RESEARCH CORPORATION
for SCIENCE ADVANCEMENT
A foundation dedicated to science since 1912.

RSCA Annual Report 2008

Electrostatic Precipitator: Cottrell used patent monies to ensure top talent was supported in U.S. academic institutions.

RCSA is the oldest foundation solely devoted to the advancement of science and was established in the United States in 1912. Its operations are governed within the guidelines of a "private operating foundation," which means that it may perform activities related to science advancement in addition to funding others to carry on such activities. The foundation is the fulfillment of the unique philanthropic concept of Frederick Gardner Cottrell, scientist inventor and philanthropist, who established Research Corporation with the assistance of Charles Doolittle Walcott, Secretary of the Smithsonian Institution. Research Corporation's funds were initially derived from proceeds from Dr. Cottrell's invention, the electrostatic precipitator for controlling air pollution. Later, proceeds from inventions contributed by public-spirited scientists, Williams and Waterman's synthesis of Vitamin B1; Brown and Hazen's discovery of the first antifungal antibiotic; and Charles Townes' invention of the laser and maser, helped build the foundation's financial base. Today, Research Corporation's operating funds are derived from an endowment based on those contributed proceeds.

Research Corporation for Science Advancement, the Foundation's formal name today, is an active, hands-on foundation that stimulates advances in science. Its role is catalytic rather than controlling. Its mission is one of partnership rather than ownership. Research Corporation readily adapts to new situations and rapidly responds to new opportunities.

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    - **Advancing cross-disciplinary collaborations;**
    - **Encouraging scientific initiatives appropriate to their times**

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A CULTURE OF INQUIRY AND RISK

With the call for science literacy ringing loudly, a national goal should be to give every student, major and non major alike, an opportunity to experience science as it is practiced.

--1989 RCSA Program Review

Research Corporation for Science Advancement (RCSA) invests in early career scientists who we believe can improve the quality of student learning and encourage student persistence in science through the integration of research and teaching. The Foundation's Cottrell Scholar Award (CSA) program is aimed squarely at promising early career faculty at research universities who have developed exceptional teaching plans; the Cottrell College Science Awards (CCSA) seed research programs of newly hired faculty at Primarily Undergraduate Institutions (PUIs) and facilitate the integration of research into the education of undergraduates.

Through these programs RCSA is making two important statements:

- Undergraduate research is the most effective learning experience in science education; it is a powerful advantage for the institutions in which it occurs, as well as the teacher-scholars who involve undergraduates in their real-world projects;
- Faculty who are intellectually engaged in research are best prepared to translate the excitement and details of science to students both in and out of the classroom.

These points comprise a driving force for our philanthropy, and they are views that are gathering momentum across the U.S.

A concerted effort to promote undergraduate research began in 1978, when RCSA funding and personnel were instrumental in supporting a group of chemists from private liberal arts colleges in creating the national Council on Undergraduate Research (CUR). The organization has since grown to include all disciplines and all types of institutions – 3,000 individuals and 492 colleges and universities, according to the CUR website.

In 1997 CUR officially adopted a definition of the process:

> Undergraduate research is an inquiry or investigation conducted by an undergraduate that makes an intellectual or creative contribution to the discipline.

During a recent speech on the topic, Professor Thomas Wenzel, department of chemistry, Bates College, Lewiston, ME, noted the CUR definition has two important features:

> …One is that research is original work and is therefore aimed at creating new knowledge. The other is that the work, if successful, is intended as a contribution to the discipline, meaning that it ought to be disseminated among the relevant community through established means…this usually entails publication of the work in a peer-reviewed scholarly journal. (Council on Undergraduate Research Transformative Research Summit, June 2009)

RCSA's scientific staff members, experienced scientists and teachers all, believe the integration of research and teaching is vital to maintain the highest quality science instruction in our nation's colleges and universities. They believe this for a number of reasons, some of which were outlined by RCSA President & CEO James M. Gentile in a web column he wrote several years ago:

- First, it's an exceptionally pure form of learning – for all students, not just the top end.
- Second, there's plenty of evidence showing that if you want to attract, retain and sustain individuals who traditionally have been under-represented in the sciences yet who are increasingly prevalent in our colleges, then the kind of mentoring that goes on in quality undergraduate research programs is fundamental because it gives these students a sense of place. It gives them an intimate one-on-one interaction with faculty who are seen more as colleagues struggling to solve problems, rather than as distant authority figures impersonally transmitting abstract information.
- Third, undergraduate research tends to illustrate for the student what his or her life in science would be like.
- Fourth, somewhere in the process students begin to think and ask questions like scientists.

On the second point, regarding under-represented students in the sciences, RCSA Program Officer Kathleen Parson, a professor of biochemistry at Macalester College in St. Paul, MN, said, "Integrating research into teaching is so important for students who've never had the opportunity of identifying their own potential… I see many women, especially, who've really caught fire and found that being intellectual is OK, that there's a rapport, there's a peer group there that sustains them. This, after they more or less got through high school by being in a closet about their intellect. There's a strong anti-intellectualism in this country, but participating in undergraduate research often provides the wherewithal for students to recognize their potential, because the opportunity is not presented as just a boring body of facts, but as something to which they can contribute."

RCSA Program Officer Silvia Ronco, a chemist, added that undergraduate research is a positive experience for the professor/principal investigator, too.

"Research really makes you a better teacher," Ronco said. "Or, to put it another way, a more engaged scholar actually has more to teach. And that generally makes people happier, to be an active part of a community."

RCSA Vice President Jack Pladziewicz, a chemist, elaborated:

"It's hard to stay enthused about a discipline if you don't really understand in depth what's going on in it, if you don't see the exciting things as they happen… And you're not going to know there's something more current if all you're doing is teaching from the book, which is what most people do when they don't do research. They teach from the book."

On the last two points, RCSA Program Officer Richard Wiener, a physicist, likened undergraduate research to the apprentice system. "Through this process, an undergraduate student begins to get a taste of what it's like to be a working scientist," he said. "You're apprenticed on a specific project; you show you can master the art of bringing a project to completion and reporting the results. You deepen the apprenticeship as a graduate student with your work culminating in a Ph.D. thesis. Then you move from apprentice to postdoctoral researcher – roughly the equivalent of journeyman. If you ply your trade a little longer and broaden your expertise, at that point you're prepared to be an independent practitioner and climb the academic ranks. And you go on from there, hopefully, with the ability to lead your own research group as a master scientist and train your own apprentices."

This approach to education is seen as an increasingly important edge in light of growing global competition. As reports on the state of American science have made painfully clear in recent years, the nation cannot afford to provide future generations with second-rate science and technical educations, nor is it likely the national prosperity will long endure with a less than superlative professoriate in these areas.

“It is critically important to understand and be passionate about the frontier, what’s happening in contemporary work,” said Parson. “And that can be done best by participating in research, where there is a need to know what the latest developments in the field are in order to participate.”

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The first point on Dr. Gentile’s list as to why the translation of research into teaching in the form of undergraduate research is vital – because it is the purest form of learning – is made clear by this statement from the 1989 RCSA program report:

> “A conclusion to be drawn from over 40 years of foundation support for research at undergraduate institutions is that research-oriented colleges are among the strongest producers of scientists, and their students are exceptions to the national trend of declining interest in the sciences. There are no set formulas for these highly successful undergraduate research programs. Some faculties and departments are highly structured, while others are individualistic. The results are similar: their programs foster a spirit of inquiry while building camaraderie among faculty and students.”

In other words two decades ago assessment was at the level of noticing that many of the excellent colleges were engaged in undergraduate research; 40 years of experience told the Foundation there is a connection.

Also, there was an element of reverence for academic tradition, as expressed in the following statement, again from the RCSA 1989 report:

> “The U.S. undergraduate colleges that emphasize research and scholarship by faculty and students alike are the true universities,” said Clarissa Habraken of Leiden University, Netherlands. Her statement is based on the observation that the symbiosis of research and teaching that occurs in those institutions is true to the concept of the university, and that it is all too sadly missing in contemporary European universities.

It should be noted that nearly a decade ago, in 2001, RCSA waded into the assessment process in a significant way, leading a combined effort by five philanthropic foundations (the Camille and Henry Dreyfus Foundation, the Robert A. Welch Foundation, the W.M. Keck Foundation, and the M.J. Murdock Charitable Trust). The resulting report, “Academic Excellence,” was the product of a determined effort to quantify the standards for first-rate science programs at primarily undergraduate institutions. One of the major results of this broad effort was creating benchmarks by which colleges could judge how well they match up against their sister institutions.

Since then the need for assessment has become more urgent in both philanthropy and academia. So much so that today it is simply no longer acceptable practice in the best-run foundations to support programs, however intellectually and culturally appealing, without quantifiable evidence that they’re working.

While RCSA’s individual grants are vetted through scientific peer review, the overall effectiveness of the programs had not been methodically scrutinized. That topic – specifically, the role our programs are playing in contributing to academic excellence and effectively supporting undergraduate research and innovative learning – will have to wait for another discussion, to be advanced by the participating program officers when their current assessment research is completed.

Strictly regarding undergraduate research, however, the growing consensus that it is a highly effective method of teaching is now viewed as a hypothesis that requires empirical validation.

As part of the validation process, RCSA was one of several foundations contributing funds to a book project detailing research in this area. A comprehensive manuscript, *Real Science: The Role of Research in Undergraduate Science Education* by Elaine Seymour and her colleagues -- Anne-Barrie Hunter, Sandra Laursen, Ginger Melton and Heather Thiry -- at the Center to Advance Research and Teaching in the Social Sciences, University of Colorado at Boulder, was circulated in rough draft form in November 2008. In it the authors efficiently lay out the history and varieties of undergraduate research in the United States; but central to their work are findings based on a pair of studies involving a total of nearly 600 interviews – with students, research advisors, directors of undergraduate research programs, administrators and staff -- conducted over half a decade. Most of their observations are based on data from 360 interviews conducted at faculty-led undergraduate research programs at four small colleges (Grinnell , Harvey Mudd, Hope and Wellesley); a second study, informed by more than 200 interviews , focused on a structured summer undergraduate research program targeted to minorities in the sciences.

Meanwhile, a second book, this one wholly funded by RCSA, was being written in 2008 by educational psychologist David Lopatto, chair of the psychology department at Grinnell College and a research colleague of Seymour's in the two studies informing the University of Colorado book. Lopatto's data reveal a generally favorable picture of the process of undergraduate research, and both Lopatto and Seymour, *et al.*, detail outcomes supportive of this method of instruction.

Toward the end of his book, which is scheduled for release in early 2010, Lopatto discusses why undergraduate research is important to America's future:

> The various government committees … have made their forecasts concerning America's need for a STEM workforce. Some sense of the future, however cloudy, helps guide planning. Gentile challenges his audience to think about what the world will look like in 25 years. He sees tremendous changes in all aspects of science, including research, teaching, instruments and facilities. He sees the future of science as "problem centered on issues that transcend disciplinary boundaries," with science becoming increasingly complex, collaborative and costly. Sir John Maddox, former editor of the journal *Nature*, predicts a future for science driven by matter, life, and "our world." He writes, "Despite assertions to the contrary, the lode of discovery is far from worked out."Kaku asserts that science is now driven by three revolutions, quantum, computer and

> biomolecular. He writes, “The heyday of reductionism is probably past. … This is heralding a new era, one of synergy.” The composite vision is one of problem-centered, interdisciplinary, collaborative science: what Gentile characterizes as “systems science.”

Lopatto speculates that undergraduate research is becoming a team sport that, increasingly, will be deemed central to the future of academic-based science:

> Undergraduates will work in teams, probably co-mentored by several faculty or other experts who gather as a team to solve a problem. Students, taking advantage of their power to cross departments and divisions in pursuit of their education, will act to connect faculty who otherwise might not collaborate. Faculty will find they need more information about other disciplines, leading to conversations and tutorials among faculty peers. The interdisciplinary nature of the scientific problems may cause the network of community members to grow: the chemists and biologists working at the boundaries of their disciplines may seek additional collaboration from mathematicians and philosophers. Thus problem-centered research will “bind together the disparate elements to create a sense of wholeness.” This holistic system is the future of science education.

He writes that “an interdisciplinary, problem-centered, research-centered undergraduate science curriculum” may “change the role of students from a source of inertia to a driving force in creating new networks of collaborators”:

> First-year students could be introduced to an interdisciplinary research problem. They may realize they need additional knowledge of the issues involved with the problem, and so see a consistency between general education and their own needs. Biology students, for example, may find the motivation to take relevant courses in mathematics, physics, psychology, and philosophy. The current lack of enthusiasm with which most students undertake general education may be lessened by the congruence between this education and their own interests. Students would become intentional learners.

Such a curriculum, Lopatto predicts, would “change the focus of faculty members from the teaching-versus-research dichotomy to a more unified, fully functioning approach to science education.” This change is necessary, in Lopatto’s opinion, if American science is to advance significantly:

> One drawback of inheriting the previous generation’s modes of education and research is that the next generation engages in safe learning and safe science. This legacy is problematic in at least two ways: first, because it does not lead to the kind of risk taking, transformative science that experts call for; and second, because it does not facilitate recruitment and retention of scientists who are not copies of the older generation, *i.e.*, it retards diversity.

Whatever the future of undergraduate research may be, it’s at least gratifying to those associated with the Foundation, both today and in years past, that the message, by and large, has been incorporated into the culture at leading schools. Dr. Ronco observed that college and university administrators have come to see the existence of UR programs as an item they can “sell” to prospective students and their parents, and, in the case of publicly funded institutions, to state legislatures, some of which, in the past, have been breeding grounds for complaints about “ivory tower” academics spending more time in research than in classrooms.

But impediments persist.

“Not every school can do it,” Dr. Ronco said, “because you need the time and you need the money. A lot of progress has been made, but we’re not there yet.” She added that some researchers continue to be skeptical of undergraduates’ abilities in their laboratories.

As noted in the 2007 National Academies report *Rising above the Gathering Storm*, we have an urgent need to make the United States shine in an increasingly competitive global marketplace when it comes to attracting and retaining future talented scientists. To that end we know that the undergraduate years provide a springboard and have a profound influence in the development of our scientific workforce. We also know that we need to “sustain and strengthen the nation’s traditional commitment to basic research.” What better way to accomplish both of these aims than through enhancing the culture of inquiry and risk-taking in research throughout the educational life of our scientists?

THE YEAR AT RCSA

2008, the 97th year of existence for Research Corporation for Science Advancement, was a time of growth through rededication , regrouping and the initial stirrings of transformation against the tumultuous background of a world in transition.

Of course the world is always in transition, and RCSA has adapted well over the previous century, at times leading change in science funding and education, at other times being content simply to partner with others.

This year, despite a severe economic downturn which caused significant reduction in RCSA’s endowment, America’s second-oldest foundation boldly moved forward on a number of fronts that may one day yield important benefits for the nation’s scientific workforce. We say “may” because what RCSA does – and has always done – is take risks. Founder Frederick Gardner Cottrell said it first and best: "Bet on the youngsters. They are long shots, but many will pay off."

Cottrell bet on such young luminaries as Robert Goddard, the father of modern rocketry, and Ernest Lawrence, who earned a Nobel Prize in physics for his development of the cyclotron and his contributions to our understanding of atomic energy. Over the decades RCSA has funded 38 young researchers who eventually won a Nobel Prize, including Thomas Cech, recent president of the Howard Hughes Medical Institute.

The Foundation continues to enhance the Cottrell tradition in ways appropriate to America’s current scientific challenges. However, due in no small measure to the success of Cottrell’s progressive philanthropy in the early Twentieth Century, the stakes have risen enormously in the Twenty-first Century, along with burgeoning global population and expanding energy demands. Thus, at RCSA today, we see science advancement – specifically those aspects of this never-ending task associated with our longtime proprietary issues of science education, undergraduate research, early career scientists, cross-disciplinary research and encouraging new communities of knowledge -- as key to global prosperity.

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Hiroshima and Nagasaki, two lethal exclamation marks at the end of the ghastly narrative of World War II, made it brutally clear to all: Science and technology rule; nations ignore this lesson at their peril. For more than half a century since then, intellects like former RCSA board member Vannevar Bush, the first presidential science advisor and NSF founding father worked tirelessly to ensure the United States enjoyed scientific and technological supremacy. The Cold War stakes were simply too high to do otherwise.

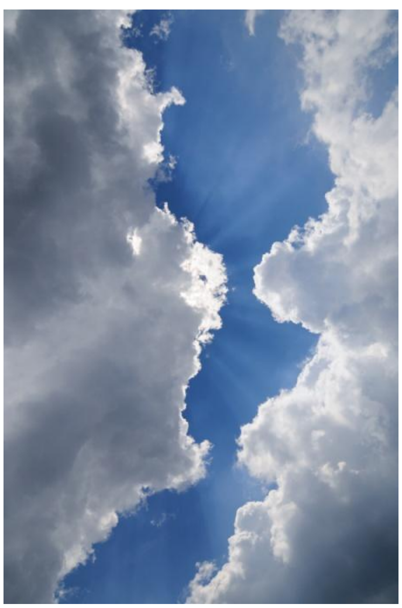
Thanks to the efforts of Cottrell and Bush and many others, the U.S. built the modern world's most extensive, best-financed system of academic-based scientific research programs. The growth in this area was breathtaking, as Dr. David Goodstein (a 2008 keynote speaker at RCSA's Cottrell Scholars Conference) made clear in his classic 1994 paper, "The Big Crunch." Goodstein noted:

> The period 1950-1970 was a true golden age for American science. Young Ph.D.s could choose among excellent jobs, and anyone with a decent scientific idea could be sure of getting funds to pursue it. The impressive successes of scientific projects during the Second World War had paved the way for the federal government to assume responsibility for the support of basic research. Moreover, much of the rest of the world was still crippled by the after-effects of the war. At the same time, the G.I. Bill of Rights sent a whole generation back to college transforming the United States from a nation of elite higher education to a nation of mass higher education. Before the war, about 8% of Americans went to college, a figure comparable to that in France or England. By now more than half of all Americans receive some sort of post-secondary education. The American academic enterprise grew explosively, especially in science and technology. The expanding academic world in 1950-1970 created posts for the exploding number of new science Ph.D.s, whose research led to the founding of journals, to the acquisition of prizes and awards, and to increases in every other measure of the size and quality of science.

The point Goodstein made so famously in that paper, however, is that the Golden Age of American Science came to an end shortly after Neil Armstrong walked on the moon. Since then the once-glittering success story has taken on a depressingly leaden tone, which Goodstein nailed more than a decade and a half ago:

> To make matters worse, the country is almost 5 trillion dollars in debt, and scientific research is among the few items of discretionary spending left in the national budget. There is much wringing of hands about impending shortages of trained scientific talent to ensure the Nation's future competitiveness, especially since by now other countries have been restored to economic and scientific vigor, but in fact, jobs are scarce for recent graduates.

Actually, to add to the general gloom, things apparently have grown much worse since 1994. The national deficit now stands at almost $12 trillion. And dismal white papers, such as the AAAS' 2007 *Rising above the Gathering Storm*, regularly pepper an apparently benumbed American public with such stinging facts as:



• About one-third of US students intending to major in engineering switch majors before graduating. (More S&P 500 CEOs obtained their undergraduate degrees in engineering than in any other field.)

• The proportion of bachelor's degrees in physics to total degrees awarded was twice as high the year before Sputnik, deemed a time of dangerous educational neglect, as in 2004.

• In 2001 (the most recent year for which data were available for *Gathering Storm*), U.S. industry spent more on tort litigation than on research.

• In 2005, only four American companies ranked among the top 10 corporate recipients of patents granted by the United States Patent and Trademark Office.

• The most capable high-energy particle accelerator on Earth, for the first time, now resides outside the United States.

• Federal funding of research in the physical sciences, as a percentage of gross domestic product (GDP), was 45% less in fiscal year (FY) 2004 than in FY 1976. The amount invested annually by the U.S. government in research in the physical sciences, mathematics, and engineering combined equals the annual increase in U.S. healthcare costs incurred every six weeks.

• In South Korea, 38% of all undergraduates receive their degrees in natural science or engineering. In France, the figure is 47%, in China, 50%, and in Singapore, 67%. In the United States, the corresponding figure is 15%.

In other words, a dissolute or ill-prepared United States populace seems to be flailing about as a new wave of international scientific and technological competition builds across the world.

There are mitigating views. Goodstein noted "the Golden Age of American Academic Science produced genuine excellence in American universities." He added -- and it remains true today, though critics say less so every year -- "Without any doubt at all we lead the world in scientific training and research." Hence such nuggets from *Gathering Storm* as:

> Some 34% of doctoral degrees in natural sciences (including the physical, biological, earth, ocean, and atmospheric sciences) and 56% of engineering Ph.D.s in the United States are awarded to foreign-born students.
>
> In the US science and technology workforce in 2000, 38% of Ph.D.s were foreign-born.

But the framers of the report see this in light of the apparent inadequacy of American students (never mind the problems inherent in apples-to-oranges comparisons), as well as the growing competition from nations like China and India, with their huge populations working hard to improve previously woefully inadequate technical degree programs. *Gathering Storm* notes:

> Estimates of the number of engineers, computer scientists, and information-technology students who obtain 2, 3, or 4-year degrees vary. One estimate is that in 2004, China graduated about 350,000 engineers, computer scientists, and information technologists with 4-year degrees, while the United States graduated about 140,000. China also graduated about 290,000 with 3-year degrees in these same fields, while the US graduated about 85,000 with 2- or 3-year degrees. Over the past 3 years alone both China and India have doubled their production of 3- and 4-year degrees in these fields, while the United States production of engineers is stagnant and the rate of production of computer scientists and information technologists doubled.

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Given the current, seemingly glum, state of affairs, RCSA, under the leadership of President & CEO James Gentile, has over the past three years shifted its funding focus from large telescopes (LBT, LSST) and programs supporting mid-career scientists, whole departments and single principal investigators within those departments, to a greater emphasis on the arguably more socially complex issues of science advancement associated with Dr. Cottrell's lifelong concern for young researchers.

Central to RCSA's mission today are the following main points and associated core goals:

Science funding:

- Funding innovative research;
- Increasing U.S. leadership in and commitment to science;
- Demonstrating leadership in crucial areas of research inquiry;
- Advancing cross-disciplinary collaborations;
- Encouraging scientific initiatives appropriate to their times

Promoting early career opportunities for scientists:

- Investing in scientists early in their careers who can change the course of science, science advancement and quality teaching;
- Strengthening the academic scientific workforce through developing faculty, students and the research environment

Strengthening U.S. institutions of higher education:

- Increasing faculty-student research opportunities;
- Strengthening and highlighting the role of primarily undergraduate institutions in developing scientists

Building the scientific workforce:

- Encouraging development of early career scientists who reflect the diversity of the U.S.;
- Encouraging flexibility within STEM degree programs to reflect 21st-century scientific research;
- Supporting high-risk research and multidisciplinary collaborations among scholar-teachers, as well as promoting the enlightened institutional policies necessary to support those who boldly take these increasingly vital paths to knowledge production

RCSA's mission and goals in recent years have been shaped, in part, by Dr. Gentile's participation in the creation of a global community in his chosen field of research – genetic toxicology – during the past four decades, as well as by the 12 years he spent as dean of a research-oriented, primarily undergraduate institution, Hope College in Holland, MI. These experiences plus his service on such policy groups as the National Science Board Commission on Science Education, the National Research Council's Life Science Board and NRC's Committee on Undergraduate Science Education have allowed him to form a comprehensive vision of the role of the small, private foundation in advancing American science.

He receives guidance from multiple sources, including:

- A Presidential Advisory Panel composed of some of America's leading scholars, researchers and academic administrators. The Advisory Panel meets on a yearly basis, and its members are also available to Dr. Gentile for one-on-one consultations regarding the direction and issues facing the Foundation.

- The collective experience of RCSA's professional staff of program officer/scientists: RCSA Vice President Jack Pladziewicz, chemistry; Silvia Ronco, chemistry; Richard Wiener, physics; and Kathleen Parson, biochemistry. Prior to joining RCSA all scientific staff members were tenured professors with active programs of teaching and research in U.S. colleges and universities.

- The professional staff works under the guidance of a 12-member Board of Directors, about half of whom are working scholar-educators, and half leaders in the national business community.

The general consensus among these groups in 2008 -- amid not-so-subtle ripples from Wall Street hinting that foundations might be wise to make cuts or merge to achieve their goals -- continued to be that it was essential the Foundation move beyond its two traditional programs. New initiatives were seen as critical to the future of science, and it was generally agreed the Foundation should be "out front" in this process. Further, new endeavors were deemed most likely to be of interest to those potential investors and partners seen as increasingly necessary to pursue complex, boundary-crossing science.

The end result of RCSA's collective wisdom and experience in 2008 was resiliency in the face of financial setbacks, a confident, well-informed approach to science advancement in an era of uncertainty, and the internal flexibility to embrace change. Among the year's accomplishments:

Scialog

The ambitious Scialog effort, announced in the 2007 Annual Report, was the focus of much activity in 2008 as it continued to move on its way to becoming a national model for ramping up big science that has the potential to catalyze transformative basic research into translational research.

This multi-year grant program is designed to accelerate the work of Twenty-first Century science by funding individuals or multi-disciplinary teams to pursue transformative research, in dialog with their fellow grantees, on crucial issues of scientific inquiry. The initial Scialog is funding grants totaling $3.2 million.

In multi-year cycles, specific research topics will be chosen and, within each topic, research proposals will be solicited, selected and then funded. Each multi-year initiative will promote scientific innovation in the face of a complex research challenge that serves as a driver in contemporary science. Successful grantees will be asked to address a few narrowly focused key issues on a particular research topic and to communicate with one another in an annual closed conference to share insights and build further collaborations.

"Scialog is a bold effort to build new communities of innovative researchers working in interdisciplinary teams. The program is dedicated to tackling complex scientific questions under the general umbrella of global climate change," according to Dr.

Gentile. “By encouraging dialog and intellectual risk-taking among grantees, we hope to inspire transformative science. Our success will be measured, in part, by whether we attract additional funders, public or private, to carry that science forward.”

The initial Scialog round will focus on funding and building research teams to undertake groundbreaking studies in the conversion of sunlight directly into useable forms of energy, such as electricity. This initiative is entitled “Scialog 2009: Solar Energy Conversion.” The topic has been chosen because reliable domestic sources of renewable energy are critically important for U.S. security, global stability and an environmentally sustainable economy.

Scientists from colleges and universities in the United States were eligible to apply, and details regarding the application process are available on the RCSA website (http://www.rescorp.org). The Scialog process is guided by the previously mentioned RCSA Presidential Advisory Panel. The initial round of grants was to begin with a request for proposals related to solar energy conversion – with awards to be made by May 2010. A second round, focusing on another topic -- yet to be determined, although under the general problem area of global climate change -- is planned for three years later.

The first three-year Scialog round will be conducted in partnership with Science Foundation Arizona (SFAz), which will be funding three projects by Arizona researchers through its Solar Technology Institute for a total of $4 million. The Arizona researchers and the RCSA-funded researchers, who need not be from Arizona to qualify, will come together during the annual Biosphere 2 meetings to discuss their solar energy research.

“The Solar Technology Institute of Science Foundation Arizona is supporting projects focused on short-term disruptive technology breakthroughs to bring down the price of solar energy,” said Richard C. Powell, co-director of the Solar Technology Institute and a past president of the Optical Society of America. “This complements the longer-term basic research projects in solar energy supported by RCSA to ensure the future growth and viability of solar energy. The Scialog partnership of SFAz and RCSA provides an important venue for communication and collaboration between these two research communities.”

RCSA staff furthered development of the program by providing organizational support for a photovoltaics workshop in October in conjunction with the Arizona Research Institute for Solar Energy (Az-RISE). The staff also pursued refinement of the Scialog request for proposals (RFP).

Partners in Science

In 1988 RCSA started the Partners in Science program with the objectives of helping improve the quality of high-school science education and increasing the number of students who choose science careers. During the following 11 years, the Partners program funded summer research opportunities for high-school teachers to work on research projects in collaboration with science faculty at universities and colleges across the country. In 1990 the M.J. Murdock Charitable Trust joined RCSA in funding the program in the Pacific Northwest, an activity that continues today. When RCSA chose to withdraw from administering the program in 1999, the Murdock Trust continued it in its five-state region.

In 2008 RCSA rejoined the Murdock Trust in this cooperative venture and announced it would be providing Partners opportunities for Arizona high-school teachers. In 2008 RCSA began piloting the program with the University of Arizona with the expectation that it would expand to all three Arizona state universities in 2009. Information on the Arizona Partners program is available on the RCSA website. The proposal submission deadline was December 1, 2008, and awards were announced in March 2009. In the first year of operation, the Foundation made eight awards at $15,000 each.

Existing Programs

During 2008 RCSA staff broadened the Cottrell College Science Awards (CCSA) program, making it available to early career science faculty with research interests that “overlap significantly” with RCSA’s traditional funding areas of chemistry, physics and astronomy, regardless of departmental affiliation. This new CCSA Single Principal Investigator program information went online in February, with preliminary proposals due by March 2008.

In addition, a collaborative component was added, in keeping with the Foundation’s goal of advancing cross-disciplinary collaboration. Dubbed the CCSA Multi-Investigator program (CCSA-Multi), this initial pilot program set a unique tone to encourage and develop traditions of collaborative research within primarily undergraduate institutions. Again, qualifying wording was included to cover related fields that significantly overlap with research in the program’s three traditionally funded disciplines. It was generally hoped the CCSA-Multi would become a hallmark of the Foundation and would set the tone for other foundations to follow (or partner).

In both programs the proposed projects are judged on the basis of scientific originality, significance, feasibility, overlap with the three core disciplines and the ability of the institutional environment to sustain the activity. The involvement of undergraduate students in the research is expected, and is an important factor in most awards. After review by Foundation staff and outside referees, the composite proposal material is evaluated by an advisory committee of scientists drawn from the academic community. Awards are made to the institution on behalf of the individual investigator – or multiple investigators, in the case of CCSA-Multi -- following approval by RCSA’s Board of Directors.

This CSA Single-Investigator program updates were made available by early summer with proposal submissions by August 1, 2008. The CCSA Multi-Investigator program information was available by the end of 2008 with proposals to be submitted in the spring of 2009.

In the Cottrell Scholar Award (CSA) program, departmental eligibility was widened beyond astronomy, chemistry and physics to include biochemistry and biophysics. Additionally in 2008 attendance at the annual Cottrell Scholar conference was made mandatory for two out of the three years of the award’s active period in an effort to more intentionally build a cohort of early career faculty with a common goal of improving teaching in research universities.

CSA awardees are chosen both for the quality of their scientific research and their dedication to teaching. Originality, feasibility, and the prospect for significant fundamental advances to science are the main criteria for judging the candidates' research, while contributions to education, especially at the undergraduate level, aspirations for teaching, prior teaching accomplishments, and the candidates' proposed strategies to achieve educational objectives are factors in assessing their teaching plans. These awards, which in 2008 provided a grant of $100,000 to each of 10 recipients, represent the Foundation's largest individual award for a combination of research and teaching.

Other Developments

In addition, 2008 saw:

- The beginnings of a move to impose greater accountability on RCSA programs through more immediate, in-depth, rigorous assessment. The program officers and vice president designed a multi-level assessment plan, including electronic post-award surveys directed at past grantees, revised annual and terminal report forms that more quantitatively assessed award impact on student advancement and the awardee's career, and evaluation of public databases of grants from other funding agencies and awards from national societies. Before engaging in the research, they shared the survey questions and report form questions with Dr. David Lopatto, chair of the psychology department at Grinnell College, and a noted educational psychologist.

- Creation of a revamped RCSA website and the debut of the Foundation's new logo. The name of the Foundation was changed from "Research Corporation" to "Research Corporation for Science Advancement."

- RCSA provided financial support for authors Sheila Tobias and Anne Baffert and their book, *Science Teaching as a Profession: Why it Isn't How it Could Be*. (Currently available free on the RCSA website.)

PROGRAM REVIEW

Over the past decade there has been a steady movement of the most competitive research projects from the center of traditional disciplines to the complex problems at the intersections and across the boundaries of disciplines. In the Cottrell College Science Award program, which is aimed at providing "seed" funding to early career faculty in primarily undergraduate institutions, nearly 40% of recent applications have been directed at projects that fall at the intersection of chemistry or physics with biology and another 20% have been directed at developing new materials, processes at the nano level or on surfaces. The advancement of instrumentation and analytical methods, as well as the rapidly advancing understanding of genomics, proteomics, molecular biology and materials has made it possible to address increasingly complex problems from these areas from a molecular perspective. RCSA has responded to these trends in reshaping its programs for the future.

Eligibility in the CCSA was expanded to include biologists, biochemists, geologists and computer scientists working on problems at the interface with chemistry or physics and in 2008 we accepted our first applications in many years from faculty beyond chemistry, physics and astronomy departments. The proposal pressure from beyond the three core disciplines has been light in this first year, but we anticipate a steady increase in interest from across the sciences going forward.

Recognizing that many of the most compelling problems require a team approach and collaboration, we have developed a new multi-investigator CCSA program as a pilot program. This new program, developed in 2008, will launch with the first awards in the fall of 2009. A goal of this program is to erode the artificial departmental boundaries between the sciences by funding cross-disciplinary teams to work on complex problems requiring expertise from two or more disciplines. We hope these projects can play a catalytic role for forging collaborations, partnerships and further cooperation – both on teaching and research – among science faculty.

Likewise eligibility for our Cottrell Scholar program, aimed at early career teacher-scholars at research universities, has been broadened to include faculty in biochemistry and biophysics programs that are independent from the related chemistry and physics programs.

Our newest program Scialog, which is designed to facilitate cross-disciplinary research, dialog and collaboration on a topic of high national importance, will target solar energy conversion in its first round of applications solicited in 2009. Moreover, the program will focus on faculty who are within five years of having achieved tenure at a U.S. college or university. This target audience is well positioned to take risk, establish new collaborations and move into new fields of research. At the same time, they are at a career stage where a modest investment has high potential to advance their research program and leverage them to much larger funding from federal agencies and industry.

Jack Pladziewicz

Vice President

PROGRAM SUMMARY

One hundred and twenty-six awards were made in support of faculty research and research-enhanced science teaching in 2008. The total amount awarded under the Foundation's programs below was $6,491,316.

COTTRELL COLLEGE SCIENCE AWARDS

The Cottrell College Science Award (CCSA), supporting faculty in the sciences at primarily undergraduate institutions, is the foundation's largest program. There were 284 applications in 2008, slightly above the 10-year average for the program. CCSA program, which encourages the involvement of undergraduates in faculty research, funded 94 awards, 33% of applications, for a total of $3,742,239. The average award was $38,982.

COTTRELL SCHOLAR AWARDS

Cottrell Scholar Awards (CSA) support excellence in both teaching and research in biochemistry, biophysics, chemistry, physics and astronomy at Ph.D.-granting institutions. Each award totals $100,000, to be used largely at the discretion of the scholar. A record 176 applications were received in 2008 and 11 awards (6.3%) were made totaling $1,100,000.

RESEARCH OPPORTUNITY AWARDS

Research Opportunity Awards support mid-career faculty at Ph.D.-granting institutions in the US who seek to develop a new area research. Out of 12 candidates nominated by their department chairs two proposals (17%) were funded for a total of $90,000. These are the last awards in this program, which has now been discontinued.

OTHER AWARDS

In 2008, there were two Department Development Awards totaling $996,730. Department Development awards are focused on a significant advancement of the teach-scholar model for faculty and enhanced engagement of undergraduates in research. These are the last two awards in this program. In addition, 17 discretionary awards totaling $615,489 were made.

AWARDS

COTTRELL COLLEGE SCIENCE AWARD

University of North Carolina-Wilmington
Paulo F. Almeida, Chemistry & Biochemsitry, Thermodynamics of membrane domains in mixtures containing cholesterol-$40,200

McNeese State University
Kiran Boggavarapu, Chemistry, Computational Design of Novel Gold-Aluminum Alloy Catalysts for Oxidation Reactions-$44,000

University of Texas at El Paso
Cristian E. Botez, Physics, High-pressure neutron spectroscopy studies of the superprotonic phases of CsH2PO4 and RbH2PO4-$38,167

University of Wisconsin - Stevens Point
Nathan Patrick Bowling, Department of Chemistry, Generation and Studies of Pyrazinyleneethynylenes: Controlling Oligomer Geometry via Transition Metal Coordination-$31,392

University of Central Arkansas
Lance C. Bridges, Department of Chemistry, Effect of Retinoids on Lymphocyte Metalloprotease Mediated Shedding-$33,250

Macalester College
John Michael Cannon, Physics & Astronomy, Exploring the Interstellar Media of Optically Compact Dwarf Galaxies-$33,146

Duquesne University
Scott M. Cohen, Physics, Local Distinguishability and Indistinguishability of Quantum States-$31,978

Hamilton College
Natalia V. Connolly, Department of Physics, Developing New Computational Tools for the Study of Dark Energy-$28,683

Fairfield University
Jessica M. Davis, Department of Chemistry, Targeting the TNF-alpha/TNF-R55 Interaction with a Small Molecule TNF-R55 Mimetic-$44,359

University of Richmond
Kelling Donald, Department of Chemistry, Preferences Across Phases: Structural Preferences in Metal Dihydride and Metal Dihalide Monomers, Oligomers, and Extended Solids-$40,680

Miami University
Khalid Fatthi Eid, Department of Physics, Spin Injection and Giant Magnetoresistance in GaMnAs/Normal Metal Lateral Spin-Valves-$44,748

University of North Carolina at Charlotte
Markus Etzkorn, Chemistry, Molecular Tweezers with Fluoroarene Pincers: Syntheses, Structures and Host-Guest Interaction-$42,276

Youngstown State University
John Joseph Feldmeier, Physics and Astronomy, Searching for intra-group starlight using deep imaging: How and when do stars leave galaxies?-$39,184

Centenary College of Louisiana
Mary Robert Nahm Garrett, Chemistry, Synthesis of Enantioenriched Beta-Ketoesters via a Ketene-Claisen Condensation-$41,271

SUNY College at Fredonia
Blake Gillespie, Department of Chemistry, California State University, Channel Islands: The stability and folding of CusF, a new model system for examining the effects of ligand binding on protein conformational dynamics.-$36,184

SUNY College at Fredonia
Matthew Gronquist, Chemistry Department, Ecological Chemistry of the Pine Spittle Bug-$27,376

Furman University
Timothy W. Hanks, Chemistry, Computational and Thermodynamic Investigation of Multiply Halogen Bonded Systems-$39,948

Amherst College
David E. Hansen, Chemistry, Organic Nanotubes of Defined Length-$29,684

Brock University
Thad Alan Harroun, Department of Physics, Structure determination of lipopolysaccharides from Pseudomonas aeruginosa-$29,000

University of Wisconsin, Eau Claire
Scott C. Hartsel, Chemistry, NMR and LC/TOF Characterization of Metal Binding and Supramolecular Structure of Methanobactin, a Novel High Affinity Chalkophore-$34,500

Georgia Southern University
James Lloyd Higdon, Physics, An Ultra-Deep Near-Infrared Emission-Line Survey for High Redshift Galaxies-$39,000

Miami University
Pei-Chun Ho, Physics, California State University, Fresno: The Effect of Neodymimum Substitution on the Properties of PrOs4Sb12-$45,000

East Carolina University
Shouquan Huo, Department of Chemistry, Investigation on Luminescent Tetradentate Cyclometalated Platinum (II) Complexes: Synthesis, Photophysics, and Application-$45,000

College of Wooster
Donald T. Jacobs, Physics, Cylindrical Micelles From Block Copolymers: Self Assembly As An Indirect Model For Biological Systems-$44,951

College of Wooster
Joseph L. Johnson, Department of Chemistry, University of Minnesota, Duluth: Elucidation of the Structure and Function of Four Mammalian BACE1 Isoforms: Implications for BACE1-Directed Alzheimer's Disease Therapeutics-$35,078

Kennesaw State University
Martina Kaledin, Chemistry and Biochemistry, Computational studies of structure and dynamics of hydrated ions-$27,674

Saint Louis University
Istvan Zalan Kiss, Department of Chemistry, Complex temporal and spatial behavior of interacting chemical systems: multi-electrode arrays and micro-fluidic flow cells-$43,499

Texas A&M University at Commerce
Nenad M. Kostic, Chemistry, Heterogeneous Catalysis by Palladium and Platinum Complexes Tethered to Mesoporous Silica-$44,000

Pomona College
Alfred S. Kwok, Department of Physics & Astronomy, Raman Imaging of Lipid Domains-$45,000

Colorado College
Kristine Lang, Department of Physics, Scanning Tunneling Microscopy of Atomic Scale Disorder in Tunnel Junction Materials-$43,915

Seattle University
Douglas E. Latch, Department of Chemistry, Exploring the persistence of estrogenic pollutants: The role of photochemical degradation mechanisms-$43,218

Eastern College
Jeffrey Alan Lawton, Chemistry, Expression and Functional Characterization of Enzymes Associated with Pathogenicity in Erwinia amylovora, the Fire Blight Pathogen-$30,738

Wabash College
Paul R. LePlae, Chemistry, Bifunctional Organocatalytic salts: A New Approach for Asymmetric Conjugate Additions-$45,000

Saint Louis University
Michael A. Lewis, Chemistry, Effects of Substitution on Arene-Arene Interactions-$45,000

University of Northern Colorado
Robin Macaluso, Chemistry, Earth Science and Physics, Single Crystal Growth and Characterization of PrAu2Si2-xGex: Materials on the Verge of Spin Glass and Magnetic Order-$44,648

Elizabethtown College
James Arthur MacKay, Department of Chemistry and Biochemistry, Enantioselective Nucleophilic Catalysis for the Synthesis of Beta-Lactams and Other Nitrogen Containing Heterocycles from Isocyanates-$44,178

Massachusetts College of Liberal Arts
Emily O. Maher, Physics, Measurements of Low Energy Neutrino-Nucleon Cross Sections using the NuMI beam and the MINERvA Detector-$33,286

Wilfrid Laurier University
Kenneth E. Maly, Department of Chemistry, Synthesis of New Nonplanar Polycyclic Aromatic Hydrocarbons-$27,000

Benedictine University
Timothy W. Marin, Department of Chemistry, Ultraviolet Absorption of the Lowest-Lying Electronic State in High-Temperature and Supercritical Water-$32,318

Lebanon Valley College
Anderson L. Marsh, Chemistry, Elementary Photoreactions for the Synthesis of Amino Acids on a Model Interstellar Surface-$44,820

Millersville University
Jeremiah K.N. Mbindyo, Department of Chemistry, Self Assembly Routes to Multifunctional Biocompatible Nanoparticles-$35,910

Boise State University
Owen M. McDougal, Chemistry & Biochemistry, The Design, Synthesis, and Biological Testing of Novel and Selective Antagonists of Neuronal Nicotinic Acetylcholine Receptors-$45,000

University of Wisconsin, La Crosse
Heather S. Mortell, Dept. of Chemistry, Metal Binding Studies on Designed Siderophores Using A Solid Phase Synthesis-Compatible Hydroxamate Amino Acid-$33,754

Towson University
Clare Ngima Muhoro, Chemistry, Phosphanyl(organyl)boranes: Synthesis, Characterization and Applications as Novel Ligands and Co-catalysts in Metal-catalyzed Oligomerizations-$43,003

Truman State University
Eric V. Patterson, Department of Chemistry, Atom-Centered Density Matrix Propagation Studies on the Solvolysis of Phosphonothiolates-$37,720

Central Michigan University
Juan Peralta, Department of Physics, Calculation of Magnetic Parameters from Noncollinear Spin Density Functional Theory-$33,684

Colorado College
Rongson Pongdee, Department of Chemistry & Biochemistry, Transition-Metal Mediated Synthesis of C-Aryl Glycals and 2-Deoxy-Beta-C-Aryl Glycosides-$39,220

Yeshiva University
Emil Vasile Prodan, Department of Physics, Molecular Electronics Research Program at Stern College-$45,000

California Lutheran University
Janet Scheel, Department of Physics, Numerical Simulations of Turbulent Thermal Convection: Investigations of the Large-Scale Circulation and its Reorientations-$43,684

Pittsburg State University
Bipin Kumar Shah, Department of Chemistry, Charge Transporting Dendrimeric Fluorescent Materials for Organic Light-Emitting Diodes (OLEDs)-$44,954

University of Texas at Tyler
Tanya Shtoyko, Department of Chemistry, Application of silver nanoparticles and silver fractal-like structures in microcavities to surface-enhanced fluorescence biosensing.-$37,664

California State University, Long Beach
Katarzyna Slowinska, Department of Chemistry and Biochemistry, Diffusion of TEMPO-modified helical peptides in a collagen matrix: understanding triple helix self assembly-$38,984

Austin College
Andra Petrean Troncalli, Physics, Investigation of Vortex Pinning Anisotropy in the High Temperature Superconductor YBa2Cu3O7-delta-$44,880

Miami University
Paul Urayama, Department of Physics, Pressure effects on the free/protein-bound NADH ratio probed using endogenous cellular fluorescence-$38,948

Wellesley College
Didem Vardar Ulu, Chemistry, Defining the Minimum Requirements for Folding and Stability of Lin12/Notch Repeats Using Biophysical Chemistry and Human Notch1 LNRB as a Model System-$44,684

Grinnell College
Sujeev Wickramasekara, Physics, Relativistic Dynamics of Quasistable States: The Bakamjian-Thomas Construction-$31,184

California State University, Chico
Jinsong Zhang, Department of Chemistry, Synthesis of 1,4-benzodioxane-based natural products using a hetero-Diels-Alder reaction-$41,718

University of Nebraska, Omaha
Haizhen Zhong, Department of Chemistry, Incorporating QPLD Derived Partial Charges in DNA-Ligand and DNA-Protein Binding Simulations-$31,806

University of Southern Maine
Julie E. Ziffer, Department of Physics, Spectroscopy of the Veritas Family: Toward a Compositional Understanding-$28,760

Saint Louis University
Brent M. Znosko, Chemistry, Thermodynamic, Energetic, and Structural Characterization of Short RNA Oligomers Containing Inosine-$44,998

Mount Holyoke College
Katherine E. Aidala, Department of Physics, Investigation and Control of Magnetic Nanorings using a Scanning Probe Microscope- $45,000

West Chester University of Pennsylvania
Kevin Bruce Aptowicz, Department of Physics, Structural and Dynamic Response of a Colloidal Glass to Local Forcing- $43,934

SUNY College, Potsdam
Fadi Bou-Abdallah, Department of Chemistry, Relationships Between Iron and Hydrogen Peroxide, Free Radical Formation, and Oxidative Damage in Recombinant Human and Bacterial Ferritins- $36,925

Hendrix College
Andres A. Caro, Department of Chemistry, Reactive Oxygen Species and CYP2E1-Dependent Oxidation of Mitochondrial DNA in Liver Cells-$44,869

CUNY, York College
Emmanuel J. Chang, Department of Chemistry, Investigating the Gas Phase Chemistry of Phosphorylated Peptide Ions Using Mass Spectrometry-$44,712

Pace University, New York
Zhaohua Dai, Department of Chemistry and Physical Sciences, Engineering Selective and Sensitive Chiroptical Fluorescent Sensors for Hg(II)- $43,106

Bowdoin College
Danielle H. Dube, Department of Chemistry & Biochemistry, Hijacking the Pseudaminic Acid Biosynthetic Pathway to Eliminate Helicobacter pylori Infection- $45,000

Vassar College
Teresa A. Garrett, Department of Chemistry, Biosynthesis of N-acylphosphatidylethanolamine in Escherichia coli- $43,998

Fairfield University
Amanda S. Harper-Leatherman, Department of Chemistry, Electrochemical and Spectroscopic Characterization of Proteins Organized Within Superstructures and Encapsulated Within Aerogels- $44,754

Swarthmore College
Alison E. Holliday, Department of Chemistry & Biochemistry, The Effect of Chiral Modifier Properties and Temperature on Chiral Separations Using Ion Mobility Spectrometry- $30,000

California State University, Fullerton
Paula Kristine Hudson, Department of Chemistry and Biochemistry, An Integrated Approach to Measuring the Hygroscopic Properties of Biomass Burning Particles- $39,960

Trinity University
Laura Marie Hunsicker-Wang, Department of Chemistry, Copper Chaperones from Thermus thermophilus: Structural and Functional Studies of TtSco- $37,052

Reed College
Lucas Illing, Department of Physics, Synchronization of Delay-Coupled Optoelectronic Systems-$44,848

Hope College
Jeffrey B. Johnson, Department of Chemistry, Carbon-Carbon Single Bond Activation for the Carboacylation of Alkenes- $45,000

Trinity College
Maria J. Krisch, Department of Chemistry, Investigations of Unique Photochemistry at the Liquid-Vapor Interface- $44,541

Haverford College
Casey H. Londergan, Department of Chemistry, Vibrational Spectroscopy of Cysteine Side Chains to Probe Site-Specific Structural Distribution and Dynamics of Proteins- $43,219

James Madison University
Victoria L. Mariani, Chemistry and Biochemistry, Understanding N-Acylethanolamine-Hydrolyzing Acid Amidase- $44,722

University of San Diego
Kimberly Irene Matulef, Department of Chemistry and Biochemistry, Bacterial Chloride-Transport Proteins: Bridging the Structure-Function Gap- $44,951

Western Washington University
Gregory W. O'Neil, Department of Chemistry, Enantioselective Intramolecular Carbonyl Hydrosilations: Applications in Total Synthesis-$44,651

Franklin and Marshall College
Katherine E. Plass, Department of Chemistry, Synthesis and Photoelectrochemical Characterization of Earth-Abundant Semiconductors for Solar Energy Conversion- $45,000

Western Washington University
Elizabeth A. Raymond, Department of Chemistry, Second Harmonic Generation Studies of Nitrogen Oxides at Water Surfaces- $44,886

Yeshiva University
Lea F. Santos, Department of Physics, Transport Properties and Control in Low-Dimensional Quantum Many-Body Systems- $30,000

Pomona College
Matthew H. Sazinsky, Chemistry, Creation of an In Vivo Reporter System to Detect Hydroxylation Chemistry and Probe Diiron Center Tuning in Re-Engineered Proteins-$43,218

University of Montana
Michael L. Schneider, Physics and Astronomy, Measurement of the Influence of Spin-Orbit Coupling on the Ultrafast Magnetic Response in Ferromagnetic Metals-$44,808

California State University, Long Beach
Michael P. Schramm, Department of Chemistry and Biochemistry, Preparation and Screening of a Modular alpha-Helix Peptidomimetic Library- $42,083

California State Polytechnic University, Pomona
Shantanu Sharma, Department of Chemistry, Computational/Spectroscopic Determination of Residue-Specific Binding Interactions Between the Antiviral Peptide Retrocyclin and a Viral Protein- $39,584

California State Polytechnic University, Pomona
Alexander Raymond Small, Department of Physics, Beating the Diffraction Limit in Photochemistry and Photolithography: A Feasibility Study With Computer Simulations- $28,213

California State University, Long Beach
Eric Joseph Sorin, Department of Chemistry & Biochemistry, Equilibrium Assessment and Refinement of Molecular Models for Biomolecular Simulation of Lipid Membranes via Distributed Computing Approaches- $38,242

Macalester College
Kathryn Elizabeth Splan, Department of Chemistry, Characterization of the Interaction of Copper With Inhibitor of Apoptosis Protein Zinc-Binding Domains- $44,988

Monmouth College
Bradley E. Sturgeon, Department of Chemistry, ESR Investigation of the Peroxidase Activity of Modified Cytochrome C- $43,119

Calvin College
Chad Tatko, Department of Chemistry and Biochemistry, Identifying the Role of Aromatic Networks in Amyloid Protofibril Formation and Anti-Alzheimer's Therapeutic Action-$42,225

Berea College
Martin Veillette, Department of Physics, Strongly Correlated Fermionic Atoms in Rapidly Rotating Traps- $29,476

Santa Clara University
Christopher Phillip Weber, Department of Physics, Ferromagnetic Exchange in Ga1-xMnxAs: Microscopic, Time-Resolved Study by Transient-Grating Spectroscopy- $44,570

Swarthmore College
Liliya Antonivna Yatsunyk, Chemistry and Biochemistry, Synthesis and G-quadruplex DNA Binding of Novel beta-substituted Cationic Porphyrins: Applications to Cancer Treatment- $41,380

COTTRELL SCHOLAR AWARD

Cornell University
Rachel Bean, Department of Astronomy, Signatures of Fundamental Physics in the Cosmos-$100,000

SUNY at Buffalo
Kirill Belashchenko, Electronic theory of magnetism and magnetotransport.
Matthew David Disney, Chemistry, Towards the Rational Design of Small Molecules Targeting RNA-$100,000

University of Massachusetts, Amherst
Jeanne Ann Hardy, Department of Chemistry, Controlling Protein Function with Designed Allosteric Switches-$100,000

Georgia Institute of Technology
Nils Kroger, School of Chemistry and Biochemistry, Diatom Bio-Nanotechnology: A New Paradigm for the Synthesis of Functional 3D Nanomaterials-$100,000

University of South Carolina-Columbia
Franklin Wayne Outten, Chemistry and Biochemistry, Characterization of a novel Fe-S scaffold system used by pathogenic bacteria under oxidative stress and iron starvation-$100,000

California Institute of Technology
Gil Refael,Physics, Breakdown of superfluidity in low-dimensional disordered systems-$100,000

Tufts University
Charles Sykes, Department of Chemistry, Single-Molecule Studies of Ferroelectric Self-Assembly-$100,000

West Virginia University
Sergei Urazhdin, Department of Physics, Magnetoelectronic Phenomena in Nanostructures-$100,000

Ohio State University, Columbus
Yiying Wu, Department of Chemistry, Searching for New Electrode Materials and Nanostructured Architectures for Efficient Dye-Sensitized Solar Cells-$100,000

University of Wisconsin, Madison
Tehshik Peter Yoon, Department of Chemistry, Oxidative Functionalization of Hydrocarbons Using Oxaziridines-$100,000

RESEARCH OPPORTUNITY AWARDS

University of California, Irvine
Dr. Michael B. Dennin, Department of Physics & Astronomy, $40,000

University of Oklahoma
Dr. Michael A. Morrison, Physics and Astronomy,$ 50,000

DEPARTMENT DEVELOPMENT GRANTS

University of San Diego
Dr. Tammy J. Dwyer, Department of Chemistry and Biochemistry, $496,730

James Madison University
Dr. John W. Gilje, Department of Chemistry and Biochemistry, $500,000

FINANCIAL INFORMATION

Research Corporation for Science Advancement's condensed statements of activities and changes in net assets for the years ended December 31, 2008 and 2007 and condensed statements of financial position as of December 31, 2008 and 2007, which are derived from the Foundation's audited financial states, are presented in this section.

The Foundation's audited financial statements for 2008 and 2007 can viewed online at http://www.rescorp.org/about-rcsa.

CONDENSED STATEMENTS OF ACTIVITIES AND CHANGES IN NET ASSETS

Years Ended December 31, 2008 and 2007

REVENUES	**2008**	**2007**
Investment (Loss) Income, Net	($57,401,286)	$16,788,690
Other Income	23,580	253,275
Total Revenues	**(57,377,706)**	**17,041,965**
EXPENSES		
Grants Approved	6,345,827	3,748,887
Program-Related	325,000	300,000
Science Advancement	1,637,144	1,430,039
Information and Communications	307,084	361,768
General and Administrative	2,046,485	1,387,100
Other	632,718	958,147
Rescinded Award	-	(2,100,000)
Total Expenses	**11,294,258**	**6,085,941**
CHANGE IN NET ASSETS	(68,671,964)	10,956,024
NET ASSETS-Start of the Year	167,509,464	156,553,440
NET ASSETS-End of the Year	$98,837,500	$167,509,464

CONDENSED STATEMENTS OF FINANCIAL POSITION

December 31, 2008 and 2007

ASSETS	**2008**	**2007**
INVESTMENTS	$112,479,649	$171,379,587
Cash and Cash Equivalents	1,987,535	3,031,977
Notes and Other Receivables	1,558,958	1,408,925
Interest in LLC	-	1,820,439
Prepaid Pension Cost	-	196,639
Other	838,982	617,860
Total	**$116,865,124**	**$178,455,427**
LIABILITIES AND NET ASSETS		
LIABILITIES		
Grants Payable	$4,491,692	$3,600,476
Line of Credit	9,625,000	4,000,000
LSST Liability	325,000	275,000
LBT Liability	1,548,970	1,598,194
Other	2,036,962	1,472,293
Total Liabilities	**18,027,624**	**10,945,963**
UNRESTRICTED NET ASSETS	98,837,500	167,509,464
Total	**$116,865,124**	**$178,455,427**

OFFICERS, BOARD, AND STAFF

OFFICERS

Gayle P. W. Jackson, Chair of the Board

James M. Gentile, President and CEO

Ray Kellman, Vice President*

Jack Pladziewicz, Vice President **

Suzanne D. Jaffe, Treasurer

Robert B. Hallock, Secretary

Daniel Gasch, Chief Financial Officer and Employee Benefits Plan Administrator

*Until June 30, 2008
**Starting July 1, 2008

BOARD

Patricia C. Barron is a corporate director and is retired from the position of clinical associate professor at the Leonard N. Stern School of Business, New York University. She is chair of the Audit Committee and a member of the Executive Committee and the Science Advancement Committee.

G. Scott Clemons is managing director of Brown Brothers Harriman & Co. He is a member of the Finance Committee and the Science Advancement Committee.

Peter K. Dorhout is vice provost for graduate studies and assistant vice president for research at Colorado State University. He is chair of the Science Advancement Committee and a member of the Governance and Nominating committees and the Executive Committee.

James M. Gentile is president & CEO of Research Corporation for Science Advancement. He is a member of the Executive Committee and the Science Advancement Committee.

Robert B. Hallock is a distinguished professor in the Department of Physics at the University of Massachusetts at Amherst. He is a member of the Audit Committee and the Science Advancement Committee.

Robert Holland, Jr. is an industry partner with Williams Capital Partners. He is a member of the Governance and Nominating committees, the Finance Committee and the Science Advancement Committee.

Brent L. Iverson is a professor of chemistry & biochemistry at the University of Texas at Austin. He is a member of the Finance Committee and the Science Advancement Committee.

Gayle P.W. Jackson is president of Energy Global, Inc. She is chair of the board, chair of the Executive Committee and a member of the Science Advancement Committee.

Suzanne D. Jaffe is president of S.D.J. Associates. She is chair of the Finance Committee, a member of the Executive Committee, the Governance and Nominating committees and the Science Advancement Committee.

Seth Lederman is an associate professor at Columbia Medical School and co-founder of Konanda Pharma Partners. He is a member of the Audit Committee and the Science Advancement Committee.

Patrick S. Osmer is vice provost for graduate studies and dean of the Graduate School of Ohio State University. He is chair of the Governance and Nominating committees and a member of the Science Advancement Committee.

AUDITORS

Keegan, Linscott & Kenon, PC

STAFF

Executive Staff

James M. Gentile, Ph.D., President

Jack R. Pladziewicz, Ph.D., Vice President

Danny Gasch, Chief Financial Officer

Linda Neefe, Executive Assistant to the President

Science Advancement Program

Kathleen Parson, Ph.D., Program Officer

Silvia Ronco, Ph.D., Program Officer

Richard Wiener, Ph.D., Program Officer

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Dan Huff, Director of Communications

Archives

Dena McDuffie, Archivist

Information Technology

Tommy Goodenow, Network Administrator

Assistants

Sarah Ashby

Cheryl Bonnes

Sandy Champion

Joan Miller

Sofia L. Morris

RESEARCH CORPORATION *for* SCIENCE ADVANCEMENT

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