation and with the passion of our founder, Frederick Cottrell.*

Seven Cottrell Scholars were among the distinguished scientists elected as 2014 American Physical Society Fellows: **Lars Bildsten**, University of California, Santa Barbara; **Duncan Brown**, Syracuse University; **Stephen Hill**, Florida State University; **Arthur Kosowsky**, University of Pittsburgh; **Zhiqiang Mao**, Tulane University; **Grzegorz Szamel**, Colorado State University; **Carsten-Andreas Ullrich**, University of Missouri. The criterion for election is exceptional contributions to the physics enterprise.

In February four teams of scientists received Scialog Collaborative Innovation Awards totaling more than \$400,000 based on ideas they developed at October's annual conference at Biosphere2.

Cottrell Scholar **Andrew Feig**, Wayne State University, had a big hand in designing much of the educational agenda that convinced the National Institutes of Health to award a consortium of Wayne State and three other Detroit-area schools \$21.2 million over five years to improve student diversity in biochemical research.

Cottrell Scholar **Yiyang Wu**, professor of chemistry and biochemistry at Ohio State, led a research team that invented a combination solar cell and battery. The patented device, composed of nanometer-sized rods of titanium dioxide covering a titanium gauze surface, recharges itself using air and light. Wu predicted it will reduce the cost of photovoltaic power by roughly 25 percent.

Dreyfus Awards: Cottrell Scholars **Theo Agapie**, Caltech, and **Sara Skrabalak**, Indiana University, received prestigious 2014 Camille Teacher-Scholar awards given to faculty at doctoral-granting institutions. As for Henry Teacher-Scholar awards to PUI faculty, six out of the seven recipients were former Cottrell College awardees: **Myriam Cotton**, Hamilton College; **Joshua Schrier**, Haverford College; **Jason Gilmore**, Hope College; **Doug Vander Griend**, Calvin College; **Hai Lin**, University of Colorado, Denver; and **Greg O'Neil**, Western Washington University.

The National Science Foundation agreed to support construction of the Large Synoptic Survey Telescope (LSST). This marked the official federal start of the LSST project, the top-ranked major ground-based facility recommended by the National Research Council in 2010. Former RCSA President **John P. Schaefer** played a major role in organizing the LSST project; first light for the telescope is scheduled for 2022.

RCSA made a gift of \$1.5 million to the National Academy of Sciences to establish the Award for Scientific Discovery in honor of RCSA past President **John P. Schaefer**.

Cottrell Scholar **Gordana Dukovic**, University of Colorado, Boulder, published a paper in the Journal of the American Chemical Society that was featured in JACS Spotlights: "Electron transfer kinetics in CdS nanorod-[FeFe] hydrogenase complexes and implications for photochemical H<sub>2</sub> generation." Dukovic was also named a 2014 Sloan Research Fellow.

**Veronica Barone**, Central Michigan University, was named Woman Physicist of the Month for June 2014 by the American Physical Society Committee on the Status of Women in Physics. Barone is a recipient of a Cottrell College Award and a related NSF award for her research on multi-walled carbon nanotubes for energy storage.

RCSA announced it would create a new award to recognize the outstanding accomplishments of Cottrell Scholars. RCSA President **Robert Shelton** announced the TREE Award (Transformational Research Excellence in Education) at the 20th-annual Cottrell Scholar Conference in Tucson, AZ. He said the TREE Award is also meant to encourage the improvement of undergraduate science education.

Cottrell Scholar **Linda Columbus**, University of Virginia, reported on the structure and dynamics of Opa proteins in the July 16 cover story of the Journal of the American Chemical Society. The Opa, she noted, provide extracellular loops as a mechanism of foreign body entry to human cells. Understanding the Opa proteins may provide insights for the development of targeted pharmaceutical delivery.

Computational chemist and Scialog Fellow **So Hirata**, University of Illinois at Urbana-Champaign, published nine papers in 2014 that acknowledged Research Corporation, including a cover article in J. Phys. Chem. A on a newly developed, highly scalable stochastic algorithm of *ab initio* electron-correlation theories. Hirata also began DOE and NSF awards totaling \$650,000 in 2014. The NSF project will fully develop ideas explored preliminarily with the seed funding from his Scialog award.

In the 4 September 2014 issue of Science, a team led by former Cottrell College Award recipient **Bert D. Chandler**, Trinity University, San Antonio, described direct evidence of a water-mediated reaction mechanism for room temperature CO oxidation over Au/TiO catalysts. Their work may prove key to solving the puzzles of gold catalysis, which is used in many manufacturing processes.

Cottrell Scholar **Eberhard Bodenschatz**, director at the Max Planck Institute for Dynamics and Self-Organization, was the recipient of the 2014 American Physical Society Stanley Corrsin Award, established to recognize influential contributions to fundamental fluid dynamics. He made contributions to experimental techniques enabling quantitative Lagrangian measurements, which opened a new subfield of turbulence research.

Cottrell Scholar/Scialog Fellow **Richard Taylor**, University of Oregon, came up with a bright idea for better retinal implants based on fractal geometry. He won first prize in the InnoCentive competition sponsored by six science philanthropies and was honored at the White House.

Two Research Corporation awardees, **Dan Dahlberg** (University of Minnesota) and **Keivan Stassun** (Vanderbilt University), received the prestigious 2014 APS Dwight Nicholson Medal. Dahlberg was recognized for his work on "The Physics Force," a public outreach program. Stassun was cited for creating the nationally recognized Fisk to Vanderbilt minority bridge program with funds from his Cottrell Scholar Award.

Oberlin College selected **Tim Elgren** as the new Dean of the College of Arts and Science. Elgren is a past president of the Council on Undergraduate Research (2004-2005) and a bioinorganic chemist at Hamilton College, where he was the program director for an RCSA Department Development Award and a two-time Cottrell College Award recipient.

Four Cottrell Scholars were awarded Sloan fellowships in 2014: **Gordana Dukovic**, University of Colorado, Boulder; **Rebecca Butcher**, University of Florida; **Tyrel McQueen**, Johns Hopkins; and **Mircea Dincă**, MIT. The fellowships are given to early career scientists identified as rising stars and the next generation of scientific leaders.

Cottrell Scholar **Will Dichtel**, chemistry, Cornell University, received the International Union of Pure and Applied Chemistry's Award for Creativity in Polymer Science. Dichtel also received the National Fresenius Award from the American Chemical Society. The Fresenius is presented to an outstanding early career chemist.

# 2014 Financial Summary

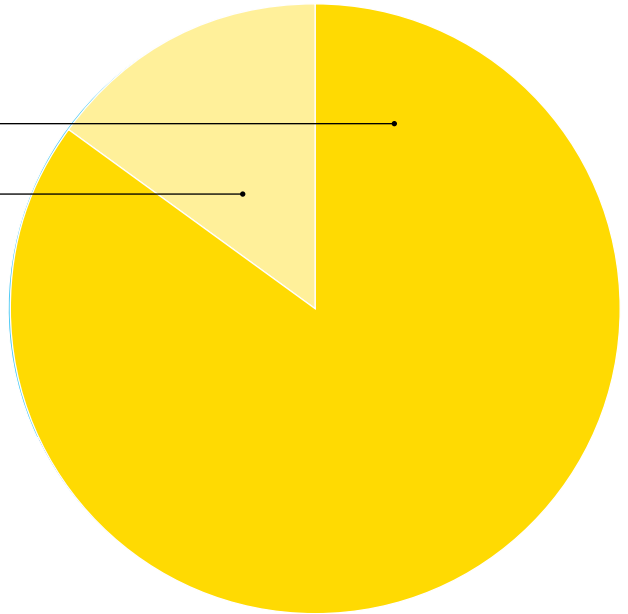
The financial activities of Research Corporation for Science Advancement were audited by Beach Fleischman, PC. The change in audit firms in 2014 was done as rotation for good governance only. For the complete audited financial statement, please visit our website at [rescorp.org](http://rescorp.org).

## Where Our Money Goes

**Total Expenses** \$7.6 million

Program Expenses, Including Grants & Awards **85%**

General & Administrative Costs **15%**



**Grants and Awards** \$4.9 million

Scialog **8%**

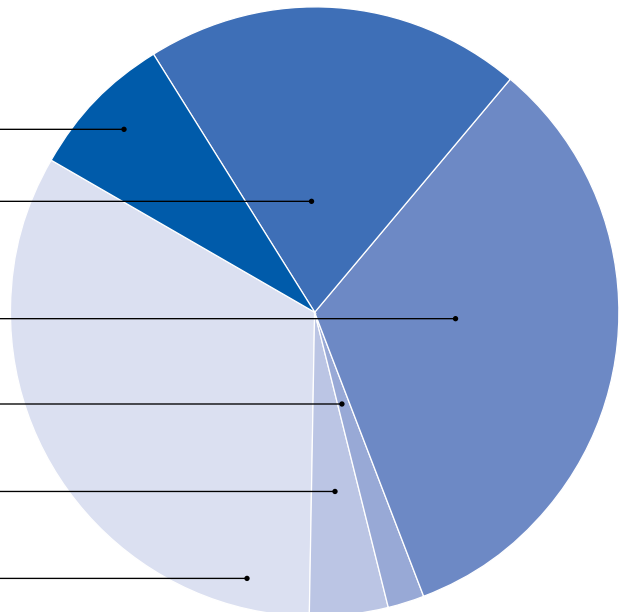
Cottrell Scholar **20%**

Cottrell College Science **33%**

Arizona Partners in Science **2%**

Science in the Public Interest, Discretionary Grants & Special Initiatives **4%**

Creation of Endowed John P. Schaefer Award **33%**



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**Net Assets at Beginning of Year** \$157.4 million

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**Net Assets at End of Year** \$154.0 million

## RCSA 2014 Board of Directors

RCSA provides catalytic funding for grants and conferences to support

- Early career faculty
- Innovative ideas for basic research
- Integration of research and science teaching
- Interdisciplinary research
- Building the academic leadership of the future

RCSA values: inclusiveness, respect, accountability, appreciation, trust.

Founded in 1912  
America's first foundation dedicated solely to science.

### 2014 Committee Assignments

**G. Scott Clemons**  
Chair of the Board  
Executive Committee, Chair  
Finance Committee  
Strategic Planning  
Task Force

**Robert Shelton**  
RCSA President  
Executive Committee  
Strategic Planning  
Task Force

**Jonathan Hook**  
Treasurer  
Finance Committee, Chair  
Executive Committee

**Brent Iverson**  
Secretary  
Governance & Nominating  
Committee, Chair  
Executive Committee  
Science Advancement  
Committee  
Strategic Planning  
Task Force

**Lars Bildsten**  
Audit Committee  
Science Advancement  
Committee

**Peter Dorhout**  
Audit Committee  
Science Advancement  
Committee

**Robert Hallock\***  
Governance & Nominating  
Committee  
Science Advancement  
Committee

**Gayle Jackson**  
Audit Committee, Chair  
Executive Committee  
Governance & Nominating  
Committee

**Elizabeth McCormack**  
Science Advancement  
Committee, Chair  
Executive Committee  
Governance & Nominating  
Committee  
Finance Committee

**Patrick Osmer\***  
Governance & Nominating  
Committee  
Science Advancement  
Committee  
Strategic Planning  
Task Force

**Dave Wenner**  
Strategic Planning  
Task Force, Chair  
Finance Committee  
Science Advancement  
Committee

**Joan Woodard**  
Finance Committee  
Governance & Nominating  
Committee  
Strategic Planning  
Task Force

\*Voted Emeritus  
status in 2014

### Directors Emeriti

**Patricia Barron**  
**Carlyle G. Caldwell**  
**Paul J. Collins**  
**Stuart B. Crampton**  
**Robert Hallock**  
**Robert Holland, Jr.**  
**Suzanne Jaffe**  
**Patrick Osmer**  
**John P. Schaefer**

### Officers of the Foundation

**G. Scott Clemons**  
Board Chair  
**Robert Shelton**  
President  
**Jonathan Hook**  
Treasurer  
**Brent Iverson**  
Secretary  
**Daniel Gasch**  
Chief Financial Officer

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