Alfred Bader

Chemistry Related Correspondence

[1987 - 2015]

California NANOSystems Institute

January 22, 2007

Dr Alfred Bader
924 East Juneau, Suite 622
Milwaukee, Wisconsin 53202

Dear Alfred

Many thanks for the sentiments expressed in your letter dated January 11, 2007.

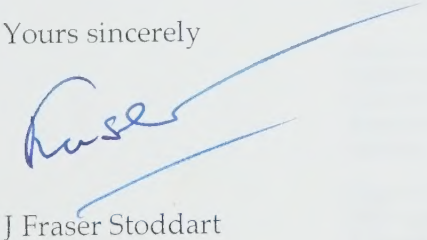
I will never forget the support that you and Isobel showed to me and my group in these difficult Sheffield days. Thank you both from the bottom of my heart.

It never rains but it pours! The enclosures will reveal that hard on the heels of the Queen of England came the King of Saudi Arabia.

I hope you are both well and enjoying life in and around Milwaukee. Hopefully, we will meet up at the ACS Meeting in Chicago in the Spring.

With warm regards

Yours sincerely



J Fraser Stoddart

Fred Kavli Chair in NanoSystems Sciences
Director of the California NanoSystems Institute
Phone: 310 206 7078
Fax: 310 206 5621
Email: stoddart@chem.ucla.edu

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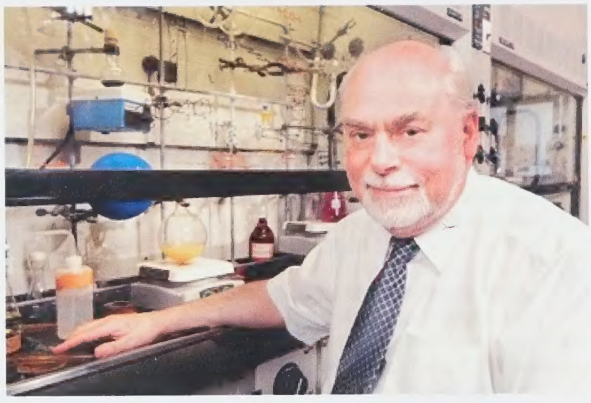

Fraser Stoddart
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Date: January 19, 2007
Contact: Jennifer Marcus (jmarcus@cnsi.ucla.edu)
Phone: 310-267-4839

UCLA's J. Fraser Stoddart Is Awarded the 2007 King Faisal International Prize for Science

UCLA professor J. Fraser Stoddart, director of the California NanoSystems Institute (CNSI), who holds UCLA's Fred Kavli Chair in Nanosystems Sciences, has been awarded the King Faisal International Prize for science.

The winners of the King Faisal International prizes for 2007 were announced Jan. 16 by Prince Khalid Al-Faisal of Saudi Arabia, director of the King Faisal Foundation, which awards the prizes.

The foundation recognized Stoddart for his pioneering work in the development of a new field in chemistry dealing with nanoscience and, in particular, his work in molecular recognition and self-assembly.

"[Stoddart's] introduction of quick and efficient template-directed synthetic routes to mechanically interlocked molecular compounds is of seminal importance," said a posting on the foundation's Web site. "It has dramatically changed the way chemists think about molecular systems and how they can be used in the fabrication of molecular switches and machines such as molecular elevators and shuttles. Stoddart's work was cleverly, elegantly and meticulously done, and carries tremendous creativity, originality and innovation."

UCLA NEWS

Welcome to the UCLA News page, which is maintained by the Office of Media Relations. The campus' central media relations unit serves as a liaison between journalists and the university, directing callers to appropriate communications representatives at the 11 professional schools and UCLA College of Letters and Science, and coordinating distribution of news releases and other communications. In addition, the office manages communication on campuswide issues such as general higher education, admissions and student affairs; key initiatives such as UCLA in LA and community relations; and other important subjects such as ethnic studies centers and environmental topics. On this site you will find news release archives, general information about the university and its leaders, a database of faculty experts, and summaries of news coverage about UCLA and its faculty.

UCLA Office of Media Relations
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"I am both elated and excited by this honor," Stoddart said when he received news of the award. "The King Faisal International Prize in science recognizes only the highest stratum of scholars and scientists from universities, scientific societies and research centers throughout the world. The list of previous recipients is dauntingly impressive. They have steered the course of science in their time and now occupy a place in history. It is a humbling experience for me to be joining their ranks."

"This is a tremendously well-deserved award for visionary science," said Harold G. Martinson, chair of ULCA's chemistry and biochemistry department. "Professor Stoddart is one of the founders and chief artisans of topological chemistry, whose principles he is using to develop intricate intertwined molecules, as well as tiny molecular switches and machines. We are unusually fortunate here at UCLA to benefit from his vision, not only through his inspiring science but also in his creative leadership of the CNSI."

"I was absolutely delighted to hear that Fraser was awarded the Faisal Prize," said Roberto Peccei, vice chancellor for research at UCLA. "This honor recognizes the path-breaking work that Fraser has done in creating entirely new molecular structures, like molecular switches and molecular valves, which are of enormous practical importance."

Bob Peirce, the British consul general in Los Angeles, said, "I am delighted that Professor Stoddart's extraordinary work is now being recognized around the world. Only three weeks ago, he was honoured with a knighthood in his native Britain. Like his adopted California, we are very proud of him."

The King Faisal Foundation believes that through the collective efforts of outstanding individuals, humanity's highest aspirations are realized. The annual presentation of the King Faisal International Prize enables the foundation to reward dedicated men and women whose contributions make a positive difference, including the scientists and scholars whose work results in significant advances in specific areas that benefit humanity. This incentive also encourages expanded research that may lead to important medical and scientific breakthroughs.

Since its establishment in 1977, the King Faisal International Prize has become one of the world's most prestigious awards. Merit and excellence alone are the criteria for selection. As testimony to the high caliber of prize recipients and to the importance of the research carried out by prize laureates, nine winners have gone on to win Nobel prizes for the same work that was recognized by the King Faisal Foundation. Four of the six 2001 Nobel laureates in physics and chemistry were former winners of the King Faisal International Prize.

The winners in each of the prize's five categories are announced in January and receive their awards two months later in a special ceremony held in Riyadh, Saudi Arabia, under the auspices of the king of Saudi Arabia. Each prize winner receives a leather-bound certificate in Arabic calligraphy describing the work for which he or she has been awarded the prize; a commemorative

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24-carat, 200-gram gold medallion; and 750,000 Saudi riyals, the equivalent of roughly $200,000. For more information about the King Faisal International Prize, visit http://www.kff.com/english/kfip/KFIPCurrentWinners.htm.

About Fraser Stoddart

In December 2006, Stoddart was appointed Knight Bachelor by Queen Elizabeth II for services to chemistry and molecular nanotechnology. Stoddart came to UCLA in 1997 and over the past decade has led a team of researchers working at the interface between chemistry, physics, materials science and the life sciences. In his role as the director of the CNSI, he brings together all these disciplines under the umbrella of nanosystems research.

Stoddart is ranked by Thomson Scientific as the third most-cited researcher in chemistry for the period from January 1996 to August 2006. He has published more than 770 communications, papers and reviews, and has delivered more than 700 invited lectures around the world.

He is one of the few chemists to have created a new field of chemistry over the past quarter century by introducing an additional bond — the mechanical bond — into chemical compounds. Stoddart pioneered the use of molecular recognition and self-assembly to create mechanically interlocked compounds called catenanes (which consist of two or more interlocked rings, as in the links of a chain) and rotaxanes (dumbbell-shaped components with at least one ring threaded in a manner reminiscent of an abacus).

Stoddart came to UCLA in 1997 from England's University of Birmingham, where he had been a professor of organic chemistry since 1990 and had headed the university's School of Chemistry since 1993. In 2005, he received an honorary doctor of science degree from the University of Birmingham, and he received the same honor from the University of Twente in the Netherlands in December 2006.

Born in Edinburgh, Scotland, in 1942, Stoddart received his bachelor of science (1964) and Ph.D. (1966) degrees from the University of Edinburgh, where he worked with British chemist Sir Edmund Hirst. In 1967, he moved to Queen's University in Ontario, Canada, where he was a National Research Council postdoctoral fellow and then, in 1970, to England's University of Sheffield, where he was first an Imperial Chemical Industries (ICI) research fellow and then a faculty lecturer (assistant professor) in chemistry. He was a Science Research Council senior visiting fellow at UCLA in 1978. After spending a three-year "secondment" (1978–81) at the ICI corporate laboratory in Runcorn, England, he returned full-time to the University of Sheffield, where he was promoted to a readership (associate professorship). He moved to the University of Birmingham in 1990.

Stoddart was awarded a doctorate of science by the University of Edinburgh in 1980 for his research into chemistry beyond the molecule. He was also the recipient of the University of Edinburgh's Alumnus of the

Year award in 2005, presented annually to a former student forexceptional achievement in arts, science, business, public service or academic life. Previous winners include British politician Lord Steel of Aikwood, novelist Ian Rankin and two-time Olympic medalist Katherine Grainger.

Stoddart is a fellow of the Royal Society (1994), the German Academy of Natural Sciences (1999), the American Association for the Advancement of Science (2005) and the Science Division of the Royal Netherlands Academy of Arts and Sciences (2006).

When Stoddart was appointed director of the CNSI in 2003, he also assumed the Fred Kavli Chair of NanoSystems Sciences. Previously, Stoddart held UCLA's Saul Winstein Chair in Organic Chemistry, having succeeded Donald J. Cram, the 1987 Nobel laureate in chemistry. The Winstein Chair will be held in abeyance while Stoddart serves as director of the CNSI. For more information about Stoddart's research, please see http://stoddart.chem.ucla.edu.

About the California NanoSystems Institute (CNSI)

The CNSI is a research center at UCLA whose mission is to encourage university collaboration with industry and to enable the rapid commercialization of discoveries in nanosystems. CNSI members who are on the faculty at UCLA represent a multidisciplinary team of some of the world's preeminent scientists. The work conducted at the CNSI represents world-class expertise in five targeted areas of nanosystems-related research: renewable energy; environmental nanotechnology and nanotoxicology; nanobiotechnology and biomaterials; nanomechanical and nanofluidic systems; and nanoelectronics, photonics and architectonics. The CNSI's new building on the campus of UCLA is home to eight core facilities which will serve both academic and industry collaborations. For additional information on CNSI, please visit http://www.cnsi.ucla.edu.

About UCLA

California's largest university, UCLA enrolls approximately 38,000 students per year and offers degrees from the UCLA College of Letters and Science and 11 professional schools in dozens of varied disciplines. UCLA consistently ranks among the top five universities and colleges nationally in total research-and-development spending, receiving more than $820 million a year in competitively awarded federal and state grants and contracts. For every $1 state taxpayers invest in UCLA, the university generates almost $9 in economic activity, resulting in an annual $6 billion economic impact on the Greater Los Angeles region. The university's health care network treats 450,000 patients per year. UCLA employs more than 27,000 faculty and staff, has more than 350,000 living alumni and has been home to five Nobel Prize recipients.

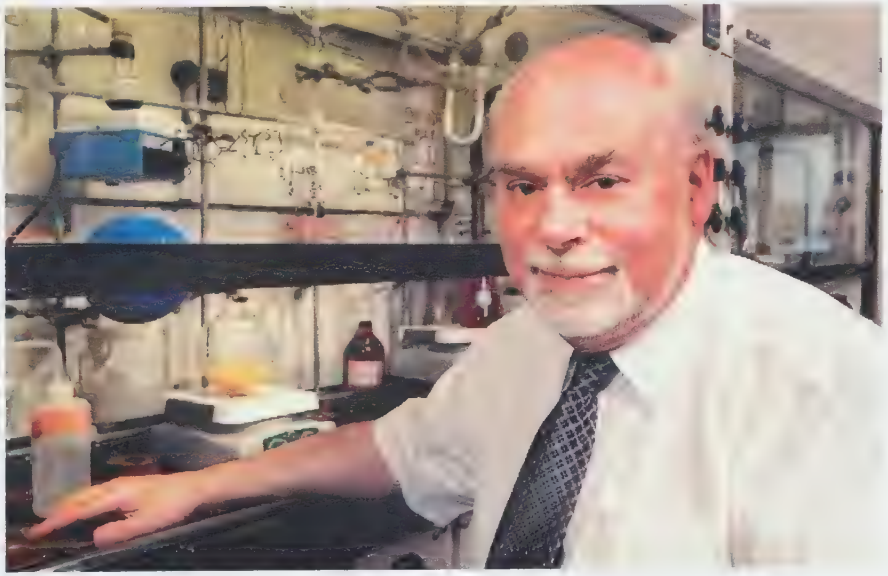
-UCLA-

JMSW029

Back

Knight of the Nano-realm

Fresh from his Knighthood, Sir Fraser Stoddart, Director of the California NanoScience Institute, tells NanoNOW! about his Eureka moment, why making molecules is like playing with Lego, and what gets him up at 5am.



What do you think is the greatest challenge for nanotechnology today?
The need is to tackle big problems. You have got to try, in any research centre, to do as much as you can. As a director of the California NanoScience Institute, I say - let's try to achieve everything we possibly can within the bounds of our talent base. We try to model ourselves on Leonardo da Vinci – one minute designing helicopters, the next minute painting the Mona Lisa. There is a revolution going on in science and technology, the likes of which we have not seen in 500 years. Everyone is being challenged in this age opened up by IT, with information being moved around our planet in milliseconds. As I say, the need is to tackle BIG problems. This challenge requires a broad educational system producing young researchers who are able to reach out beyond their own knowledge base and become team players. Only by bringing this kind of synergy to bear on BIG problems can the challenges in nanotechnology today be met

'I told my group - we are the entrance to a gold mine - come back tomorrow morning with 39 new ideas… they often did.'

What's your strategy for success at CNSI?
I am fortunate to run a research group filled with some of the brightest young minds in the world – 35 of them, to be precise. I give them a lot of freedom, and encourage them to come up with their own ideas within certain boundaries, of course.

In such a privileged situation, I can afford to lead from behind, because my students are, by and large, productive, motivated and inventive - I have always resisted telling my students what to do but I rather see myself as their supporter and enabler. In the CNSI we have an excellent mix of different disciplines, so opportunities to collaborate on tackling "BIG" problems abound.

My philosophy has, to a large extent, been fashioned by the discrimination against young people that I met at the beginning of my academic career: it made my life at the time miserable and I resolved that, when the time came, I would treat young people with respect and courtesy. I challenge them in a positive way to greater and greater achievement, and it is amazing just how much a very talented individual can do. In the US, young researchers are looked up to and revered if they are successful. They become the role models for others, and often I find their talents stretch far beyond academia - into sport, art and music, which makes it even more fun.

I use the same principles in guiding the CNSI. My job as director is one of trying to provide a first class environment for my colleagues to thrive within. I fight night and day to create opportunities for others at all levels – and I just hope that some of my efforts will be fruitful in the fullness of time.

What has been your most exciting achievement?
I had some highly memorable times when I left Sheffield University in 1978 to go on a three-year secondment to the ICI Corporate Laboratory in Runcorn. At that time, the Science Research Council had come up with a highly visionary program that allowed scientists in academe and industry to cross each others' boundaries. I spent three years (1978-81) at ICI at a time when the Corporate Laboratory was at the height of its achievements. Many of the most able scientists in the UK were in Runcorn at that time: it was the place to do out-of-the-box things. All of what I have subsequently achieved as a scientist can be traced back in large measure to these three years! It is ironic, for I had been driven out of the Sheffield chemistry department by the turf wars that were being waged there at the time. Sometimes in life, good things rise out of adversity.

At ICI, I met up with Howard Colquhoun (now at Reading University) and we effectively worked out together the molecular basis for all the research that I subsequently pursued using the mechanical bond in chemistry. Our research, which was aided and abetted by studying the molecular recognition properties of the herbicides Diquat and Paraquat, was eventually, years later, to lead the template directed synthesis of compounds called catenanes (interlocked rings) and rotaxanes (rings on a dumbbell). It was all incredibly exciting at the time and much of the structural basis for the work was established in collaboration with X-ray crystallographer David Williams at Imperial College London. Research on the rotaxanes led to our making of a "molecular shuttle". The work was published in the *Journal of the American Chemical Society* in 1991. It anticipated the subsequent development of linear molecular motors powered by chemicals, electricity and light. Research on the catenanes led to a bistable version, which was subsequently to become the basis for a one nanometre cube switch in a molecular memory device.

It was a unique time for my research group in the late 80s and early 90s. I used to say to the members of my group, "We are the entrance to a gold mine", and I would challenge them with statements like "Come back to me tomorrow morning with 39 new ideas." They often did! The kind of chemistry that uses the mechanical bond appeals to the kind of minds that play with Lego and enjoy solving three-dimensional puzzles. Work is just like playing with toys.'

What made you leave the UK for the US?
I made the move, partly for professional and partly for personal reasons. I came to the US on 1st July 1997 – and my lab was up and running four days later, the day after Independence Day. I'd had a marvellous time in Birmingham; the university was incredibly supportive of chemistry - a total of approximately £10 million was spent during the 1990s on renovating the chemistry department before I left. This investment marked the beginning of a turnaround in infrastructure for chemistry in UK universities, and many others followed Birmingham's example.

On 19th February 1992, two days after I had given my inaugural lecture at Birmingham, my wife suffered a brain haemorrhage. She recovered slowly only to discover in the August of that year that she had cancer of the breast. In the UK by 1997, the prognosis was not good. But when we moved to the US, the UCLA Medical Center transformed her situation overnight. She was no longer considered to be someone who was on her deathbed: her cancer was described as a 'chronic disease',

'Chemistry is for people who like playing with Lego and solving 3D puzzles… Work is just like playing with toys.'

for which oncologists could offer at least 50 different ways of treating. Our move to the States gave her another five years: she was able for most of that time to work in support of my research group and also to accompany me on some of my travels worldwide. Today, a part of me feels that she might still be alive today if we had been in the US in 1992 at the outset of her cancer.

The reason that the UK lags behind the US in cancer treatment is because young doctors are not being trained in a way that equips them properly for the work ahead. In the US, medical students are obliged to spend four years at university, reading for a science degree: they take classes in maths,

physics, chemistry, biochemistry, biology etc. before they can even apply to go to medical school! Lecture theatres in the chemistry and biochemistry departments at UCLA are packed with "pre-meds" eager to do well before the best of them move on to medical school. By contrast, medical schools in UK universities stopped the requirement for pre-meds to attend science courses taught in science departments back in the '70s.

Fraser Stoddart shares a joke with James R. Heath, Caltech's Elizabeth W. Gilloon Professor of Chemistry

In many respects, UK universities have stopped being universities when it comes to the training of young people to enter professions like medicine and dentistry. By the same token, science departments have had to find a hundred and one different ways to try and survive: they have to invent highly prescriptive 'soft' courses to attract students into their departments. Just imagine if science departments in UK universities were still packed to the seams with medics, dentists and engineers, they would not be in the slightest danger of being closed down!

'We try to model ourselves on Leonardo da Vinci – one minute designing helicopters, the next minute painting the Mona Lisa.'

Cancer is, importantly, a multi-dimensional problem. Young people wishing to become oncologists need to be trained to think and work in a multidimensional way to tackle the BIG problems. In some ways, the advent of nanotechnology will serve to encourage this multi-dimensional approach, since nanotechnology is a uniting discipline that brings together all disciplines.

What differentiates research in the US with research in Europe / UK?

What can each learn from the other? The US has adopted the Scottish educational tradition of old – namely, a broad education, implemented in the high schools right up through colleges and universities. In the US education is a serious business: a 24/7 activity for many. The problem in much of Europe is the lack of commitment to learning on a day-in, day-out basis. People leave the workplace, including the universities, for a whole month to go on holiday! In the US, people just roll their eyes at this practice. Of course, maybe we want to move too fast and work too intensely. There is a happy medium to be found

It's no coincidence that the Netherlands and Switzerland are home to some of the top people doing nanotechnology in Europe: these countries have come a long way towards adopting the US model. It would, in my opinion, give a major fillip to the economy of any country in Europe, if that country had the courage to take on board the US academic system, lock, stock, and barrel Another important point is that there is far too much government control of universities in Europe, and in the UK in particular. There is no Research Assessment Exercise imposed on US universities by the federal government. The universities here establish and maintain their own standards. I find it amazing how in the UK, academia has given in to government control at so many levels. The practices associated with the Research Assessment Exercise in the UK are magnified by external examining and assessing systems that I believe ultimately lower standards, rather than raise them. What helped to drive me away from the UK – apart from the inability of the healthcare system to meet my wife's needs – was the bureaucracy and implications surrounding the Research Assessment Exercise and its teaching equivalent. It all adds up to a horrific waste of money (£40 million per round, so I am told) and energy and time (an order of magnitude more in some people's eyes). It creates the wrong culture altogether – one where you identify weaknesses and leave departments on the (geographical) periphery exposed, e.g., the chemistry departments in Aberystwyth and Exeter. It's a nonsense. If young people from outwith the South East of the country want to go to university, are they all going to be comfortable going to places like Oxford, Cambridge, and Imperial? Also, the country needs a spectrum of higher educational institutions: one acts as a feeder for another and so on.

'It was the place to do out-of-the-box things… all of what I've achieved as a scientist can be traced back to those three years'

What are the leading countries in nano research and development today? Where do you think the biggest challenge to the US is coming from?

Nano is a world-wide phenomenon! The action is global. There is lots of activity in the US, Canada, Korea, Japan, Israel, and in Europe, in Switzerland, Germany and the Netherlands in particular – partly because they have embraced the American academic system to at least some extent. The Chinese (in China, Hong Kong, Taiwan and Singapore) are also very impressive. The people involved are very highly motivated and they are trying very hard to do *better* They have their eyes very firmly trained on quality: they ask all the right questions as they strive to succeed. There are so many things they want to know. How do you publish in *Nature*? How do you publish in *Science*?

I believe that, in the fullness of time, China and India will become a force to be reckoned with in nanoscience and technology. It's very difficult to say how the US will fare in this competition. It depends on so many things – the economy, political leadership and so on. Presently, the US is a conduit for talent from all over the world. As a whole, the world is going to face a severe shortage of talent over the next decade or so. The US will remain dependent on its ability to attract talented people from overseas

What's on the cards for you next?

I am off to Washington to speak strongly in support of chemistry, the central science, at the National Science Foundation (NSF). I wear my chemistry unashamedly on my sleeve! I have invited my students to come up with some ideas to help me deliver a very positive message to the NSF. **My message will be to invest appropriately in chemistry, for it is chemistry, in large measure, which will be required to solve the problems that confront us on the planet today.** I will urge the NSF to make the funding possibilities in chemistry as broad as possible and to avoid being overly prescriptive. Let the scientists drive the science forward, with the minimum of interference, and let them decide what research goals should be tackled!

'Discrimination I met at the beginning of my academic career made my life miserable… I resolved that I would treat young people with respect'

Where do you rate the UK as a nanotechnology player, in a global sense?

There always have been and there always will be world leaders in science in the UK The top 10% are as good as anywhere else in the world. British scientists – including those working in the area of nanotechnology – will lift Nobel Prizes in the future, for they compete at the highest level. My concern – as with much in British society – is that after you leave the top 10%, the situation is not so encouraging. The UK remains an interesting mix of extremely high quality and down right mediocrity.

J. Fraser Stoddart, with UCLA colleagues Jeffrey I. Zink, and Thoi Nguyen

Which countries are the movers and shakers in European nanotechnology?

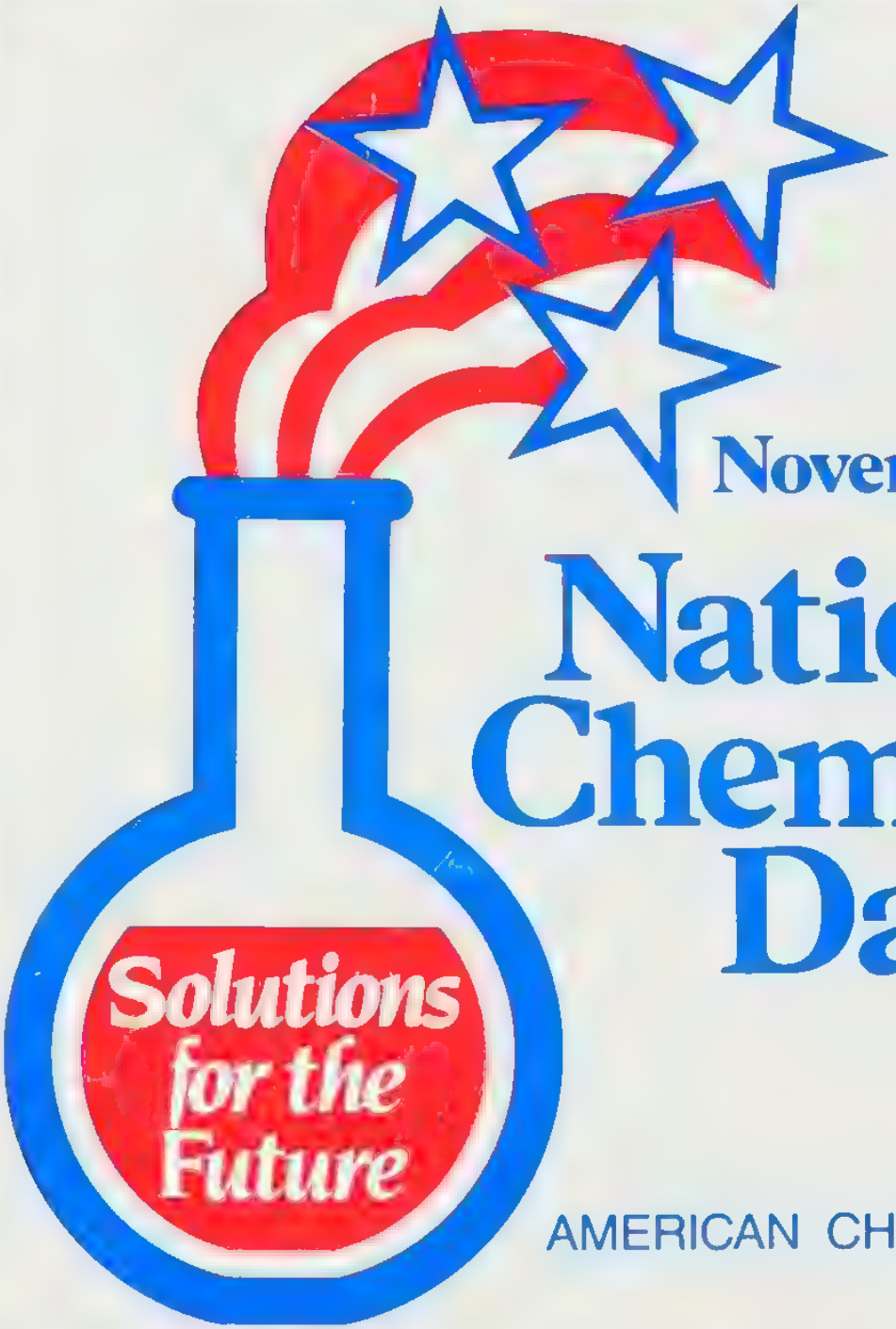
The small countries are doing well. For example, the Netherlands, with major centres in Delft and at the University of Twente in Enschede, Denmark with powerful institutes in Aarhus and Copenhagen, Switzerland with a strong federally-funded program in nanoscience, are all making outstanding contributions to nanotechnology. Finland is doing amazingly well and Ireland is also very active, but perhaps more so in biotechnology than in nanotechnology. If I were forced to say where the movement towards nano is going to be most profound, I would have to say in the smaller countries in Europe. They are able to adapt to change more quickly than the larger countries.

So, finally - what gets you out of bed in the morning?

I'm in the office by 5 AM for that's the way to beat Los Angeles traffic! It is my sheer addiction to science, chemical science and the nanomachines we design, create, and bring through to some potentially practical reality that drives me forward relentlessly. And then there is my love of working with young people, some of them the very brightest and most able of their time I gain so much pleasure from living my life on a daily basis with some of the most talented and adventuresome people on the planet, colleagues who are fearless when it comes to taking on grand challenges. It's an enormous privilege to find myself amongst such people. I'm so lucky ■

Profile

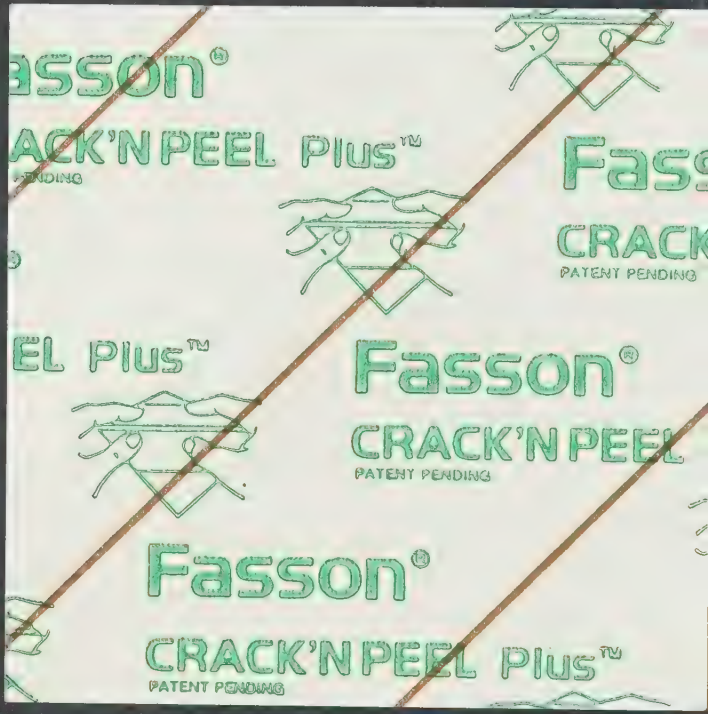
Fraser Stoddart is one of the few chemists to have created a new field of chemistry over the past quarter of a century, by introducing an additional bond, the mechanical bond, into chemical compounds. He has pioneered the development of the use of molecular recognition and self-assembly to make mechanically interlocked compounds called catenanes and rotaxanes, by a process he calls "Molecular Meccano". Sir Fraser was born in Edinburgh, Scotland, in 1942. He received his BSc (1964) and PhD (1966) degrees from The University of Edinburgh. He was also awarded a DSc degree by The University in 1980 for his research into stereochemistry beyond the molecule. He is currently director of the California NanoSystems Institute (CNSI), and he holds the Fred Kavli Chair in Nanosystems Sciences at UCLA. Over the last decade he is the third most highly-cited chemist in the world, according to Thomas Scientific. In January 2007 he was appointed Knight Bachelor by Her Majesty Queen Elizabeth II, 'for services to Chemistry and Molecular Nanotechnology'. For more information about Stoddart's research, please see http://stoddart.chem.ucla.edu/.



November 6, 1987

National Chemistry Day

AMERICAN CHEMICAL SOCIETY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American Chemical Society

Ann B. Messmore
Director of Public Outreach

1155 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036
Phone: (202) 872-4091
800-ACS-5558, press 54

Ann's Fax: 202/872 4377

June 19, 1995

Dr. Alfred Bader
2961 N. Shepard Avenue
Milwaukee, WI 53211

Dear Dr. Bader:

I realize that you will not be able to respond to this letter any time soon, but I just wanted to alert you to our plans for the Science in American Life committee during the Chicago meeting.

We plan to meet on Tuesday, August 22 from 3:00 to 5:00PM in Parlor D of the Sheraton Carlton Hotel. However, prior to that meeting, Joan Shields and I would like to meet with you over lunch to bring you up to date on the events that transpired during your absence.

Please call my office upon your return and let me know if these plans are agreeable to you. I look forward to hearing from you.

Sincerely,

Ann Messmore

Ann B. Messmore

Copy: Dr. Joan Shields

LONG ISLAND UNIVERSITY
C.W. POST CAMPUS BROOKVILLE, LONG ISLAND, NEW YORK 11548
DEPARTMENT OF CHEMISTRY

August 3, 1995

Dr. Alfred Bader
2961 North Shepard Avenue
Milwaukee, WI 53211

Dear Dr. Bader:

Thank you for your letter of August 2, 1995. The Board Committee on the Smithsonian exhibit has been very busy in your absence working with the museum staff. We have scheduled a meeting of the committee in Chicago so that we can bring you up to date on the activities and to obtain your input. The meeting is scheduled from 3-5 pm on Tuesday, August 22 in Parlor D of the Chicago Sheraton Hotel.

Also, if you are available, Ann Messmore, Director of ACS Public Outreach Department and I would like to meet you for lunch on Tuesday. Ann will contact you regarding the time and place

I hope your trip was enjoyable and relaxing. I look forward to seeing you in Chicago.

Sincerely,

John D. Shields

cc: Ann Messmore

Facsimile Transmission

Aug 3, 1995

Attention: Dr Alfred Bader

Company:

Telephone #:

Fax #: 414-277-0709

Subject: Smithsonian

Sender: JOAN E. SHIELDS

Sender Telephone #: 516-299-2492

Sender Fax #: 516-299-3022

You should receive 2 pages, *including this cover sheet* If you do not receive all the pages, please call the number above.

COMMENTS:

American Chemical Society

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1155 SIXTEENTH STREET, N.W.
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Phone (202) 872-4600

August 31, 1995

Mr. Steven Newsome
Anacostia Museum
Smithsonian Institution
1901 Fort Place, SE
Washington, DC 20020

File with others

Dear Steve:

Thank you for your letter of August 16, 1995 with your comments regarding the list of changes to the "Science in American Life" exhibit.

The ACS Special Board Committee on Smithsonian met during the National Meeting in Chicago last week and discussed your response. The committee was dismayed by your comment that Drs. Crew and Heyman "will not respond favorably to the notion of removing material from the exhibit." As you know, the committee feels very strongly that some items in the exhibit be removed and replaced by other more positive aspects of science. Moreover, if our suggestions for additions to the exhibit are accepted, then some items must be removed.

The committee has asked me to inform you that the dissatisfaction with the exhibit among our members is very strong, and minor changes that do not address our problems will not be acceptable to us.

We look forward to resuming our discussions of the exhibit changes.

Sincerely,

Joan E. Shields

Joan E. Shields, Chairman
ACS Board Special Committee on
Smithsonian

cc: Dr. Spencer Crew
Secretary I. Michael Heyman

American Chemical Society

OFFICE OF THE
BOARD OF DIRECTORS

1155 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036
Phone (202) 872-4600

August 31, 1995

Secretary I. Michael Heyman
Smithsonian Institution
1000 Jefferson Drive, SW
Washington, DC 20560

Dear Secretary Heyman:

The ACS Special Board Committee on Smithsonian met during the National Meeting in Chicago last week and discussed the status of our negotiations with the Smithsonian Institution.

We were shocked to see the letter from Arthur Molella in the *Wall Street Journal* on July 31, 1995, since this action violates the agreement between the Smithsonian Institution and the American Chemical Society not to issue public releases until we conclude our negotiations. More significantly, Dr. Molella's letter completely misrepresents the position of ACS. He indicates in his letter that "representatives of ACS helped plan the exhibit ... and worked closely with us at every phase of development." While superficially this statement is true, it certainly does not reveal the dissatisfaction, frustration, and helplessness that the ACS representatives experienced during the process and the enormous efforts of our representatives that fell on deaf curatorial ears. Dr. Molella also failed to mention that the ACS is still so dissatisfied with the anti-science nature of the exhibit that our Board of Directors established a special committee that is presently working with Mr. Newsome of the Smithsonian Institution to address the lack of balance in the exhibit.

A problem that particularly bothers many ACS members is that the negative tone of the entire exhibit will discourage young students from pursuing careers in science, contrary to the original purpose of our support and contrary to national policy. As a result, many ACS members and officers are urging that we initiate strong action. Among the suggestions are that we share with major corporations and the public our experiences with the Smithsonian and how inappropriate we consider your behavior.

Some of our members are urging us to initiate Congressional hearings into this whole sorry episode and what it indicates about the politics and policies of the Smithsonian. Up to now we have assuaged our members' outrage by informing them that we are making progress through the committee's negotiations. However, Dr. Molella's letter has rekindled their anger toward the Smithsonian.

We hope that drastic actions will be unnecessary and that we may come to a satisfactory resolution of our conflicts. However, you should know that the dissatisfaction among our members is very strong, and that they will not be satisfied with minor changes that do not address the major problems many scientists see in the exhibit.

In the event that your response does not meet our expectations, we will move forward with strong action.

Sincerely,

Joan E. Shields, Chairman
ACS Board Special Committee on Smithsonian

cc: Dr. Spencer Crew
Dr. Paul Walter

MARY BET DOBSON
ASSISTANT DIRECTOR, DEVELOPMENT

AMERICAN CHEMICAL SOCIETY
OFFICE OF THE TREASURER
1155 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036 USA

PHONE: (202) 872-4094
FAX: (202) 872-4604
E-MAIL: m_dobson@acs.org

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Alfred and Isabel Bader Itinerary
Washington, DC
October 3-6, 2006

Tuesday, October 3, 2006

6:20 pm	Arrive Washington DCA Midwest #415
	Mary Bet Dobson will meet Baders at gate. Drive to University Club for check in.
	University Club, 1135 16th Street, NW, 202-862-8800
7:30 pm	Dinner, Eli's Restaurant, 20th and N Streets, NW Mary Bet and Andy Dobson

Wednesday, October 4, 2006

8:00 am -	Breakfast with Madeleine Jacobs Taft Dining Room, University Club Visit Madeleine's office at ACS building
10:00 am	Josh Duberman to pick up Baders Meet in lobby of University Club
10:30 AM -	Baders at National Gallery, Meet with Dr. Arthur Wheelock regarding Leiden exhibit
Noon	Lunch with Arthur Wheelock at National Gallery, (Josh Duberman, Mary Bet to join party) East Building Study Center, call Molli Kuenstner, 202-842-6567
1:45 PM	Josh Duberman brings Baders back to University Club
2:30 pm	Depart University Club with Josh Duberman for University of Maryland talk – Mary Bet to accompany
3 pm	Pre-reception at University of Maryland
4:30 -6:00 pm	Bader lecture at University of Maryland College Park, Room 1402, Department of Chemistry and Biochemistry "Richard Anschütz, Archibald Scott Couper and Josef Loschmidt: A Detective at Work"
6:00 pm	Josh Duberman to return Baders to University Club Dinner with Josh Duberman (TBD)

Thursday, October 5, 2006

8:30 am	Josh Duberman to pick up Baders at University Club
Mary Bet to take metro to Medical Center, North of Bethesda	
9:30 am	"Meet and Greet" at NIH (tea and coffee)
11 am	Bader's Lecture NIH Warren Grant Magnuson Clinical Center, Building 10, Lipsett Amphitheater, 10 Center Drive, Bethesda, MD "The History of Aldrich and Sigma-Aldrich, With Advice to Young Scientists"
Lunch	Dr. Schechter at NIH (location TBD)
By 3 pm	Return to University Club with Josh Duberman
4:15 pm	Mary Bet Dobson to meet Bader's at University Club for dinner Drive to dinner at Eli's Restaurant, 20th & N Street, NW Roseanne Runte to meet us at restaurant (to be confirmed)
5:40 pm	Depart for Embassy: Baders, Runte and Dobson
6:00 pm	Review projection equipment and lecture location
6:00 pm	Madeleine Jacobs to arrive at Embassy
6:30 pm	Reception begins
7:15 pm	Lecture begins "The Rembrandt Research Project and the Collector"

Friday, October 6

9 am	Depart for airport Mary Bet Dobson to pick up Baders and drive to airport
11:15 am	Depart Washington, DC Midwest #402

Contact Information:

Mary Bet Dobson, Office – 202-872-4094, cell 571-274-9293
ACS Main Number 1-800-227-5558

Josh Duberman, Office 301-594-6200, cell: 425-591-8200
NIH Library information desk: 301-496-1080

ACS Executive Director's Office
202-872-6019

University Club
1135 16th Street, NW
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2011–12 PROJECT SEED COLLEGE SCHOLARSHIPS

THE ACS COMMITTEE on Project SEED has announced the winners of its 2011–12 college scholarships. The recipients, who were selected from participants in ACS's Project SEED research program, receive one-year nonrenewable scholarships for up to $5,000 to help cover tuition and fees during their freshman year of college. The 29 college scholarships for the 2011–12 academic year, which have a total value of $145,000, were funded by private corporations and individual donors.

Project SEED is ACS's summer research program that enables economically disadvantaged high school students to conduct hands-on research. Past participants are eligible to compete for the scholarships, which are designed to help them transition from high school to college. For more information about Project SEED, visit www.acs.org/projectseed.

ALFRED & ISABEL BADER SCHOLARS

Alfred Bader is one of the founders of Aldrich Chemical, now Sigma-Aldrich. The Baders have supported Project SEED for many years and contributed to the initiation of the Summer II SEED program, which allows students to return for a second summer of more intensive research.

Matthew Avila is a graduate of Pocatello Senior High School, in Idaho. Through the Project SEED program, Avila worked under the direction of Todd A. Davis of Idaho State University, Pocatello. His research project was on "α-Chlorination of Ketones Mediated by Thiourea & *p*-Toluenesulfonic Acid." Avila is now majoring in chemistry at Idaho State.

Brian Chiou graduated from East Lansing High School, in Michigan. He worked under the supervision of Mikhail Y. Redko of Michigan State University, East Lansing, on research titled "Synthesis of Natural Carbohydrates & Proteins." He is majoring in biochemistry and molecular biology at Lansing Community College.

Niecia Flikweert graduated from the Potter's House, in Grand Rapids, Mich. Under the direction of Douglas Vander Griend at Calvin College, in Grand Rapids, Flikweert worked on research titled "Characterizing the Interaction between G-quadruplex DNA & Insulin." She is majoring in biochemistry at Calvin College.

Nikia Gloston is a graduate of Washington-Marrion Magnet High School, in Lake Charles, La. At McNeese State University, in Lake Charles, Gloston worked under Omar Christian on research titled "The Isolation of Coumarins from *C. rosea*." He attends the University of Louisiana, in Lafayette, where he is majoring in chemical engineering and biochemistry.

Nicholas Hoover graduated from Altoona Area High School, in Pennsylvania. He worked under the supervision of Richard C. Bell at Pennsylvania State University, Altoona, on research titled "Exploring Pore Growth in the Anodization of Aluminum for Nanowire Synthesis." He is majoring in chemical engineering at Penn State's University Park campus.

Si Li graduated from Central High School, in Philadelphia. At the Forensics Mentors Institute, in Willow Grove, Pa., Li worked under G. John DiGregorio on research titled "Optimization of Cocaine Extraction from U.S. Currency." Li is a chemistry major at the University of the Sciences, in Philadelphia.

Jessica Lopez is a graduate of North Bergen High School, in New Jersey. She worked under the mentorship of Keun Hyuk (Ken) Ahn at New Jersey Institute of Technology, in Newark, on research titled "Studying Magnetic Phase Transition with Computers—Using Model & Monte Carlo Simulations." She is majoring in chemical engineering at Stevens Institute of Technology, in Hoboken, N.J.

Alyssa Morgan is a graduate of Middle College High School, in Durham, N.C. At the University of North Carolina Chapel Hill, Morgan worked under the supervision of Christopher J. Fecko on research titled "The Quantification of Strand Cleavage in DNA Stained with Hoechst 33342." She is majoring in chemistry at UNC Chapel Hill.

Kwame Newton graduated from University High School of Indiana, in Carmel. He worked under the mentorship of Bruce D. Ray at Indiana University-Purdue University, Indianapolis, on research titled "Use of Hydrofluoric Acid as an Aid to Matte Paint Binder Analysis by FTIR." He is a chemistry major at DePauw University, in Greencastle, Ind.

Erika Portero graduated from Union City High School, in New Jersey. At Rutgers University, Piscataway, N.J., she worked under the supervision of Yao Ping Lu on research titled "Mechanisms of Decreased Tissue Fat by Caffeine & Exercise To Prevent Skin Cancer." Portero is majoring in chemistry at Drew University, in Madison, N.J.

Emma Russo is also a graduate of Union City High. She worked under the direction of A. James Link of Princeton University on research titled "CapB: A Protein Involved in Lasso Peptide Antibiotic Biosynthesis." She is majoring in chemistry at Brown University.

Paola Severino also graduated from Union City High. At Princeton University, Severino worked under A. James Link's mentorship on research titled "Engineering High Affinity Peptide Cancer Therapeutics." Severino is majoring in chemical engineering at Yale University.

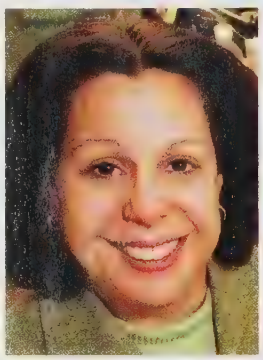
Sheeniza Shah graduated from George Washington Carver High School for the

ACS Awards: A Call For Action

VICKI H. GRASSIAN, AND VALERIE J. KUCK, COCHAIRS, ACS AWARDS TASK FORCE

ALONG WITH SIX other societies, the American Chemical Society is partnering with the Association for Women in Science in a National Science Foundation-funded program entitled "Awards: Advancing Ways of Awarding Recognition in Disciplinary Societies." The goal of this effort is to develop processes that increase the diversity of scientific award recipients and to use the lessons learned from this work to formulate best practices for other disciplinary societies.

Two years ago, ACS formed the Awards Task Force to critically review the nomination and selection processes used in the society's national awards program, to identify ways of increasing the diversity of ACS national award nominees and recipients, and to recommend appropriate changes to ensure equity in the selection of award recipients.



TOM JORGENSEN/U OF IOWA

Grassian

PETER CUTTS PHOTOGRAPHY

Kuck

The task force has reviewed the gender of the nominees and recipients for ACS national awards granted from 2007 through 2012. The society has 62 national awards. Fifty-two of them are presented annually, nine are given out biennially, and one is awarded triennially. Because individuals can be renominated for a given award for up to three consecutive years, the pool of nominees reflects the summation of the nominees for an award for each of the six years reviewed rather than the number of distinct individuals who were nominated for an award.

Analysis of the data showed that women were underrepresented among nominees. Women accounted for only 13% of the nominees—substantially less than their fraction of the membership, which is 21%. Moreover, women represented 13% or less of the nominees for 44 of the 52 awards that recognize outstanding technical accomplishments. A dozen technical awards had no female nominees.

Women were also underrepresented among recipients. Over the six-year span, women received just 12% of the technical awards. But that percentage was significantly and positively affected by the fact that women had done extremely well in being selected to receive several specific awards. More than 33% of the recipients for seven awards were women. In sharp contrast, there were no female recipients for 31 of the technical awards. Clearly, immediate action is needed to address the underrepresentation in the nomination and selection of women receiving technical awards.

During the past two years, the task force has taken a number of actions. It has supported the formation of canvassing committees for all of the awards having few or no female nominees. Those committees are responsible for assisting ACS in the identification and nomination of deserving women as well as individuals from other groups that are underrepresented in the awards program.

In other efforts, the task force prepared supplementary information for the award selection committees. And it developed a best practices document that describes ways for ensuring that all nominees are evaluated fairly. To further assist selection committees, the task force provided committee members with a summary document, video presentation, and PowerPoint presentation on implicit associations. Several studies in the social sciences have shown that implicit biases and nonconscious hypotheses and stereotypes—often about competence—unintentionally discourage diversity in nomination and selection processes. Selection committee members are asked to discuss the implicit association materials before they commence their discussions on nominees.

In another effort, ACS surveyed previous selection committee members on the criteria they used in choosing an awardee. Analysis of the responses showed that there is a wide variation in the criteria used to evaluate nominees. In collaboration with the Board Committee on Grants & Awards, the task force is developing a list of consistent criteria to be used by all selection committees. This set of criteria is expected to result in a more equitable distribution of the awards.

Despite the society's efforts to promote diversity in the chemical sciences, our analysis of the data clearly shows that many technical awards have few or no female nominees or recipients. This situation must change, and you can play a key role in making this happen. We call on you, the ACS membership, to identify and nominate qualified women for ACS national awards. Specific information on each of the awards is posted on the ACS website (www.acs.org/nationalawards) along with the material that must be included in a nomination package.

We also ask you to volunteer to be on a canvassing or selection committee that acknowledges outstanding technical accomplishments in your field of expertise. If you are appointed to a canvassing committee, enthusiastically work toward broadening the pool of applicants and finding nominators who can prepare competitive nomination packages for women and underrepresented minorities. If you are on a selection committee, make certain that all of the nominees are treated fairly. You can make a difference!

Members of the task force hope and expect that their work can help increase diversity in divisional, regional, and local section awards, as well as prestigious lectureships, by laying the foundation and putting processes in place that can be used by these selection committees. With your help, ACS can take tangible steps that demonstrate it is an inclusive society.

Views expressed on this page are those of the authors and not necessarily those of ACS.

OFFICERS' MESSAGE

Introduction – A Year of Collaboration and Global Partnerships

2012 was a year of great achievement for the American Chemical Society. We achieved success through a robust partnership of ACS members, governance, and staff, often working with other organizations. The 2012 ACS Annual Report highlights several of these accomplishments. ACS carries out so many initiatives that we often forget the incredible diversity of ways that we serve our members and the broader scientific enterprise worldwide.

Bassam Z. Shakhashiri
President

William F. Carroll, Jr.
Chair
Director At-Large

Madeleine Jacobs
Executive Director
& CEO

ACS issued one of the most comprehensive reports in a half century on the fundamental changes needed in the education of scientists in the chemical sciences whose work impacts virtually every scientific discipline. The report was the result of the Commission on Graduate Education in the Chemical Sciences, one of the major initiatives of ACS President Bassam Z. Shakhashiri, Ph.D. Symposia and workshops will be held in 2013 to review and explore ways to implement the recommendations.

Another presidential initiative was the ACS Presidential Working Group on Climate Science. This group developed a web-based tool kit about the science of climate change to be used as a resource by ACS members to discuss this important issue with other scientists, policymakers, educators, and the public.

ACS fostered collaboration among people across geographic boundaries to solve global challenges. We support our members in many ways to help them advance chemistry through research, education and innovation. Communicating chemistry to fellow scientists and to the world is one of ACS's core functions. The quality and prestige of ACS publications, including 42 journals and *Chemical & Engineering News* (C&EN) weekly news magazine, are unparalleled. Communicating the value and contributions of the chemical sciences to non scientists is another important role for ACS and is one of the goals of the ACS Strategic Plan for 2012 and Beyond.

ACS expanded its international collaborations. As a global organization with a sizeable percentage of our members living outside the United States, we see our global presence in terms of helping all members achieve their goals in a global workforce and environment. In December 2012, ACS launched a new International Center, an online clearinghouse of information on international opportunities for chemical practitioners. The site is a one-stop, efficient, and comprehensive resource showcasing existing international collaboration opportunities, experiences, and logistics. This was an outgrowth of a 2010 Presidential Task Force.

The launch of the Chinese Microsite was ground-breaking for ACS in the development of localized ACS websites for international audiences. It was developed based on the needs of our Chinese stakeholders. The site is in Chinese and includes information about ACS programs, products, and services. It represents a global dialogue in science, technology, and chemistry and is especially important in helping to strengthen the connection between ACS and the scientific community in China and the rest of the world.

OFFICERS' MESSAGE

In 2012, editors of a dozen ACS journals and key ACS Publications staff completed a two-week editorial outreach visit to India, where they met with more than 3,000 scientists and students to discuss emerging trends in chemical science and the publication of scientific research in ACS journals. In recognition of India's leadership in science, ACS editors visited 13 academic and research institutions spanning seven cities in India: Mumbai, Bangalore, Delhi, Kanpur, Hyderabad, Pune, and Kolkata. The trip to India, while the first for ACS Editors, is part of ACS journals' growing presence around the world, with other activities taking place in China, Japan, and elsewhere.

Another significant event in 2012 was ACS hosting the 44th International Chemistry Olympiad (IChO) in Washington, D.C. This was the first time that the United States and ACS had hosted the event in 20 years. IChO involved 72 countries, nearly 300 students, and 700 participants. The Dow Chemical Company was the sole financial sponsor ($2.5 million) of the 44th IChO, along with generous donations of facilities and personnel by the University of Maryland at College Park. Other major donors included Sigma Aldrich, which provided the chemicals for the experiments. The U.S. team won one gold medal and three silver medals. U.S. Senator Chris Coons (D-DE) sponsored a Senate resolution recognizing the importance of STEM education and the roles of ACS and the University of Maryland in arranging for the 44th IChO. The Maryland legislature gave citations to Dow, University of Maryland, and ACS honoring them as principals for the event.

The economy was challenging in 2012. ACS continued to help members look for jobs and provide guidance for career development. In addition to leadership training and the enormous existing suite of ACS Career Services designed to help members thrive in the global workforce, ACS launched a model Online Jobs Club program to help displaced workers, especially the long-term unemployed, gain tools, leads, and insights from colleagues on job search and employment issues. These clubs met weekly through web-based communications to discuss common challenges and facilitate training and networking.

To enhance chemistry-related training, innovation, and job creation, ACS developed and launched a new Entrepreneurship Initiative (EI) in 2012, the outgrowth of a 2011 Presidential Task Force. The program received the highest award given by the American Society for Association Executives for programs that make a difference in the world. The EI's two components—an intensive training program for budding entrepreneurs and a resource center for established entrepreneurs—were both test marketed and fully operational in 2012. In addition, through the generosity of entrepreneur Kathryn (Kitty) Hach Darrow, a new award established by the ACS Board of Directors was endowed with $500,000 and named the Kathryn C. Hach Award for Entrepreneurial Success. The first award will be given in 2014.

Although the global economy continued to struggle in 2012, we are pleased to announce that ACS ended 2012 with many extraordinary achievements and with a positive financial position. The Board of Directors is pleased to report that for the ninth consecutive year, ACS ended the year with a positive net contribution from operations.

In 2012, ACS settled the long-running legal case, *ACS vs. Leadscope* to the agreement of all parties

Looking forward, the Board of Directors will be guided by the ACS Strategic Plan for 2012 and Beyond. The plan has four strategic goals that provide a path to achieve our Vision, *Improving people's lives through the transforming power of chemistry*.

ACS – Global Authority for Chemical Information

ACS continues to be the most authoritative, comprehensive, and indispensable provider of chemistry-related information through its Publications division, Chemical Abstracts Service, National Meeting programs, and the Petroleum Research Fund.

ACS Publications maintains its reputation as "Most Trusted. Most Cited. Most Read" by publishing groundbreaking research in its premier journals in chemistry and related sciences, *Chemical & Engineering News* (C&EN) and books.

In 2012, ACS members received a valuable new member benefit: expanded access to more than one million articles and book chapters from ACS publications. This new benefit is offered exclusively to ACS members Publications, working in close collaboration with Membership and Scientific Advancement (M&SA), introduced the ACS Member Universal Access program, which is a significant expansion in ACS journal subscription options for ACS members. As part of an annual membership, this program includes options ranging from online access to any 25 articles from all ACS journals, ACS Symposium Series e-Books, C&EN Archives, and book collections, to new "Passport" collections that duplicate access rights previously limited to institutional libraries. More than 14,000 ACS members downloaded journal, book and C&EN Archive content via this program in 2012. In a survey of members conducted by M&SA six months after the introduction of the program, more than 54 percent of respondents said that this benefit made them more likely to renew their ACS membership in future years.

ACS Publications continued to innovate through the development and launch of two new peer-reviewed journals, *ACS Macro Letters*, and *ACS Synthetic Biology*, and engaged in an early editorial and marketing introduction of *ACS Sustainable Chemistry & Engineering* prior to its subscription-based availability in 2013.

In 2012, ACS Publications received several recognitions. ACS won the American Association of Publishers' Professional and Scholarly Excellence (PROSE) award for Best eProduct in Physical Sciences & Mathematics. The free *C&EN Mobile* app for ACS members was recognized for its innovative capabilities that provide access to daily news updates from C&EN Online, analysis and commentary from the CENtral Science blog network, and the latest chemistry job postings. Published issues automatically update to the user's device regardless of whether or not they are running the application. In addition, we have added a yearly subscription model for non-ACS members.

ACS Journals continued their preeminence in citations and Impact Factors. The 2011 Journal Citation Reports® was released by Thomson Reuters in June 2012. The ACS journal portfolio continued to perform extremely well, receiving more than 2 million total annual citations and posting a #1 ranking in either Impact Factor and or Total Citations in 16 categories.

In 2012, CAS continued extraordinary database growth, analyzing more than 1.4 million patents, journal articles and other disclosed research sources, for a new total of more than 36 million records. Updated daily, the CAS reaction database saw even greater gains, with growth exceeding 9.1 million new reactions.

OFFICERS' MESSAGE

The CAS REGISTRY℠ is the world's largest collection of small molecules. In December 2012, CAS celebrated registration of the 70 millionth substance in the CAS REGISTRY℠, just 18 months after registering the 60 millionth substance. The 70 millionth substance – a potential T-type calcium channel blocker was disclosed in the patent application published by KIPO in Korea, and may be useful in the treatment of epilepsy, Parkinson's disease, dementia and other conditions.

CAS patent authority coverage expanded to include Eurasia in 2012. CAS now covers 63 patent authorities worldwide to ensure comprehensive patent information within its databases

More than 30,000 people participated in ACS National Meetings in San Diego and Philadelphia in 2012. Participants presented more than 19,000 papers at these two meetings - significantly expanding the body of knowledge in dozens of chemistry-related fields

At the 2012 ACS National Meetings, the highly anticipated and well-received Kavli Foundation Lectures continued to grow. ACS worked with The Kavli Foundation to establish a new Kavli-sponsored lecture series for 2013-2015 titled "Emerging Leader in Chemistry Lecture," which identifies and acknowledges outstanding young scientists with exceptional individual achievements in scientific or engineering research. This new series launches in 2013 at the ACS National Meeting in New Orleans.

The National Meetings program also won the prestigious 2012 Green Leader Award offered by the Professional Convention Management Association, the leading meetings industry group.

The Petroleum Research Fund (PRF) provided more than $16 million to fund 178 grants to support basic research and advanced education in the field of petroleum and related fields. The ACS Petroleum Research Fund's 56th e-Annual Report was posted online. This online e-annual report includes the impacts and benefits of the Fund reported by each investigator.

With so many achievements in 2012, it is clear why ACS is truly "home" for chemical professionals!

OFFICERS' MESSAGE

Focusing on What Matters Most

For more than 136 years, ACS has been the chemical enterprise's "hometown" the focal point for chemical professionals around the world to meet, share information, and find tools and guidance that enable them to become stronger and more marketable scientists.

As our members' needs have changed, we have developed innovative programs and resources available to our global colleagues to meet those needs. We are committed to offering career and leadership training and resources, fostering international collaboration, improving chemistry education especially providing opportunities for underrepresented populations, and engaging the general public to highlight the value and contributions of chemists and the chemical enterprise to society.

We believe that these efforts on behalf of our more than 163,000 members will provide enormous benefits now and in the future.

PROGRAM HIGHLIGHTS

Making International Connections

The American Chemical Society is a global organization with a sizable percentage of its members living outside the United States. As a membership organization, we see our global presence in terms of helping all members achieve their goals in a global workforce and environment. The Division of Membership and Scientific Advancement launched a new International Center in December 2012, an online clearinghouse of information on international opportunities for chemical practitioners. The site is a one-stop, efficient, and comprehensive resource showcasing existing international collaboration opportunities, experiences, and logistics. This was an outgrowth of a 2010 Presidential Task Force.

The Global Research Experiences, Exchanges, and Training Program (GREET) provided intensive international research experience and collaboration opportunities to U.S. chemical scientists and drew extremely favorable feedback from participants. The 2012 teams were hosted by Kenya, China, Israel, Italy, and New Zealand. The Membership & Scientific Advancement Division also organized a summit in November of international students in the U.S. to facilitate discussions around the unique national resource and opportunities provided by the more than 700,000 international students studying in the United States. Discussions focused on promoting cross-cultural understanding, increasing international skill flow and collaboration, and ways to enhance engagement with this segment. The recommendations are being used to inform engagement strategies in 2013. Travel awards from the Executive Director's Initiative Fund were awarded to nine U.S. graduate students to attend and present their research during the 4th EuCheMS Congress in Prague, which helped bring an ACS and U.S. perspective to the meeting and demonstrate ACS membership value to the graduate student community. During the Congress, students blogged about their experiences on the ACS Network.

The launch of the Chinese Microsite was ground-breaking for ACS in the development of localized ACS websites for international audiences. Washington IT (Web Strategies and Operations unit) successfully developed the site in collaboration with the ACS Office of International Activities based on the needs of our Chinese stakeholders. The site is in Chinese and includes information about ACS programs, products, and services. The site represents a global dialogue in science, technology, and chemistry and is especially important in helping strengthen the connection between ACS and the scientific community in China

PROGRAM HIGHLIGHTS

ACS Publications - Journals

Living up to their reputation as "most trusted, most cited, and most-read," ACS Journals continued their preeminence in citations and Impact Factors while continuing to develop new and enhanced content and delivery options.

The 2011 Journal Citation Reports® were released by Thomson Reuters in June 2012. ACS journals continued to perform extremely well, receiving more than 2 million total annual citations and posting a #1 ranking in either Impact Factor and or Total Citations in 16 categories.

With 2012 marking the first full calendar year of publication for *ACS Macro Letters* and *ACS Synthetic Biology*, ACS Publications also launched an early editorial and marketing introduction of *ACS Sustainable Chemistry & Engineering* prior to its subscription-based availability in 2013. David T. Allen of the University of Texas at Austin was named editor in April 2012. The latest journal to secure Governing Board approval is *ACS Photonics and Optoelectronics*, with publication planned for 2014.

In a strategic collaboration between ACS Publications and ACS Membership and Scientific Advancement, the Society significantly expanded its journal subscription options for members. These ranged from offering all members a pre-determined number of free article and chapter downloads from ACS journals, archives and book collections, to new "Passport" collections that duplicated access rights previously limited to institutional libraries. In a survey conducted six months after its introduction, more than 54 percent of respondents said that this new member benefit made them more likely to renew their ACS membership in future years.

The Web Editions platform saw record web usage in 2012, delivering over 80 million full text article downloads. The platform now provides 130 million free abstract views a year to over 20 million unique visitors. Some 200,000 researchers have chosen to register with ACS and receive subject specific email alerts to new material posted on the ACS Web Editions within hours of publication. The ACS Mobile app—available on both Android and iOS devices has more than 40,000 active users who downloaded over a million abstracts. This is the result of moving the app into the "freeware" category and the explosion in web-capable smartphones and iPad devices in use in 2012.

ACS Publications continued to serve an expanding customer base in Asia, South America, Europe, and the Middle East. A contingent of ACS editors and Publications staff made a two-week editorial outreach visit to India, where they met with more than 3,000 scientists and students to discuss emerging trends in chemical science and the publication of scientific research in ACS journals.

The Publications-initiated ACS on Campus (ACSoC) program also expanded in 2012. With new content, ACSoC is now a broader, cross-divisional outreach and skills development program of the Society, serving research and author communities. In 2012 nearly two dozen sessions were held across the U.S., Europe, Asia and South America

PROGRAM HIGHLIGHTS

ACS Publications – C&EN

This year marked a change in leadership at the Society's weekly newsmagazine, *Chemical & Engineering News*. Editor-in-Chief Rudy Baum retired from that post on Sept. 14. He is succeeded by Dr. A. Maureen Rouhi and Joshua Fischman succeeded Rouhi as C&EN's Deputy Editor-in-Chief in November 2012.

The free *C&EN Mobile* app was recognized for its innovative capabilities that provide access to daily news updates from *C&EN Online*, analysis and commentary from the CENtral Science blog network, and the latest chemistry job postings. For this app, ACS was awarded the American Association of Publishers' Professional and Scholarly Excellence (PROSE) award for Best eProduct in Physical Sciences & Mathematics.

With the introduction of additional features, the application ("app") was made available in the Apple Newsstand interface. Published issues automatically update to the user's device regardless of whether or not they are running the application. The *C&EN* covers in Newsstand update to the latest cover issue and a new sash appears notifying users the issue is new to read. Improvements to the look and feel and the addition of a YouTube channel were also made. Version 2.2.0 of Android *C&EN Mobile* was prepared for release to the Android market. This release improves upon features in previous versions and is associated with the latest changes in the Android operating system.

C&EN also continues to expand its presence online through engagement in social media. Social media, which now account for 9 percent of *C&EN Online*'s referral traffic, enable C&EN content to be shared and discussed by prominent outlets like the *New York Times, Scientific American,* and the *Atlantic*.

CENtral Science, the magazine's blog network, introduced two new blogs this year: Fine Line, which covers the fine chemicals industry, and Grand CENtral, a home for weekly summaries and announcements of the network. Almost all of the blogs saw an increase in page views from 2011.

In the social media arena, C&EN's twitter feed (@cenmag) has more than 7,100 followers who read, share, and interact with C&EN via this channel. Traffic to C&EN's Facebook page and YouTube channel continued to grow, and a new Tumblr site was launched to foster sharing of photos, videos, C&EN articles, and social media posts from ACS National Meetings.

PROGRAM HIGHLIGHTS

Chemical Abstracts Service (CAS)

CAS — the World's Authority for Chemical Information

As the only organization in the world solely dedicated to finding, collecting and organizing all publicly disclosed chemical information, CAS serves chemical, pharmaceutical and bio-medical companies as well as universities, government organizations and patent offices around the world with the most comprehensive and authoritative sources of curated and quality controlled chemical and related information. By combining its databases with advanced search and analysis technologies (e.g., SciFinder® and STN®), CAS delivers the most current, complete, secure, and interlinked digital information environment for scientific discovery

In 2012, CAS continued extraordinary database growth, analyzing more than 1.4 million patents, journal articles and other disclosed research sources, for a new total of more than 36 million records. Updated daily, the CAS reaction database saw even greater gains, with growth exceeding 9.1 million new reactions. Because of the work of the more than 1,000 scientists around the world who assemble, curate, and assure the quality of the CAS databases, researchers can also explore the largest collection of disclosed chemical synthesis information, including more than 47 million single- and multi-step reactions from 1840 to the present. CAS added thousands of experimental procedures from three high-impact Taylor & Francis journals and also updated SciFinder® with nearly 200,000 additional experimental NMR spectra to help scientists better characterize and identify substances. Front page graphics from USPTO and structure graphic additions for the CAS Markush database provide additional structure data. CAS now provides access to more than 4 million experimental procedures for reactions from prestigious publishers including all ACS Publications journals, Taylor and Francis top synthetic titles, Shanghai Institute of Organic Chemistry journals, and patents from the USPTO, European Patent Office, World Intellectual Property Organization, the Japanese Patent Office and the German Patent Office

The CAS REGISTRY℠ is the world's largest collection of small molecules. In December 2012, CAS celebrated registration of the 70 millionth substance in the CAS REGISTRY℠, just 18 months after registering the 60 millionth substance. This potential T-type calcium channel blocker, disclosed in the patent application published by KIPO in Korea, may be useful in the treatment of epilepsy, Parkinson's disease, dementia, and other conditions. CAS REGISTRY℠ also contains more than 64 million sequences. The continual growth and updating of organic and inorganic substances in the CAS REGISTRY℠ database is reported with the REGISTRY counter on the newly designed CAS website home page. This growth has been complemented by CAS's expanding coverage of predicted and experimental property values, spectra, and data tags, to more than 3.8 billion by year-end.

CAS patent authority coverage expanded to include Eurasia in 2012. CAS now covers 63 patent authorities worldwide to ensure comprehensive patent information within its databases. In addition, multiple basics coverage was extended to include patents from all covered authorities. Scientists can now also uncover more disclosed chemistry in SciFinder® thanks to the backfile addition of Markush structure-containing patents from 1987 to the present.

PROGRAM HIGHLIGHTS

Enhancements to SciFinder® Improve Researchers' Workflow, Convenience, and Productivity

Major updates to the web version of SciFinder® during 2012 provided scientists with new capabilities to further their research.

- New commercial sourcing features enable researchers to quickly link to, analyze and sort chemical sources by pricing and availability.
- CAS expanded its collection of synthetic chemistry and reactions information in SciFinder® with the addition of experimental procedures from Japanese and German patents (2008-present) as well as from Taylor & Francis journals (1998-present).
- SciFinder® users can now search substances by individual experimental or predicted property, and chemists can target results more efficiently by locating compounds with specific property characteristics.
- Substance searchers now benefit from the convenience of inputting a CAS Registry Number to the structure editor in SciFinder®. Instead of relying solely on their drawing ability, users can rely on the most widely recognized substance identifier to accurately produce a model for structure-based searching.
- From multiple points within SciFinder®, users can quickly view details related to a select substance or reference using *Quick View*. This view makes scanning large answer sets easier.
- A new default role (reactant) assigned to the substance or fragment to the left of the reaction arrow improves the precision of reaction searches (the former reactant/reagent role is still an option).
- Researchers can quickly evaluate synthesis options and preferred pathways by grouping reaction answers by transformation type.
- New SciPlanner™ import and export options let researchers share synthesis plans with other SciFinder® users.
- The "Remember me" feature at login allows users to remain signed in to SciFinder® for more convenient access.

A new tagline was established for SciFinder®, the choice for chemistry research™. This reflects the fact that customers rely on SciFinder® for their chemistry research and builds on the value of chemistry as the central science. An ad campaign using this tagline was developed to position SciFinder® as the most important tool for chemistry research, with access to the most comprehensive and trustworthy chemistry-related content from CAS.

PROGRAM HIGHLIGHTS

Organizations around the globe rely on SciFinder® for accurate, timely chemistry and related information. In 2012, the National Institutes of Health (NIH) Library collaborated with CAS to provide enterprise-wide access to SciFinder® so scientists across NIH can now have on-demand access to the most complete and authoritative chemistry content in the world. In addition, academic institutions around the world continued converting to the SciFinder® Unlimited Access Plan, including the Council of Australian University Librarians (CAUL), which comprises 39 academic institutions in Australia, including the University of Melbourne, Australian National University and the University of Sydney

ACS Publications and CAS Jointly Introduce *Reference QuickView*

Reference QuickView is a dynamic new feature powered by SciFinder® that enables readers of web content to view directly the text of abstracts linked to bibliographic citations within an ACS Publications journal article or book chapter. Readers viewing the full-text HTML version of an ACS article can scan abstracts from the broader literature, across millions of citations drawn from a broad array of scientific disciplines covered by CAS. Navigational features facilitate quick review of an article's references and corresponding abstracts. Links to the *Reference QuickView* display are placed conveniently in-line within footnotes found in the article text.

Outstanding Ph.D. Students Representing 12 Countries Participate in the SciFinder® Future Leaders in Chemistry Program

CAS selected 15 Ph.D. students in the chemical sciences for the 2012 SciFinder® Future Leaders in Chemistry program. Each of these students demonstrated academic excellence, a commitment to research and an appreciation of chemical information, as evidenced through their exceptional essays and impressive letters of recommendation, distinguishing them among the hundreds of students who applied. Since 2010, the SciFinder® Future Leaders in Chemistry program, formerly the SciFinder® Academic Exchange Program, has served as an intensive mini-university where graduate students from around the world exchange ideas and experiences in chemistry and informatics. Participants in the program have the unique opportunity to share their insights on chemical information and learn from their peers.

CAS and its STN® Partner, FIZ Karlsruhe, are Revolutionizing Patent Searching with a New STN®, The Choice of Patent Experts

In December, CAS and FIZ-Karlsruhe announced that Version One of the new STN® platform was made available in beta for fixed fee customers. This was the first major milestone in a multi-year initiative to create the next generation of STN®--The Choice of Patent Experts™

The focus of this first version was on developing the core search and retrieval system for the new STN®. This release combines the complete CAS REGISTRY℠ and Chemical Abstracts content along with Thomson Reuters' Derwent World Patents Index® and powerful new search features to support preliminary searches in these key areas

- Chemistry and general technology research
- Intellectual property, such as basic novelty and prior art
- Due diligence

PROGRAM HIGHLIGHTS

- First pass freedom to operate

A new approach for STN® is to allow organization of work in projects for easy management of search queries and results. New technologies are designed to process broad and complex searches with industry-leading performance. A new ad campaign was also launched to reinforce STN®'s role as the professional search tool. The theme of the campaign is It's hard to get professional results with amateur tools. The STN® marketing campaign is targeted to professional searchers and appears in print and digital media in North America, Europe, Asia, and China.

PROGRAM HIGHLIGHTS

Career Services

The Division of Membership & Scientific Advancement created a ground-breaking new learning system for industry professionals called SciMind™. The system contains the world's first "Labinar," a real lab exercise in a virtual environment. Focused initially on separations science and toxicology, the new product has drawn very positive feedback from instructors and learners to date In addition, the overall Professional Education website was redesigned in 2012

To enhance chemistry-related training, innovation, and job creation, ACS developed and launched a new Entrepreneurship Initiative (EI) in 2012, the outgrowth of a 2011 Presidential Task Force. The program received the highest award given by the American Society for Association Executives for programs that make a difference in the world. The EI's two components—an intensive training program for budding entrepreneurs and a resource center for established entrepreneurs—were both test marketed and fully operational in 2012.

ACS offered a record number of Leadership Development System (LDS) courses in 2012, which attracted nearly 900 participants. The LDS provides online and in-person workshops that assist volunteers in their ACS activities as well as in their workplace. In addition, strategic planning retreats were held for several ACS committees, divisions, and local sections through a new initiative that makes this available to various ACS units

An Online Jobs Club program was established to help displaced workers especially the long-term unemployed - gain tools, leads, and insights from colleagues on job search and employment issues. The club meets weekly through web-based communications to discuss common challenges and facilitate training and networking.

PROGRAM HIGHLIGHTS

Promoting Education

Teaching and learning chemistry in the context of our world is a hallmark of the resources, services and products produced by ACS. Students and educators know that the ACS is synonymous with quality. ACS continues to be a leader in science education - to inspire students to seek knowledge and careers in science and prepare them for the realities of the global marketplace.

In 2012, we reached out to thousands of eager, young elementary and secondary school students in new and innovative ways. We provided a new generation of undergraduate and graduate students with opportunities to learn skills they will need to compete and succeed as they move forward with their careers

The ACS hosted the 44th International Chemistry Olympiad (IChO) in Washington, D.C., from July 21-30. The competition engaged 283 students from 72 countries in practical and theoretical examinations at the University of Maryland. Numerous activities were offered to nearly 600 participants during the ten-day event. The Dow Chemical Company was the sole financial sponsor ($2.5 million) of the 44th IChO, along with generous donations of facilities and personnel by the University of Maryland at College Park. The U.S. team won one gold medal and three silver medals. Christopher Hillenbrand earned a gold medal, placing 16th in the overall competition, and Sidharth Chand, James Deng, and Jason Ge won silver medals.

ACS celebrated the 75th anniversary of welcoming undergraduate students into the Society. Since the ACS bylaws were amended in 1937, the number of undergraduate students and chapters has grown to over 18,000 members and 1,040 chapters. The celebration of the 75th anniversary of welcoming undergraduates into ACS - combined with the establishment of Reactions: The ACS Undergraduate Blog and implementation of an integrated social media strategy - resulted in the establishment and reactivation of 53 chapters, including ten on two-year college campuses.

International Year of Chemistry Challenge Kits, created through a grant from the National Science Foundation and the National Institutes of Health, were designed to take students on an imaginary trip around the world to meet scientists, learn about chemical reactions, and get a sense of the wide variety of ways that scientists use chemistry to solve world problems. Over 10,000 kits were distributed to upper elementary and middle school classrooms across the United States. Survey results from teachers who received kits indicated that over 95 percent found the lessons in the kit helped students realize that chemistry is used to solve real-world problems.

The ACS High School Chemistry Club Program, established in 2005 with 15 clubs, now has more than 520 clubs across the United States and Puerto Rico. The number of clubs participating in this exciting, engaging activity grew by 12 percent during 2012. Additionally, in 2012 the program published a highly regarded and well-received cookbook, populated with recipes and activities submitted by ChemClub participants.

PROGRAM HIGHLIGHTS

ACS participated in the USA Science and Engineering Festival, which culminated in a three-day finale Expo at the Washington, D.C., Convention Center on April 27-29. In the lead-up events, ACS provided a "Nifty Fifty" speaker for a local high school, the ACS Mole marched in the Cherry Blossom Parade, and a special STEM Congressional briefing was held that included Bill Nye as a panelist. Based on estimated numbers from the Convention Center, nearly 200,000 people participated over the three days, the second largest event the Convention Center has ever seen. At the ACS booths, over 6,000 children and adults either did a hands-on activity, took a picture with the Mole, learned about green chemistry, or viewed a video podcast.

The Society of Chemical Industry (SCI) America International Group, the American Chemical Society, and the American Institute of Chemical Engineers continue to collaborate in offering the SCI Scholars summer industrial internship program, which introduces chemistry and chemical engineering undergraduate students to careers in the chemical industry. The program hosted 31 internships in summer 2012 and will host 38 internships in 2013 Every SCI scholar selects a high school chemistry teacher to receive recognition and a $1000 award.

During 2012, the ACS Office of Professional Training (OPT) and IT staff developed a system that allows ACS-approved programs to submit their periodic reports online and provides an interface for the Committee on Professional Training (CPT) to complete the reviews of these programs online The successful pilot test of CPT Periodic Review System (CPRS) was completed during the summer, culminating with CPT's review of 25 reports using this paperless system. Beginning in 2013, all periodic reports will be submitted and reviewed using CPRS. The implementation of this system eliminates the need for chemistry programs to make photocopies of their reports and course materials and mail them to ACS. CPRS also eliminates the need to ship over 500 pounds of printed materials to three CPT meetings per year.

The ACS Science Coaches program was renewed for three additional years in August 2012. This program encourages chemists to volunteer to assist a teacher on an on-going basis throughout the school year. Science Coaches (chemists) make a minimum of six one-hour visits and assist on an as needed basis via e-mail and phone. For the 2012-2013 school year, 102 chemists signed on to assist a teacher at the elementary (19 partnerships), middle (28 partnerships), or high school (55 partnerships) level in 30 states plus Puerto Rico

One of our most successful efforts, the ACS Scholars Program, continues to help underrepresented minority students achieve their dreams of degrees and careers in a broad range of chemical sciences. In all, nearly 2,450 African American, Hispanic/Latino, and Native American students have participated in the program since 1995. Of those, nearly 1,330 have earned bachelor's degrees in a chemical science and 40 percent have entered the chemical science workforce. More than 147 of these ACS Scholars have gone on to earn doctoral degrees in chemistry, chemical engineering, or a related discipline

Another premier program, Project SEED, offers high school students the rare opportunity to work in academic, government, or industrial research laboratories for an 8 to 10-week term. In 2012, the program placed 431 economically disadvantaged high school students in more than 130 research laboratories in 33 states, the District of Columbia, and Puerto Rico, under the supervision of 434 volunteer scientific mentors and coordinators

PROGRAM HIGHLIGHTS

The Project SEED Scholarship Subcommittee awarded 29 Project SEED College Scholarships, totaling $145,000, to former SEED students for their freshman year. In addition, three new renewable Ciba Specialty Chemicals scholarships ($5,000/year) were awarded for the 2012 – 2015 academic years.

PROGRAM HIGHLIGHTS

Communicating the Value of Our Science

News about chemistry from ACS journals, C&EN, and National Meetings reached the public in record numbers. Independent monitoring data for 2012 shows that ACS-generated publicity resulted in more than 19,000 news media articles, a significant increase from 2011, resulting in potential readership or viewership of literally billions

The award-winning ACS Digital Services unit produced more than 350 videos, a 10-percent increase from 2011. This unit created popular general audience videos about the Chemistry of Snowflakes, Chemiluminescence: How Glow Sticks Work, How Sunless Tanner Works: Tan-In-A-Can Chemistry and other topics. The Chemistry of Snowflakes was viewed more than 358,000 times making it the most popular video produced by the ACS Digital Services unit in 2012. The clip received widespread coverage, most notably from The Huffington Post, Boing Boing, CNet, ABC 7 News Washington, and the Washington Post, to name a few. The Bytesize Science videos received tens of thousands of views on YouTube and Vimeo, as well as coverage on Time, Wired, Los Angeles Times, AOL News, Live Science and many other sites

A core value for ACS, diversity and inclusion, was recognized. The ACS Committee on Chemists with Disabilities (CWD) was the top winner in the employer category of the Campaign for Disability Employment's "What can YOU do?" video contest. CWD's entry, "Chemists with Disabilities. We All Can," won the top award based on originality, content, reflection of campaign themes and categories, production value, impact, and accessibility. The video was produced by the ACS Digital Services unit. It was featured on the Campaign for Disability Employment's website, YouTube, and various social networks and local, state, and national events.

ACS offers members many opportunities to volunteer or simply share chemistry resources with their communities. Under the banner of Chemistry Ambassadors, members are encouraged to be compelling advocates and spokespersons for their profession. Whether it's sharing ACS scholarship information with high school counselors, emailing ACS Back-to-School Resources to teachers, using a Kids and Chemistry kit with the Scouts, joining the local section for National Chemistry Week or Chemists Celebrate Earth Day, or talking to policymakers about science funding, there's something for everyone

In 2012, the nearly 8,000 Chemistry Ambassadors took chemistry to the streets in all of these ways. They put ACS resources into more of the hands they are intended to serve, they put a human face and voice on chemistry, and they talked less about what they do and more about why what they do matters—to everyday people, every day

In 2012, ACS and its members marked the 25th anniversary of National Chemistry Week with the theme "Nanotechnology: The Smallest Big Idea in Science." Many thousands of families and children of all ages were introduced to this exciting area of chemistry through hands-on activities, experiments, puzzles and online and printed publications

PROGRAM HIGHLIGHTS

For members interested in serving as public relations (PR) chairs for their local sections, the "Sparkle" communication workshop was offered again, bringing the total number of trained PR chairs to 61. These volunteers learned how to write news releases that will bring results, how to work effectively with the news media, and how to "speak simply" about chemistry in order to build greater community awareness of the important activities of the local section and their fellow members

The National Historic Chemical Landmark (NHCL) program enjoyed greater impact in 2012 than ever before. Record levels of web traffic overall, plus op eds, press conferences, videos, and panel discussions for the 2012 designations of DayGlo Fluorescent Pigments and Rachel Carson's *Silent Spring* reached new and influential audiences. In the month of October, the Landmark site received more than 44,000 views making it one of the most popular sites on the ACS web platform. The program expanded its reach into classrooms through newly launched high school lesson plans, based on NHCL subjects and created in cooperation with the ACS Education Division.

Through all of these efforts, ACS helped members to "Share Chemistry! and Spark a Reaction!

Financial Highlights

Despite challenging economic conditions, the American Chemical Society (ACS) ended 2012 with favorable operating results by generating a net contribution of $16.4 million. In addition, total revenues increased 3.6 percent over 2011 with record operating results from ACS's information services divisions (Chemical Abstracts Service and ACS Publications) driving the increase. The 2012 financial results represent the ninth consecutive year of positive net contribution. The Society's strong operating performance was attributable to a combination of outstanding financial performance from the information services divisions and a continued emphasis on expense management across all operating units.

Despite the positive operating results and sizable investment gains, the ACS's financial position weakened slightly from 2011. Unrestricted net assets declined from $139.5 million in 2011 to $138.8 million at December 31, 2012. The decrease is primarily attributable to two factors: non-cash accounting charges related to the Society's underfunded postretirement benefit plans (i.e., defined benefit pension plan and retiree medical plan); and settlement of the Leadscope case in September 2012.

In furtherance of its mission *"to advance the broader chemistry enterprise and its practitioners for the benefit of Earth and its people,"* ACS continues to invest heavily in its information services units. These investments are made to strengthen the Society's position as the world's most trusted and comprehensive source for chemistry-related information. In support of this goal, in 2012, ACS added 5 million new small molecules to the CAS Registry℠, indexed more than 1.4 million articles and patents, and added more than 9 million reactions to CASREACT®. SciFinder® had four major releases and the first version of the new STN®, powered by the Search Engine of Tomorrow (SPOT), was released. ACS journals continued their preeminence in citations and Impact Factors, receiving more than 2 million citations and posting a #1 ranking in either Impact Factor and/or Total Citations in 16 categories as reported in the 2011 Journal Citation Reports® released in June 2012. ACS Publications undertook the first full calendar year of publication of two new titles: *ACS Macro Letters* and *ACS Synthetic Biology*

Looking ahead, the Society intends to enthusiastically pursue the goals set out in its *Strategic Plan for 2013 and Beyond.* Whether providing information resources, advancing member careers, improving education or communicating chemistry's value, ACS remains firmly committed to providing indispensable programs, products and services. In this way, ACS will enhance the Society's value and relevance to its diverse stakeholders, including members, educators, public policy makers and other chemistry professionals

To access ACS audited financial statements and IRS Form 990 returns, visit the ACS website. Click the About Us tab, scroll down and click on the link to ACS Financial Information, or view the page here

Financial Summary

($ in Thousands)

Statement of Financial Position

	2012			2011
	ACS Programs	Petroleum Research Fund	Total	Total
ASSETS				
Cash and Cash Equivalents	$ 64,342	$ 22,259	$ 86,601	$ 48,291
Accounts and Pledges Receivable	106,091	-	106,091	81,146
[illegible]	1,953	-	1,953	2,850
Investment[illegible]	390,141	472,944	863,085	864,450
Interfund (Payable) Receivable	(13,880)	13,880		
[illegible]	20,833	27	20,860	15,184
[illegible]ings, Land, and Other Property	109,467	-	109,467	110,172
[illegible] Asset	$ 678,947	$ 509,110	$ 1,188,057	$ 1,122,093
LIABILITIES AND NET ASSETS				
LIABILITIE[illegible]				
[illegible] Expenses and Accounts Payable	$ 64,358	$ 11,470	$ 75,828	$ 75,274
[illegible]	161,449		161,449	133,729
[illegible] and Long-Term Debt	2,431		2,431	3,168
[illegible]ment Benefits and Other	218,929	3,598	222,527	243,120
Total Liabilities	447,167	15,068	462,235	455,291
NET ASSET[illegible]				
[illegible]	138,796	-	138,796	139,470
Temporarily Restricted	26,001	421,542	447,543	412,563
[illegible]ently Restricted	66,983	72,500	139,483	134,769
[illegible] Net Assets	231,780	494,042	725,822	686,802
[illegible]es and Net Assets	$ 678,947	$ 509,110	$ 1,188,057	$ 1,122,093

Statement of Activities

	2012			2011
	ACS Programs	Petroleum Research Fund	Total	Total
[illegible]				
[illegible]				
[illegible]ed from Restriction	8,438	20,483	28,921	26,485
[illegible]	12,277	-	12,277	12,304
Member Insurance Premiums, Refunds, and Fees	11,464	-	11,464	11,299
[illegible] Fees and Booth Sale	11,145	-	11,145	10,061
[illegible]	9,217	-	9,217	8,945
[illegible]ent Income	8,613	53	8,666	10,008	
[illegible]	7,155		7,155	8,846
[illegible]	7,106		7,106	8,028
[illegible]n Revenue	497,259	20,536	517,795	499,900
EXPENSES				
[illegible]rmation Services	368,901	-	368,901	354,249
Member Programs and Services	46,391	-	46,391	42,152
[illegible]surance Programs	15,210	-	15,210	14,781
[illegible]s and Awards	3,821	18,852	22,673	22,205
[illegible]	37,913	1,684	39,597	38,157
[illegible]	8,645	-	8,645	8,157
[illegible]	480,881	20,536	501,417	479,701
[illegible]	16,378	-	16,378	20,099
[illegible]	31,568	-	31,568	(535)
[illegible]nge in Pension Funding Status and Other	(48,620)		(48,620)	(50,016)
[illegible]ted Net Assets	(674)		(674)	(30,452)
[illegible]	3,936	-	3,936	6,089
[illegible]estment Income and Net Investment Gains (Losses)	9,374	55,324	64,698	(6,556)
[illegible]ets Released From Restriction	(8,438)	(20,483)	(28,921)	(26,485)
[illegible]	131	(150)	(19)	880
[illegible] Restricted Net Assets	5,003	34,691	39,694	(26,072)
Change in Total Net Assets	4,329	34,691	39,020	(56,524)
Beginning Total Net Assets	227,451	459,351	686,802	743,326
[illegible] Total Net Assets	$ 231,780	$ 494,042	$ 725,822	$ 686,802

Allocation of Dues & Member Status

The American Chemical Society is a 501(c)3 non-profit organization with a multidisciplinary membership of more than 163,000 chemists and chemical engineers.

2012 Allocation of Dues

($ in Thousands)		
C&EN	$ 6,514	42%
Support for Society Programs	1,325	9%
Member Services	4,438	28%
Local Section Allotments	1,823	12%
Division Allotments	1,399	9%
Total	$ 15,499	100%

Excluding the impact of Local Section and Division Allotments, 2012 dues revenue totaled $12,277,000 as reported on the Financial Summary.

Membership Status*

Emeritus Member	13,714
Regular Member	102,620
Regular Student Member	20,132
Undergraduate Student Member	18,294
Retired Member	5,561
Society Affiliate	993
[illegible]	[illegible]
Total	163,322

*Source: ACS Demographics

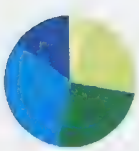
2012 Comprehensive Salary and Employment Survey

[illegible] (regular members <70 years of age)

Highest Degree
17% B[illegible]
17% M.S.
66% Ph.D.
100% Total

Employment Type
[illegible]% Industry
[illegible]% Academic
7% Government
2% Self-employed
100% Total

Employment Status
[illegible]% Employed full-time
[illegible] Employed part [illegible]
[illegible] Postdoc
[illegible]% Not Working Seeking
[illegible]% Not Working, Not Seeking
[illegible]
Total [illegible]



Age
[illegible]

Sex
[illegible]
[illegible]
Total [illegible]

2012 Division Year-End Membership Summary

Name	Total
Agricultural & Food Chemistry Division	3,095
Agrochemicals Division	1,177
Analytical Chemistry Division	8,229
Biochemical Technology Division	3,168
Biological Chemistry Division	7,38[illegible]
Business Development & Management Division	961
Carbohydrate Chemistry Division	785
Catalysis Science and Technology Division	1,272
Cellulose & Renewable Materials Division	1,675
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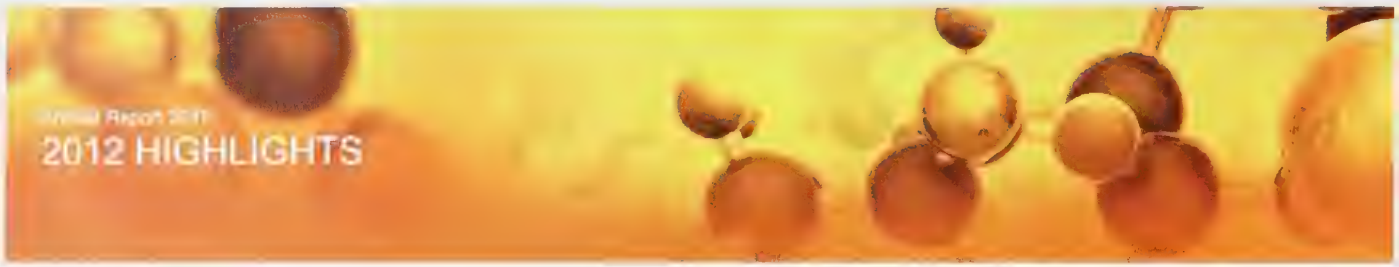

ACS by the Numbers

The American Chemical Society achieved some significant milestones in 2012 and we are pleased to present a summary of some of the highlights. These selected accomplishments were achieved through a robust partnership of American Chemical Society members, governance and staff, often in partnership with other organizations. Go to http://www.acs.org/acshighlights to download the complete PDF.

6,219
ACS membership in 1912

163,000 +
ACS membership as of Dec. 31, 2012.

30,000 +
Combined attendance at 2012 ACS National Meetings in San Diego and Philadelphia

19,000 +
Number of papers submitted for those ACS National Meetings.

1,046
Presentations posted online after 2012 ACS National Meetings

37,200 +
Unique visitors who viewed those presentations online.

96
Number of scientists inducted into the 2012 class of ACS Fellows during the Philadelphia National Meeting.

2,800 +
Job seekers who participated in ACS Career Fairs at National Meetings and in the ACS Virtual Career Fair online.

100
Number of employers recruiting applicants.

900
Job opportunities available

178
Total number of ACS Petroleum Research Fund grants awarded in 2012

2
Number of 2012 Nobel Laureates in Chemistry – Robert J. Lefkowitz and Brian K. Kobilka.

7,800 +
Number of ACS Chemistry Ambassadors by year-end.

19,000 +
News media stories generated by ACS press releases and social media activity in 2012.

12 billion
Combined unique visits to websites and circulation of newspapers and magazines that ran stories on ACS journal and National Meeting research in 2012.

1.5 million
Downloads/views of Office of Public Affairs videos and podcasts in 2012.

431
Number of economically disadvantaged high school students who participated in Project SEED in 2012.

19
Years since ACS inaugurated the ACS Scholars program.

2,400 +
Number of students from underrepresented backgrounds who have participated in ACS Scholars since 1995.

1,323
ACS Scholars who have earned at least a bachelor's degree in a chemical science.

1.4 million
Indexed records added to CAplus℠ in 2012.

74
Countries where SciFinder® is used.

38,000 +
Number of peer-reviewed articles published in ACS Journals in 2012.

80 million +
Journal articles downloaded by researchers from the ACS Web Editions Platform in 2012.

16
Number of subject categories in which ACS Journals rank #1 in total citations and/or ISI Impact Factor™ as reported in the 2011 Journal Citation Reports from Thomson Reuters.

520
ACS-chartered high school chemistry clubs in 2012.

12
Percentage increase in the number of ACS-chartered chemistry clubs from 2010 to 2012.

4
Medals won – one gold, three silver – by the American team at the 44th International Chemistry Olympiad (IChO) in Washington, D.C. in July 2012. This was the first time that the U.S. and ACS hosted the event in 20 years.

2012 HIGHLIGHTS

$16.2 million +
Total funding awarded to 2012 ACS PRF grants.

26
Number of ACS PRF grantees who had one or more research grants and who have received the Nobel Prize

$473 million +
Value of the ACS PRF Endowment at year-end

8
Number of Herman Frasch Foundation for Chemical Research grants awarded in 2012 (awarded every five years).

3
Number of Teva Pharmaceuticals Scholars grants awarded in 2012 (awarded every three years)

$900,000
Total funding awarded to 2012 Teva Pharmaceuticals Scholars grants

1
Number of Irving S. Sigal Postdoctoral Fellowships awarded in 2012 (awarded every other year)

$100,000
Total funding awarded to 2012 Irving S. Sigal Postdoctoral Fellowship

147
Number of ACS Scholars who have earned doctorate degrees.

260,000
Members of the ACS Network, the premier online forum for chemists and other scientists to communicate and build professional connections.

14,000 +
ACS members who are in the Act4Chemistry network.

1,651
Messages sent by ACS members to Congress and other public policymakers in support of science issues through the Legislative Action Network

900
Number of people who enrolled in ACS Leadership Development courses in 2012

70 million
Chemical substances in the CAS REGISTRY℠ at the end of 2012.

64 million
Sequences in the CAS REGISTRY℠ at the end of 2012

47 million
CAS's collection of searchable single and multi-step reactions from 1840 to the present

1,611
The number of schools converting to SciFinder® Academic Unlimited Access, providing students and faculty from all departments at these institutions with access to SciFinder® and the CAS database.

50,000 +
Registrants who participated in ACS Webinars in 2012.

15
Science & the Congress briefings conducted in 2012 on Capitol Hill and elsewhere to educate lawmakers and their staff about science issues.

1,500
The number of participants at Science & the Congress briefings

75
Year anniversary of welcoming undergraduate students into ACS more than 18,000 students and 1,040 chapters

15,700
Bachelor's degrees earned by students in ACS-approved chemistry programs in 2009-2010, an all-time high.

25
States with National Historic Chemical Landmarks

2012
The year when the most recent National Historic Chemical Landmarks were designated - DayGlo Flourescent Pigments and Legacy of Rachel Carson's *Silent Spring*

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Gilbert Stork: In His Own Words and in the Musings of His Friends**

*Jeffrey I. Seeman**

"The absent-minded but organized Gilbert Stork… "
Koji Nakanishi[2]

"Stork is as nice as they come. Few people of his brilliance are so completely free from any conceit."
Louis F. Fieser[3]

Born in Brussels, Belgium on December 31, 1921 and for 59 years a professor at Columbia University, Gilbert Stork is one of organic chemistry's most beloved and simultaneously eminent artists.[1-3] His creativity extends far beyond his chemical successes. He has a special way, an aura that is and has been unique in our community of scholars and—yes—unique among a group of already rather eccentric practitioners.

Many celebrations highlighted 2011, the International Year of Chemistry. Some of these honored Gilbert's reaching the wonderful age of 90. See, for example, Gilbert's own recollections[4] published in an issue of Tetrahedron *honoring his 90th birthday and in a broad review of his chemistry published a decade ago.[5] The reader is urged to read Gilbert's own articles.*

Why so much attention on Gilbert Stork? It is because Gilbert has been one of the leaders of synthetic organic chemistry for decades. He has propelled the discipline of can be found in Gilbert's two recent reviews.[4,5] He was not just a synthesizer of numerous important natural products; he was a major developer of methodology that sustains the experimental work of the bench chemist! The Stork enamine reaction and his radical cyclizations are just two examples of his major methodological contributions.

I am both a fan and a friend of Gilbert. I have long been involved in studying his research and life, first as a student in need of synthetic methodologies for my graduate research[11] and later, much later, as a historian of chemistry (Figure 1).[12]

chemistry for decades. He has propelled the discipline of organic chemistry throughout the broader community of chemists by virtue of his research and scholarship, his legacy of graduate students and postdoctoral fellows, and his demeanor. Stork is not only one of the most esteemed and well-liked of chemists; he has mentored a cadre of some of the discipline's most successful organic chemists whose loyalty to and even reverence for this fine gentleman is extraordinary. As stated by one of his former students, "Gilbert is a global treasure! He has directly and indirectly inspired a legion of scientists who have gone on to make profound contributions to science, health care, medicine, materials, the economy, education and our quality of life."

Arguably, his synthesis of cincholoipon (1946)[6] was the first planned stereocontrolled synthesis, and cantharidin (1951[7]) was probably the first natural product synthesized with high stereoselectivity. These early successes were bookended by the first stereoselective synthesis of quinine (2001)[8] and the syntheses of reserpine (2005)[9] and morphine, codeine, and thebaine (2009.)[10] Highlights of the fifty years in between

[*] Dr. J. I. Seeman
Department of Chemistry, University of Richmond
Richmond, VA 23173 (USA)
E-mail: jseeman@richmond.edu

[**] Dedicated to the memory of an astute historian of chemistry and one of the interviewers of Gilbert Stork's 1991 oral history quoted herein,[1] James J. Bohning, who passed away at the age of 77 on September 2, 2011.

Figure 1. Seeman and Stork examining the R. B. Woodward collection at the Harvard University Archives, August 2009.

(I might still be in graduate school had it not been for the Stork enamine reaction.[13,14]) Thus, I wanted to make some special contribution toward the celebration of Gilbert's life. What better way, I realized, then assembling and sharing Gilbert's own words and deeds. So, what follows is mostly a collection of "Storkisms". They—and he—are often funny and always insightful. These snapshots contain lessons in life. Enjoy, thank you Gilbert, and Happy Birthday!

Except as noted below, all the quotes are by Gilbert Stork himself.

Excitement of Science versus Making a Contribution

"Some things actually gave us a great thrill, which are not particularly important. Some were important, but not that much. For instance, the prostaglandin synthesis from glucose is a beautiful piece of work.[15] It was not all that important, but in a way it sort of was one of the landmarks of establishing that you can use the chiral sugar pool to make a complex chiral compound which is not obviously embedded within the glucose structure. There were others like this. They were just simply a thrill. Like solving a mathematical puzzle. You get a thrill, but it doesn't mean that you're necessarily making an

important mathematical contribution. But that one was a thrill."[14]

Painful Lessons of Life

"I went to what the French called a lycée which is sort of a preparatory school for college ... What the French system was based on at that time was essentially memory. Now, this is not a very reasonable system but they teach you resistance to pain because it was really extremely painful to learn the amount of material you were supposed to learn and also, a certain skill at getting around the painfulness of the system for survival reasons. That probably has been very successful in fact. May have been the most important thing that I learned there."[16]

Stork's Childhood Naiveté

"I was good at French literature, and I was even selected to represent my lycée in a nationwide high school competition in French writing. I was not terribly self-confident, however, and did not think that I could get a job in what I liked to do. So I was actually considering getting some safe government position. Something in French Indochina seemed especially attractive to me. Things took a different turn. In 1939, my father became very concerned about what was going to happen in Europe and decided to emigrate [to the United States]."[17]

On Taking Tests

"[As an entering undergraduate student at the University of Florida in Gainesville,] I was doing very well on the chemistry exams, which were a multiple choice thing, where I could test my hypothesis that the longest answer is statistically much more likely to be the correct one than the shortest one simply because it's harder to phrase correct things than incorrect things."[1]

My Undergraduate Summer Job

"I had a job as a waiter in a private establishment just outside of [the University of Florida]. I remember when somebody in a crowded room full of school teachers ordered what was probably beer of some kind, and I thought they wanted watermelon. [laughter] I made my way with this big watermelon through this crowded room, and it was not the right thing. Eventually I got fired from that job."[1]

On the Way to Graduate School: Slightly Older Naiveté

"I decided to go to the University of Illinois [for graduate school] because Roger Adams was there. Hard as it is to believe, I didn't realize that you had to apply for admission. The idea that they wouldn't immediately give me a lab didn't occur to me. I went to Illinois and demanded to talk to Roger Adams. A secretary told me that he was busy and could not

Nonconformist and Novel Problem-Solver

As told by Frances Hoffman[*]: "[Gilbert's] creative solutions to difficult problems also surfaced early. Gilbert's favorite occupation during his summers at Ostend was going for pony rides on the beach. Unfortunately, he often had to wait fifteen to twenty minutes because of the long lines. One weekend, Gilbert was left in the care of his favorite Uncle Alex. Gilbert explained his problem to his uncle and proposed that the way to solve it was to have a pony of his own. His uncle found this to be a good solution, but when the pony appeared on the grounds of his home, considerable rumblings from the neighbors mounted to a volcanic eruption when Gilbert's parents returned."[18]

Figure 2. Stork, ca. 1940. Photograph courtesy G. Stork.

On Overcoming the Difficulties of Learning

"The truth is, when you don't know a language, it's easy for people to say, 'Well, you can learn it.' It's obviously true. At one extreme, you say, 'If one billion little Chinese can learn Chinese, it mustn't be that hard.' That's one point of view."[1]

[*] Hoffmann is a friend and colleague of Stork's for decades, former Director of Chemical Laboratories at Columbia University.

see me. I thought this was outrageous and took the train to Wisconsin… "[17]

Madison, Wisconsin

"I was quite happy in Madison [for graduate school] even though, when it was 20°F, you get the acute experience of having your scalp shiver—a strange thing—if you don't wear the proper clothing. [laughter]"[1]

Figure 3. Stork as a graduate student, Madison, WI, ca. 1944. Photo courtesy G. Stork.

Giving Authorship to One's Professor

"I also did not know you were supposed to put your professor's name on your papers. It shows how tolerant [Samuel M.] McElvain[19] [Stork's PhD advisor at Wisconsin] was. Most people would have been very upset. He flipped slightly, but not too much, when he picked up a *JACS* [in 1945] and saw there was this communication, my first paper[20] [that he knew nothing about]… McElvain said, 'You cut this fooling around out.' and moved me next to his office. [laughter] Then I started working more seriously on [our joint projects]… [The end of that paper said, 'The work in this Communication had to be discontinued almost two years

Figure 4. Stork with Professor and Mrs. McElvain, Paris, 1954. Photo courtesy W. S. Johnson.

THE SYNTHESIS OF 3,4-DIAMINOCARBETHOXY-FURAN

The work reported in this Communication had to be discontinued almost two years ago.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF WISCONSIN
MADISON, WISCONSIN GILBERT STORK

RECEIVED APRIL 12, 1945

Figure 5. The title and last sentence of Stork's first paper.[24] At the time, Stork was a graduate student at the University of Wisconsin. His Ph.D. advisor was S. M. McElvain. Stork and McElvain published four papers together in 1946 and one in 1947.

abstract this thing, they must put down the corrected melting point in the abstract. *My* abstract is the only abstract, so far as I know, which has a note that says, 'Private communication from the author'. [laughter] [see Figure 6] It does say that, actually; it's a private communication. *Chem. Abstracts* no longer does it. There are no more private communications to *Chem. Abstracts*."[b]

Carl Djerassi, My First "Graduate Student"

"Carl Djerassi and I were overlapping graduate students. I guess he was a year behind me when he started; maybe, maybe not. We would have lunch together every day at the lab. Eventually I convinced him he was wasting his time doing a Ph.D. with [Professor] Al [Alfred L. Wilds], and that he should obviously work on *my* problem. He agreed that that was certainly reasonable. So he started doing that... Djerassi's problem was going to be to synthesize morphine. This lasted two weeks, until Wilds found out about it, and then we were both threatened with instantaneous expulsion. [laughter] So that stopped us... Even if it was for only two weeks, [Djerassi] was sort of my graduate student [laughter]... At the time, he was in the hospital; when I

ago.' See Figure 5.] Well, that was McElvain saying, 'You cut that out.'"[1]

"Private Communication to Chemical Abstracts"

"[In my first paper, the] melting point [of the final product] was a misprint; I think the two last digits are inverted. I forget what it says; does it say 113 degrees or 131 degrees or whatever for the melting point? It's the melting point of the diazide. [reading] 'melting point 166–167 degrees'. Yes, I think it's 176 degrees. I forget exactly what it is, but it's one of those digits that's wrong. I was shocked. I was shaken, because my melting point's wrong, and now it's published in the literature. So I wrote to *Chemical Abstracts* and said that when they

Synthesis of 3,4-diaminocarbethoxyfuran. Gilbert Stork. *J. Am. Chem. Soc.* 67, 884(1945).—3,4-Furandicarboxylic acid and PCl_5 in C_6H_6 give 85% of the *diacid chloride*, m. 76°; NH_4OH gives the *diamide*, m. 262° (decompn.); NaN_3 in cold aq. Me_2CO gives a nearly quant. yield of the diazide, explodes on rubbing when dry; heating gives *3,4-diaminocarbethoxyfuran*, m. 106–7° (given in the original, through a typographical error, as 166–7°.—Communication from the author). C. J. West

Figure 6. A rare if not unique example of an author correcting an error in his publication by a communication to *Chemical Abstracts*. *Chemical Abstracts* 1945, *39*, 2991(5).

'conned' him, he was weakened. [laughter] That's true. He was in the hospital. I don't remember what was wrong with him, but it was nothing terribly serious. He was in the hospital, so I went to visit him, and used the opportunity to convince him he should work for me."[1]

Figure 7. Carl Djerassi, learning how to drive a tractor in Tarkio, Missouri, 1941. Photo courtesy C. Djerassi

Blowing Up the Chemistry Department at Madison with my Steak

"There was this one really idiotic time. I remember I was really scared that I was going to blow up the entire Chemistry Department at the University of Wisconsin. I had a steak on the window ledge of my office. It was the winter, and I used the window ledge as a refrigerator. You obviously were not supposed to be cooking steaks in the lab, but I had a small lab where I was usually alone in there, and so I had a steak. But I also was not aware that biodegradable material is biodegradable, and this steak was clearly degraded on the window ledge. And the question was, what to do with it? And I decided to toss the steak in a hot acid bath which we used to clean up glassware. So, it's fuming nitric and sulfuric acid. It's really *aqua regia* in that bath, in that heavy lead dish, and the steak.

"And then, as I just had thrown it in there, and it fumed furiously and red fumes of who knows what, nitrous oxide of various kinds were being produced there. I became frantically concerned because fat is glycerides. So, I'm hydrolyzing the fat to glycerin. You make nitroglycerine by taking glycerin and nitric acid and sulfuric acid, and obviously, I'm going to produce a pile of nitroglycerine and blow up the entire building with my steak.

"Now, what is an interesting point there, why didn't it? And of course, the reason is kinetics. That is, the kinetics of oxidation of the glycerol at that temperature is much, much, much. I mean, infinitely faster than the cold temperature nitration of glycerin. And so the place was safe."[8]

Chemistry on One's Birthday

"I used to make diethylaluminum cyanide myself, and I usually liked to do it on December 31st because it's my birthday, and it was a sort of black humor that, if I died on that day, it would be easy to tell how old I was. And so I would do it. In fact, I sometimes did it in a tuxedo, which was really some ridiculous operation."[8]

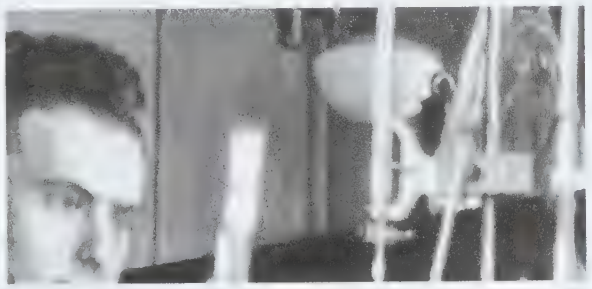


Figure 8. Stork as a graduate student. Notice the lack of safety glasses, apparently not a concern to a graduate student who

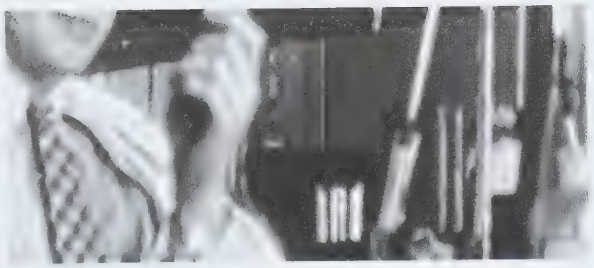
whether you try to find a way of preventing paper bags from falling apart when they're wet. If you can make it into a problem, it becomes interesting."[11]

The True Meaning of Success in Organic Synthesis

"The toughest question to ask in synthetic organic chemistry after the work is done is: what have you learned? And you can have extraordinarily complex things. They look complex as hell. Maybe they have 80 asymmetric centers and maybe the answer is, [you've learned] nothing. I mean, you could have learned that humans are capable of enormous focused efforts and are capable of sticking with a problem which is extraordinarily complicated. On the other hand, if somebody makes polyethylene, as somebody obviously did, then you learn a lot, even though it will not thrill most synthetic chemists because this would be comparable to building a highway for an architect. I mean, it's important, but it's fairly dull compared to [building] the Guggenheim Museum, for instance..."[10]

"So something could be not terribly glamorous but extremely important, or vice versa. I think that B_{12} was vice versa. It's enormously complicated."[11]

Figure 9. Stork at Colombia University, 1997. Photo courtesy J. I. Seeman.



throws steaks into hot acid baths and wears tuxedos when working with toxic substances. Photo courtesy G. Stork.

Gilbert's Experimental Prowess

As told by Derek Barton[*]: "When I arrived at Harvard in 1949, Gilbert was working with his own hands on the synthesis of morphine. This was an ill-advised activity. Gilbert had, and still has, a brilliant mind. However, its extension to the control of his hands was somewhat lacking, so he did not accomplish very much until his first graduate students arrived... "[2]

Why Synthesis?

"The origin [of my passion for synthesis] is the structure, and the structure needs methods. Not the method first and then the structure. Structure, problem, method, back to structure. It's kind of a sculpture. It's a challenge. Everybody gets interested; as soon as you can make a problem of something, it becomes interesting. Whether you're a chess player, or

[*] During 1949–1950, Barton was Visiting Lecturer at Harvard, taking R. B. Woodward's place during the latter's sabbatical year. At that time, Stork was an Assistant Professor at Harvard.

The Core Essence of Organic Synthesis

"I finally think I understand why people play golf. Why are they so fascinated by golf? If you really want to put that ball in that hole, there are many other things to do that. And the reason, of course, is that no one interferes with you. You're 100% responsible for what you do, right and wrong. And so it's nice. If you play team sports, well, maybe somebody didn't pass the ball to you at the right time...

"You can see why [individually focused activities] would make you passionately involved.... in synthesis because you can devise any scheme that you want... it's also easy to do, in the sense that if an experiment doesn't work, you just throw it out... it doesn't take a year to do an experiment. In fact, that's the beauty of synthetic organic chemistry still. You can think on the weekend a great idea and, if you're really motivated, you go over the weekend and try it, and you can know at the end of that day that thing is no good... And so, it is both easy and very frustrating. So is golf. I mean, it's easy to hit that ball with a stick... "[16]

To Explore, Not To Sleep

"Most of my students have been graduate students. And these are students who are pretty well committed... You don't really have to instill enthusiasm for chemistry that much, it's already there. You have the problem of not killing it all together. They may not have the courage to try things. They

may have too much reliance on what is supposed to be known, rather than 'this is true or maybe not'. If it's neither explosive nor toxic, you should try it no matter what people tell you about it. It's one or two steps, why not?"[36]

Figure 10. Stork with Alicia Regueiro-Ren at Columbia, 1997. Photo courtesy J. I. Seeman.

Figure 12. The Syntex group, Mexico City, 1951. Stork (consultant to Syntex) is at the far left, standing. George Rosencranz and Carl Djerassi are seated, third and fourth from the left, respectively. The photo was taken at a press conference announcing the first synthesis of cortisone from a plant source. Rosencranz is holding what is, for photographic license, a test tube presumed to be filled with cortisone. But as only milligrams of cortisone had been synthesized, the test tube actually contained sodium chloride.[22,23] Photo courtesy C. Djerassi.

On Being Mozart's Teacher

"The truth is, I've thought about it a lot. And one of the nice things about being a professor is that you get credit, you get some credit, for the accomplishments of all these various Syntex was George Rosenkranz. What Tishler said was ridiculous. He said, 'Syntex is a nothing operation. When the president of the United States wants some advice, who

students that have done very well. But of course there's no question that they wouldn't have done that well if, by the age of 23, 24, 25, they were not already potentially great. I mean, it is not likely that Mozarts can be trained. I mean, so one can take credit, 'I was Mozart's teacher.' That's nice, and I've not spent any large amount of time denying that I deserve some credit. But on the other hand, it's highly dubious. I mean these people are already very good... but that doesn't mean that you can't kill what's in there. So the main goal of your teaching Ph.D. students is to nurture what's there."[10]

Figure 11. Max Tishler.

On Giving Advice to Carl Djerassi

"In the late 1940s, Carl Djerassi was working at Ciba. When Djerassi decided to join Syntex in 1949, I [Stork] told him he was 'stark raving mad'... he wanted to [seek advice from] Max Tishler, who was at that time the industry–university connection statesman [at Merck]. I'll always remember what Tishler told him. The president of Merck at that time was George Merck. The president of does he call? George Rosenkranz or George Merck?' [laughter] That was supposed to be a serious point. Djerassi had the good sense, I guess, of paying no attention whatsoever and taking off for Mexico, which took a lot of guts because he didn't speak Spanish, among other things."[11]

Syntex Consultants

As told by Arthur Birch[*]: "I recall with amusement the meetings of the Syntex consultants board... The meetings sometimes resembled gladiatorial contests with loud disputation but good humor, bets being freely exchanged about predictions, notably between Gilbert Stork and Carl Djerassi. The bets were even collected later, and I recall Carl framing a $10 bill that he, somewhat unusually, won from Gilbert in a particularly hotly argued case. This attitude kept everybody on their toes with interest in what could easily have become drowsy meetings. Between bouts, Gilbert used to catch up on recent issues of journals, to the freely expressed annoyance of Carl."[24]

[*] In the early 1950s, Arthur Birch – after whom the academically and commercially invaluable Birch reduction was named – was invited by Carl Djerassi to be one of Syntex' consultants along with Gilbert Stork.

Troubles Find Stork

As told by Frances Hoffman: "How can such an intelligent man [as Gilbert] insist on buying cars which, without fail, are incapacitated at least fifty percent of the time? One of these 'treasures' was a sporty, white Simca with red leather seats. After spending a good amount of money transporting it from France, a small fortune to adapt it to New Jersey requirements and further fortunes to keep it running, the engine blew up as he was driving to Yale to present the Treat B. Johnson lectures. With the usual Storkian luck, the car was on an incline which terminated in front of a gas station. Gilbert arranged for the car to be fixed and took a train to New Haven. He retrieved the car on the way back after contributing Yale's honorarium to the garage mechanic. While on the Merritt Parkway, the engine exploded again. While he was removing the license plates, a state trooper stopped to check on the strange situation. With characteristic aplomb, Gilbert struck a bargain—the state trooper could have the car in exchange for [$25[4] and] a ride to the nearest railway station. [Who] made out best on that one?"[1c]

Gilbert Not Unlike Woody Allen

As told by William S. Johnson[1*]: "There is nothing contrived about Gilbert's humor which just comes naturally, and being with him engenders a feeling that is not unlike watching a Woody Allen movie. Several chemists collect and exchange anecdotes about him; one of these is recorded here.

"On the occasion of the 1957 Spring ACS meeting in Miami, Gilbert was receiving one of the most prestigious honors in chemistry, the ACS Award in Pure Chemistry. The Storks and Johnsons had arranged to stay at a hotel at Miami Beach. It was very hot and we got badly sunburned before the meeting. Gilbert had rented a convertible for taxiing over to the city where the sessions were being held. While driving over, with the top down, just before his award address, he kept looking at some rather crumpled papers which he propped up on the steering wheel. When questioned, he put on air of nonchalance in the face of utter disaster and explained to us that he was trying to decide what he was going to talk about.

Stork continues this episode by reporting, "When I called my wife for a ride from New York to our New Jersey home, she asked, 'What happened to your car?' 'I sold it to a policeman' was my answer."[6]

Shenanigans

As told by Arthur Birch: "There are more car stories about him than anyone I know. I suspect he may have embroidered them a little. In his own estimation, he may be the second worst car driver in the world. For instance, a wheel once rolled past him on the George Washington Bridge. 'Someone has lost a wheel... I have.' Question: 'Did I have a flat the day before? Did I change a wheel?' His guardian angel works overtime, as this and many other episodes indicate. He introduced me to the subtleties of bribing the Mexican traffic police, among his other creative activities."[7]

On Driving with Gilbert

As told by Ron Breslow[*]: "I remember being in the death seat in a car Gilbert was driving. While he was talking to me, he looked at me, not out the front window. That was Gilbert being polite, but how did he keep from an accident? Then I realized, when I showed a look of horror, he took it as a clue that there was something ahead and temporarily looked out the windshield."[8]

[*] Ron Breslow did undergraduate research with Stork at Harvard, received his Ph.D. at Harvard with R. B. Woodward, did a postdoctoral stint with Lord Todd in Cambridge, England, and jointed the Department of Chemistry at Columbia University in 1956 as Instructor in Chemistry.

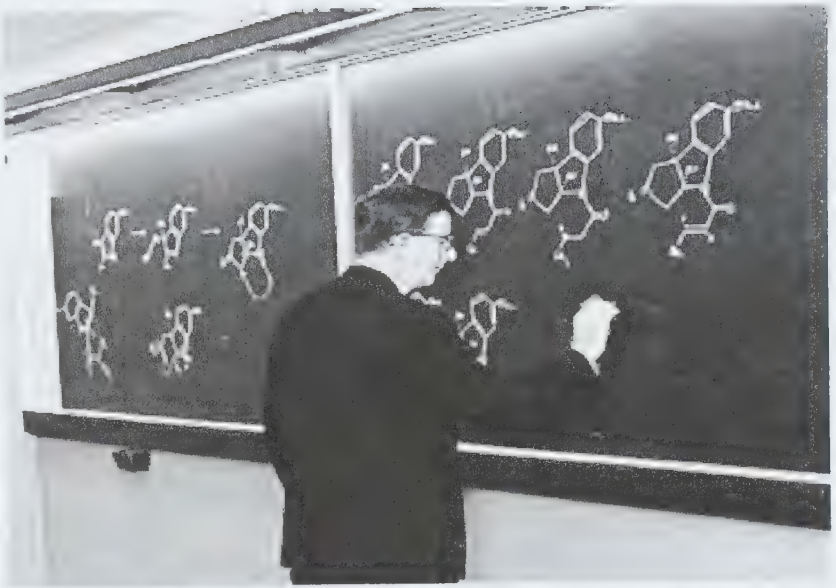


Figure 13. R. B. Woodward lecturing. Photograph courtesy Harvard University Archives.

"The very large auditorium was packed with people, most of whom had, not long before, heard a talk given by Bob Woodward who appeared, as usual, immaculately dressed in his blue suit and began his talk with the dramatic introduction, 'The lecture that I am privileged to deliver today concerns recent work that has never before been disclosed in the Western Hemisphere.' Now Gilbert, after being introduced, stood up at the podium looking quite non-Woodwardian in his rumpled suit that had suffered from the open car ride in the severe heat. Then he began, 'The lecture that I

[*] Bill Johnson was on the staff of the University of Wisconsin from 1940-1958, including while Stork was in graduate school at Wisconsin (1942-1945). They remained close friends, and Stork was one of the authors, together with Paul A. Bartlett, William R. Bartlett, and John D. Roberts, of "An Epilogue" that appeared in Johnson's autobiography[9] that was published in 1998, three years after Johnson's death in 1995.

am privileged to deliver today concerns recent work that has never before been disclosed in Miami.' This brought the house down, and I laughed so hard as to cause conversion of an incipient hernia into a major rupture requiring surgery soon after I returned home. (Before writing the above anecdote, I phoned Gilbert to see how he felt about having it published. Among other things, he said, 'I never did understand why people thought my remark was so funny.'"[22]

Gilbert as a Terrorist

As told by Carl Djerassi, on the receipt of his first honorary doctorate, from the Universidad Nacional Autónoma de México: "Gilbert Stork tried to photograph the occasion, and the flashbulb exploded in his hand as the rector of the university was placing that silly-looking hat on my head. Owing to recent bombings in Mexico City, everybody responded with panic—as the newspapers later reported—as if this were another terrorist attack."[23]

The Origination of an Idea

"The Stork reaction [enamine alkylation and acylations] originated with wondering what might be going on in nature at a very primitive level... how does nature manage to make carbon–carbon bonds. That must be, obviously, a much milder process than we normally use in the lab. We take an enolizable carbonyl compound, treat it with a very strong base, at very low temperatures, and alkylate the resulting enolate with an

Figure 14. Stork and Derek Barton on a trans-Atlantic voyage, ca. 1955. Photo courtesy C. Djerassi.

The difference is simply that there are things that are not absolutely correct with a capital 'C', but extremely worthwhile because they're major assumptions, which allow things to move forward."[1]

alkyl halide. This is a violent operation and this is clearly not what goes on in nature. So I wondered about that, and I thought that maybe there was some sort of a reaction, not of an enolate of a ketone, which is what we chemists use, but an equivalent, which might be a nitrogen analogue of the enolate, such an enamine."[1]

Emotional Attachment

"My quinine involvement is really quite something. It's somewhat typical of everything that's wrong with what I do and what has motivated me. What's wrong with it is the inability to give up something to which I'm emotionally attached. If it had been any kind of business decision, subject to the criteria of reasonableness, I should have given up quinine a long time ago. Still, it's important to make clear that I have not been spending all my time since 1942 trying to synthesize quinine, but I did come back to it every so often... Now [in 1991], I've finally decided to call it quits."[1] [Note that Stork's stereospecific synthesis of quinine was published ten years later, in 2001![5]]

The Main Event

"[Derek] Barton and I overlapped in the sense that he spent a year at Harvard when I was there. He developed his conformational insights at that time. I was violently opposed to it... My objection was both reasonable and stupid; his was fundamentally not rigorous but brilliant. There's a difference.

Poor Choice of a Research Project

"We decided we ought to find out what would take place... So, we slipped into this [project]. We should never have messed with it. The result of our work was to add darkness to an obscure situation. [laughter] That was all.

"If you look back at a piece of work and you say, 'What is it that you know now?' There are several aspects, one, which could legitimately be, 'What is it that you now know that was not known before?' That's a tough one."[1]

The State of the Art in Organic Synthesis

"There's another thing that gives a hint that there's something funny there. By now, there must be at least 40 groups worldwide, probably more, working on taxol. In the greater New York area, there are at least six. They're all different. They're all different syntheses, which sounds nuts but you don't get a huge waste of money because everybody's trying to do the same damn thing. This would be a problem if you were doing mechanistic work or structural work. If people work on a structure, they must all end up with the same structure if they are right. If people work on a mechanism, they must all end up with *the* same mechanism, if they are right. But in synthesis, they can all end up with something different; it's like writing a novel or something like that. But that also suggests that the state of the art is not that advanced

when all these people, who are very competent, all try to do the best they can, and they all come out with different answers! [laughter]"[10]

On the Advancement of Synthesis

"The advance of organic chemistry has been absolutely spectacular, but it's hard to tell. The way you can tell is that no one in his right mind would have considered making a compound like erythromycin thirty years ago. I don't mean succeeded in making it; nobody would have considered the possibility of making it. Out of the question. Today people do this until you're bored to read this type of thing. I mean, there's another description of another damn macrolide antibiotic synthesis that someone made by controlling the aldol or not controlling this aldol. Who needs it?"[11]

The Value of Named Reactions

"I have a tentative hypothesis that if there is a name attached to a reaction, it was probably discovered by someone else. I like to think that what some have called the Stork reaction may be an exception."[12]

On the Huang Minlon Reduction

"Huang Minlon was a postdoc. Do you know the Huang Minlon reduction? His name was really Minlon Huang, but everybody's called Huang in China, so he inverted it. Huang Minlon was a postdoc of Fieser's. Mary Fieser used to delight in coming, sneaking behind him when he was working away in the lab, Huang Minlon, and shouting something in what she Bannister. Today, many people run the mile in considerably less than four minutes. Is it important who did it first? It's not but it is striking."[13]

On Rivalries within the Same Department

"There's no question in my mind whatsoever that if [good friends] went to the same place, that would be the end of [the friendship]. Forget it. [laughter] [Bill] Johnson and [Gene] van Tamelen faced that problem. They were very good friends, but eventually they would only write letters to each other through the [Stanford University] Post Office, even though they were only two doors apart. That's what happens. Obviously it could be the same woman; in that case, it was not very different, it was the same [scientific, chemistry] problem."[14]

considered to be Chinese and startling the hell out of him. [laughter]"[1]

Figure 15. Louis and Mary Fieser with their cats. Photo courtesy Harvard University Archives.

On Competition

"Sometimes people do engage in intense competition... Some people love the type of competition common in sport: 'Who will make cholesterol first?' At one time, everybody was fascinated by who would be the first to achieve a four-minute mile, and I must admit that I remember that it was [Roger]

Figure 16. Gene van Tamelen, Barbara and Bill Johnson, and Mary van Tamelen, at the Caribbean Chemical Conference, University of the West Indies, 1969. Photo courtesy J. D. Roberts

The Joy of a Crystal

"Nobody knows what a crystal is anymore. Chemistry is an intellectual thing now. Now you look at a peak in a spectrum: it's very analytical. You don't often get the thrill of making crystals... a real feeling of joy at the crystal, the crystal shape and coloring and that sort of thing."[21]

My Office

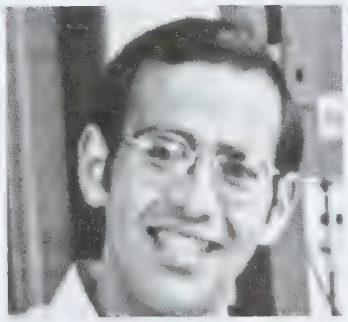
"I shared the sixth floor with a physical chemist, who is a very famous physical chemist: he has a prize named after him from the ACS which is the Victor K. LaMer Prize in Colloid Chemistry. He was the other occupant of that floor. [LaMer] had no use whatsoever for organic chemists; he hated them. He had a thick white line painted on the floor, which was the frontier beyond which organic chemists were not to trespass. [Arthur C.] Cope was only here one year. He was involved in war work, and he worked mostly in Washington... On one of his trips, LaMer decided he needed more space. He took out all of the equipment of Cope's in a couple of the labs, tossed it out in the corridor, and put his people in. Presumably it is no

longer done that way. [laughter]... So Cope told me, 'I'll give you only one piece of advice. Stay away from LaMer.' The next thing I know, I'm sharing the floor with LaMer. [laughter]..."[10]

On Being Fearful

"I was at Columbia, and Bruce Ganem, who is now a professor at Cornell, was in a lab across the way from my office. I found a bottle of SO_3, which is not that stable and had crystallized inside the bottle, which normally looks like Karo syrup, like molasses, and you pour it through a small opening. This thing couldn't be poured out and the question was, how do I get rid of this stuff? And so the idea was to find some solvent, some inert solvent, dissolve it, and pour it gently into ice. And as the solvent, I decided on carbon tetrachloride...

"To this date, I don't know what happened. There may have been a metallic impurity somewhere that catalyzed, ripping out one of the chlorines from CCl_4 in this extremely acidic medium... it was bubbling furiously, the bottle cracked in the hood. Black crap was coming all over the place, and I could detect what I was convinced was the smell of phosgene.



"And I remember the dilemma that I had. I thought, 'Should I tell Bruce that he will probably die during the night or and read them to the staff. And I didn't know anything about the telegram. Then he opened this telegram. When Hammett got a little excited, you could see red climbing up the back of his neck. He was obviously getting somewhat excited as he read this telegram, which said, 'Pleased to accept your offer of the instructorship.' Of course, [Hammett's] saying, 'What does this mean?' 'Oh,' I said, 'I'm sorry. This has no meaning. It's just a code, that he was supposed to wire back if he would accept it, if we decided to offer it to him, so we can save time.' Hammett said, 'Oh, I see.' Although we never talked about it, it was perfectly certain that he knew perfectly well the kind of skullduggery I'd been involved in and went along with it. So Breslow came. That was pretty good."[11]

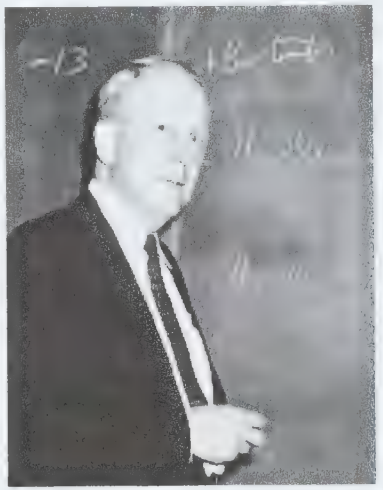


Figure 18. Louis P. Hammett at Universal Oil Products, 1954. Photo courtesy L. P. Hammett.

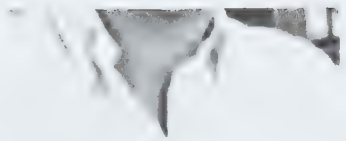


Figure 17. Bruce Ganem at Columbia, 1970s. Photo courtesy B. Ganem.

should I keep it quiet and just see what happens?' Well, the truth is, it was probably low enough in concentration, that nothing happened. But I remember I was really frantically concerned."[18]

On Hiring Ron Breslow at Columbia

"I knew Breslow when he was an undergraduate at Harvard. In fact, he did his first two papers with me[27,28]... So I knew Breslow was an extremely bright guy. At that time, he was a postdoc for [Alexander, later Lord] Todd in England. He had been offered a position at Wisconsin, and I wrote him and said, 'You really should forget about Wisconsin. You should come here.' You know the way departments move. You've been around enough to know that this is not necessarily the fastest operation in the world. At that time, this place was sort of a frozen mastodon. So circumstances arose that I had to send a telegram to Breslow that we offered him this position, before discussing it with my colleagues. [laughter] Now, one should not do that, and I'm not advocating it at all. It just had to be done that way. It was a gamble that I would be able to convince my colleagues.

"So there was a department meeting. Things went slightly wrong, in that Breslow wired back a telegram to the chairman, Louis Hammett, accepting the offer. Hammett had not opened the telegram before the meeting. He'd collected together departmental stuff, and he would open these letters

Figure 19. From the left: Nick Turro, Ron Breslow, and Stork at Columbia University, 1970s. Photo courtesy N. Turro.

On Hiring Nick Turro at Columbia

"Turro came through the Jack Roberts connection.[29] I was involved in bringing him here, but only as a conduit, not as an initiator.... the main reason why I was suggesting bringing Turro here was that he told a joke that was so bad, so outrageous, and so long that I decided he must have enormous self-confidence. He clearly has enormous drive, and is clearly intelligent, so obviously, he would be perfectly okay."[11]

As told by Nick Turro: "When I was to give my interview lecture, I was very nervous with Gilbert, Ron [Breslow], Tom [Katz] and Cheves Walling in the front row: a chemist's murderer's row if there ever was one! So to break the tension, I decided to tell a joke about an amateur photochemist, since this was the topic of my colloquium.

"Alexander the Great studied phototropism, the ability of certain dyes to change color when exposed to light. He noted that the color change in sunlight depended on the time of day. In a brilliant stroke, he envisioned the military applications of this phenomenon. He would take a cloth, soak it in the dye and then after it reaches a color for a certain time of day, freeze the color in the cloth with some fixing chemical. He would then give one of these cloths to each of his generals who would surround an enemy. They would wear the fixed colored dye with a fresh photochromic system, and when the colors matched they would attack! The enemy had no defense again this clever photochemical trick.

"To this day, the cloth that Alexander gave his generals is knows as Alexander's Rag Time Band!

"There was stunned silence when I finished the story. Then suddenly a roar of disbelief that a brash young interviewee could have the insanity to tell such a joke to start his interview!

"There is a cute Stork story to follow this talk. Ron had a reception for me in his apartment which was on the top floor of one of the buildings off of Broadway. I got there early but as the evening wore on, Gilbert had not arrived. Finally, the entrance buzzer rang, and it was Gilbert, announcing his arrival. Ron let him in the building.

the experience may be worth it.' So eventually he had the courage and guts to go to Harvard and said, 'Okay, let's do that, and I'll do the best I can.' That worked out pretty well."[11]

As told by Paul Wender: "I was only two or three months into my two-year NIH postdoc with Stork when Woodward called. Much before I had planned, I had an offer in hand from Harvard. To Stork's credit and a remarkable reflection of who he is and his exceptional mentoring skills, he encouraged me to think about where I would like to go. After discussions with him and also with Woodward, the decision was easy."[11]

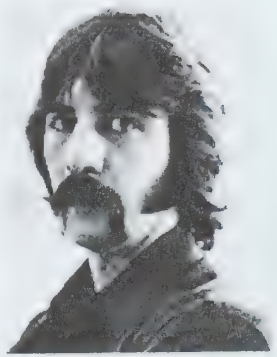


Figure 20. Paul Wender at Harvard University, mid-1970s. Photo courtesy Paul Wender and Scott M. Sieburth

On Being Playful in the Literature

"Woodward had developed a particular style at that time, using Latin phrases here and there to buffalo the assembled multitude. Obviously, I couldn't use Latin phrases, but the purpose seemed obvious to me. So my thing was that I would use some English words which people didn't know. The test of that was whether or not Barton had to use a dictionary to figure it out. So that paper has a footnote that the British school considered the S_N2' reaction their appanage... I was fairly pleased with that. But I got over that after a few more of these things."[11]

"Twenty minutes later, no Gilbert! Then finally, the bell to Ron's apartment and Gilbert at the door, red faced and out of breath. After a period of recovery, he explained that the elevator was so slow that he decided to take the stairs, up 15 flights! When he got to the top, exhausted, he realized that he was in a fire stair well and could not get onto Ron's floor. So he ran back down the stairs and took the elevator. This was my first introduction to a real-life Storkism!"[1]

The Columbia Chemistry Department's Personality

"The Columbia personality has been unkindly described as a group of people whose natural tendencies would be to grab the microphone while someone else is still using it. That's an unkind statement, which is not any kinder because I made it, originally. [laughter] But it has some truth to it. This may be the description of anyone who is going to make it in this world of chemistry."[1]

Giving Career Advice to Paul Wender

"I remember that Paul Wender had an offer [from both Harvard and several other institutions]. We spent a lot of time discussing it. 'Do you want to go to the safety of [university names redacted], where it's unimaginable that you would not get tenure, or do you want to go to Harvard, where it's essentially unthinkable that they would give you tenure. But

Figure 21. From the left: Albert Eschenmoser, Stork, R. B. Woodward, and D. H. R. Barton.

On the Consequences of Flippant Answers

"I made myself extremely unpopular once in Canada. I gave a lecture. Maybe 250 students were there and time came for questions and there was a tough time in Canada at that time... People had a hard time finding jobs.... And the first question, I expected something about chemistry... the first question is, 'What do you think will happen with the unemployment situation?' I was really not so prepared for that. And my answer was both unexpected and stupid, which was 'Well, I... it's... not... it wouldn't be that tragic if people got a Ph.D. in chemistry and then were a bus driver because at least in traffic jams, they would have something interesting to think about.'

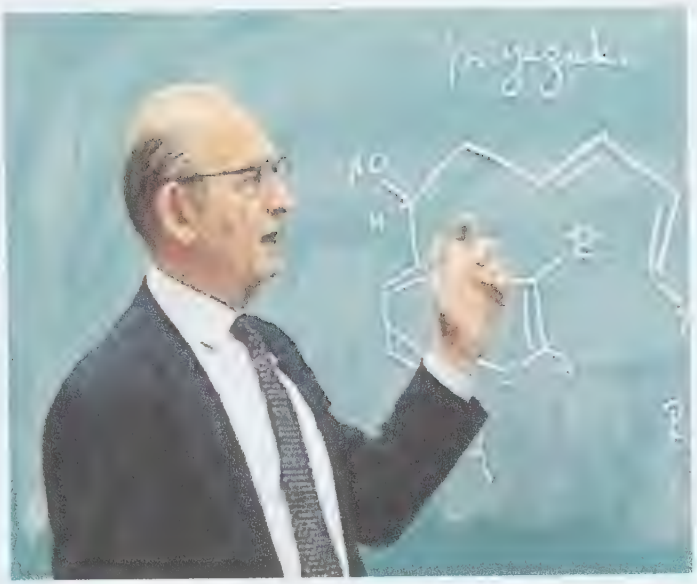


Figure 22. Stork lecturing at Columbia, 1997. Photo courtesy J. I Seeman.

And that had the merit of cutting out any further questions, because of the resulting shock, and also to teach me eventually that one should give more thought to casual answers."[16]

On Being Honored

"To my surprise, there was recently an event that I didn't know was going to take place during a meeting in Minneapolis where they had found some people to say more or less nice

maintaining the collection; and Ron Breslow, Sam Danishefsky, Sharbil J. Firsan (Editor, Aldrichimica *Acta), Bruce Ganem, John Gupton, Albert Padwa, Gary H. Posner, Nick Turro, and Paul Wender for helpful discussions. The video production cited in reference [16] was funded by Philip Morris USA which I acknowledge with special thanks. I also acknowledge and thank the various other sources cited and referenced herein for use of photographs and text.*

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Keywords: Columbia University · history of chemistry · natural products chemistry · Stork, Gilbert · synthetic methods

[1] G. Stork. Chemical Heritage Foundation Oral History, given to J. J. Bohning and L. Fine. New York, NY. August 6, 1991.
[2] "A Wandering Natural Products Chemist": K. Nakanishi in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman). American Chemical Society, Washington, DC **1995**.
[3] L. F. Fieser, letter to A. Emery, Cambridge, MA, April 20, 1955 (Chemical Heritage Foundation oral history research file # 0100, Gilbert Stork).
[4] G. Stork. *Tetrahedron* **2011**, *67*, 9754 – 9764.
[5] G. Stork. *Med. Res. Rev.* **1999**, *19*, 370 – 387.
[6] G. Stork, S. M. McElvain. *J. Am. Chem. Soc.* **1946**, *68*, 1053 – 1057.

things about my scientific career. One of them was [Sam] Danishefsky. Danishefsky came with slides, which he had made of what he thought were the most interesting things I had done. The interesting result of that was that I was both interested and annoyed. For the obvious reason, if you're a psychologist. I was annoyed because he didn't pick Q, R and S, which I thought were great stuff. How come he didn't pick that? [laughter] On the other hand, he picked some other stuff I thought was really not that great."[15]

In response to reading the above quote, Danishefsky says, "The story is true. I still think I picked his best works."[15]

A Call from the White House

"My wife and I were vacationing in the U.K. and were visiting friends, when the telephone rang and, improbably, 'It's for you' followed. The person on the phone stated that this was the White House calling. I could only think of the White House Hamburger chain, and it took a little while to straighten things out. But they were straightened out, and I received the [National Medal of Science in 1983] in the White House, from President Reagan."[15]

A Final Word

"If we're lucky, none of this will be published. [laughter]"[16]

I thank István Hargittai for permission to include four quotes from Candid Science III: More Conversations with Famous Chemists: *David J. Caruso, Program Manager, Oral History, Chemical Heritage Foundation for providing information and*

[7] G. Stork, E. E. van Tamelen, L. J. Friedman, A. W. Burgstahler, *J. Am. Chem. Soc.* **1951**, *73*, 4501.
[8] G. Stork, D. Niu, A. Fujimoto, E. R. Koft, J. M. Balkovec, J. R. Tata, G. R. Duke, *J. Am. Chem. Soc.* **2001**, *123*, 3239–3242.
[9] G. Stork, P. C. Tang, M. Casey, B. Goodman, M. Toyata, *J. Am. Chem. Soc.* **2005**, *127*, 16255–16262.
[10] G. Stork, A. Yamashita, J. Adams, G. R. Schulte, R. Chesworth, Y. Miyazaki, J. J. Farmer, *J. Am. Chem. Soc.* **2009**, *131*, 11402–11406.
[11] W. G. Dauben, M. S. Kellogg, J. I. Seeman, N. D. Vietmeyer, P. H. Wendschuh, *Pure Appl. Chem.* **1973**, *33*, 197–215.
[12] J. I. Seeman, *Angew. Chem.* **2007**, *119*, 1400–1435; *Angew. Chem. Int. Ed.* **2007**, *46*, 1378–1413.
[13] G. Stork, H. K. Landesman, *J. Am. Chem. Soc.* **1956**, *78*, 5128–5129.
[14] G. Stork, A. H. Brizzolara, H. K. Landesman, J. Szmuszkovicz, R. Terrell, *J. Am. Chem. Soc.* **1963**, *85*, 207–222.
[15] G. Stork, T. Takahashi, L. Kawamoto, T. Suzuki, *J. Am. Chem. Soc.* **1978**, *100*, 8272–8273.
[16] G. Stork, video interview with J. I. Seeman, New York, NY, May 30, 1997 (see also: A. M. Rouhi, *Chem. Eng. News* **1997**, *75*, 34–35).
[17] I. Hargittai, *Candid Science III: More Conversations with Famous Chemists*, Imperial College Press, London, **2003**.
[18] F. Hoffman, *Aldrichimica Acta* **1982**, *15*, 3–10.
[19] G. Stork, *Biogr. Mem. (Natl. Acad. Sci. USA)* **1983**, *54*, 220–249.
[20] G. Stork, *J. Am. Chem. Soc.* **1945**, *67*, 884.
[21] "Some Recollections of Gap Jumping": D. H. R. Barton in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman), American Chemical Society, Washington, DC, **1991**.
[22] "Steroids Made It Possible": C. Djerassi in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman), American Chemical Society, Washington, DC, **1990**.
[23] C. Djerassi, *The Pill, Pygmy Chimps, and Degas' Horse*, Basic Books, New York, NY, **1992**.

[24] "To See the Obvious": A. J. Birch in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman), American Chemical Society, Washington, DC, **1995**.
[25] R. Breslow, email to J. I. Seeman, New York, NY, December 28, 2011.
[26] "A Fifty-Year Love Affair with Organic Chemistry": W. S. Johnson in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman), American Chemical Society, Washington, DC, **1997**.
[27] G. Stork, R. Breslow, *J. Am. Chem. Soc.* **1953**, *75*, 3291.
[28] G. Stork, R. Breslow, *J. Am. Chem. Soc.* **1953**, *75*, 3292.
[29] For Jack Roberts's role in Columbia University's hiring of Gilbert Stork, see "The Right Place at the Right Time": J. D. Roberts in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman), American Chemical Society, Washington, DC, 1990, pp. 137–138.
[30] N. J. Turro, email to J. I. Seeman, New York, NY, December 28, 2011.
[31] P. Wender, email to J. I. Seeman, Stanford, CA, January 5, 2012.
[32] S. Danishefsky, email to J. I. Seeman, New York, NY, December 28, 2011.

And Finally

Gilbert Stork

J. I. Seeman* ——— ▮▮▮▮–▮▮▮▮

Gilbert Stork: In His Own Words and in the Musings of His Friends

Storkisms: In honor of the 90th birthday of Professor Gilbert Stork a collection of poignant quotes and anecdotes have been gathered which illustrate his philosophies of life and his unique qualities of intensity, humor, and gentleness. These stories are both entertaining and didactic, while revealing aspects of academic life of a chemist from 1940 to 2011.

April 17, 2013

Drs. Alfred and Isabel Bader
2961 N. Shepard Avenue
Milwaukee, WI 53211-3435

Dear Alfred and Isabel:

I am writing to ask for your help in a vitally important study the American Chemical Society will be undertaking with regard to the ACS Scholars Program.

As you know, the ACS Scholars Program promotes inclusion by opening doors for underrepresented minority students to pursue careers in the chemical sciences. Since its establishment in 1994, the program has assisted nearly 2,500 students, many of whom have gone on to successful careers in the field.

In 2012, the ACS Board of Directors determined the ACS Scholars Program should be a permanent component of ACS's activities and that we should explore developing an endowment to assure its future. That would require the Society to undertake a capital campaign to raise the necessary resources. A campaign would be an extraordinary commitment by ACS and its members, donors, friends, and partners.

As we begin planning for this campaign, we have retained the Washington, D.C.-based consulting firm of Michael J. Worth & Associates to assist us. The firm has provided campaign or fund-raising guidance to many other associations and institutions, including the National Academies, the American Association for the Advancement of Science, the Foundation for NIH, and the Carnegie Institution.

I will be most grateful if you are able to meet personally for about 45 minutes with a consultant from the firm. Enclosed is a draft of materials describing our preliminary plan for the campaign, and I hope that you will be able to read and consider it carefully. Your thoughtful and candid opinions during the meeting with our consultant would be greatly appreciated. The meeting will be entirely confidential and the consultant will report only a general summary of findings to ACS.

To emphasize, the consultant will not be visiting to solicit a gift to the campaign. Rather, the purpose of the study is to learn your views on the directions described in our draft material, your assessment of our preliminary plan, and your assessment of the feasibility of the proposed campaign.

A member of my staff in the Development Office will call you in the next few days to see when you might be available for a personal meeting with our consultant.

Thank you in advance for helping us in this important way.

Sincerely,

Madeleine Jacobs
Executive Director and Chief Executive Officer

ACS
Chemistry for Life®

CAMPAIGN FOR THE ACS SCHOLARS PROGRAM

DRAFT 4/3/2013

The American Chemical Society (ACS) is a nonprofit membership organization, founded in 1876 and chartered by a 1937 Act of the U.S. Congress. With a membership of more than 163,000 chemists, chemical engineers, and other practitioners of the chemical sciences, it is the world's largest scientific society.

The ACS Scholars Program was founded in 1994 to promote inclusion in the chemical enterprise by opening doors for underrepresented minority students to pursue careers in the field. Establishment of the program reflected the concern of the ACS Board of Directors that people from racial and ethnic minority groups are underrepresented in the science fields.

ACS now is considering a fundraising campaign to secure $12 million in philanthropic support, over five years, to develop an endowment that will assure its funding in perpetuity as well as support the program's continuation over the campaign period.

Overview of the ACS Scholars Program

The ACS Scholars Program is designed to encourage African American, Hispanic/Latino, and Native American students to pursue undergraduate college degrees in the chemical sciences and chemical engineering and to assist them in obtaining the skills and credentials necessary for success in these fields.

The program provides scholarships, undergraduate research internships, and mentoring. Students must demonstrate financial need, high academic achievement, and be enrolled full-time pursuing four-year degrees in the chemical sciences. Recipients are selected by a Scholars Selection Committee, including professors and members of minority advocacy organizations. Applications are evaluated carefully, using a process developed by the Educational Testing Service.

Since 1994, the program has awarded nearly $14 million in direct financial assistance to nearly 2,500 students. Of these students, 58 percent are female, 52 percent are African American, 41 percent are Hispanic/Latino, and 7 percent are Native American. We have documented 147 Ph.D.'s earned by former ACS Scholars.

The Continuing Challenge

Despite some progress, minority students continue to be underrepresented in chemistry and other physical sciences. A 2013 study by the National Science Foundation revealed that, while minority students' share of bachelor's degrees in the sciences and engineering had increased since 1991, most of the growth had been in psychology, the social sciences, and computer science. **The NSF study reported that between 2000 and 2013, underrepresented minorities' shares of degrees in engineering and the physical sciences remained flat, and participation in mathematics actually had dropped.**

[Does ACS have some better data that applies just to chemical sciences?]

From its founding in 1994 until 2012, continuation of the ACS Scholars Program was approved on an annual basis by the ACS Board of Directors. Recognizing the persistence of disparities and the need to continue our efforts, the Board in 2012 committed to making the ACS Scholars Program a permanent component of the Society's programs and to seeking long-term funding to assure its support. This will require the development of an endowment fund as well as continued annual funding over the period required to fully establish the endowment.

Meeting the Financial Need

ACS currently maintains an average of 350 students in the program at all times and expends a total of $900,000 for scholarships annually. Of that total, approximately $400,000 is contributed through gifts and the balance funded by ACS.

The economy and philanthropic marketplace continue to present challenges and intense competition. The expenditure of resources required for ACS to secure annual support of the program continues to increase, and the year-to-year funding makes it difficult to plan for the program's future. There is a need to develop a permanent endowment fund to assure annual earnings sufficient to provide the $400,000 that is currently obtained through annual fundraising. Assuming a reasonable level of investment returns, that would require a total endowment of $10 million. Assuming that many gifts to the endowment might be paid over five years, an additional $2 million in expendable support will need to be raised to support the program over that period at its current level.

In view of this need, the Board of Directors is considering a campaign for $12 million, including $10 for endowment and $2 million for current support of the ACS Scholars Program. This will require significant commitments of philanthropy from its members, friends, and partners.

Achieving Our Goals

Based on an analysis of ACS's philanthropic history and known principles of fundraising, achieving a goal of $12 million will require the gifts described in the following table.

Range of gifts	Number of gifts required	Total of gifts at this level	Cumulative total
$2,500,000	1	$2,500,000	$2,500,000
1,500,000	2	3,000,000	5,500,000
500,000	4	2,000,000	7,500,000
250,000	6	1,500,000	9,000,000
100,000	10	1,000,000	10,000,000
50,000	15	750,000	10,750,000
25,000	20	500,000	11,250,000
10,000	50	500,000	11,750,000
Below $10,000	Many	250,000	$12,000,000

Opportunities for Donors

Donors who provide gifts to establish endowment funds to fully support one or more ACS Scholars may be recognized through naming of a specific endowment fund in perpetuity. Recipients of the scholarships will forever be known as, for example, "John Doe Scholars" or "XYZ Corporation Scholars."

A gift of $2,500,000	Endowment supports 25 scholars annually
A gift of $1,500,000	Endowment supports 15 scholars annually
A gift of $500,000	Endowment supports 5 scholars annually
A gift of $250,000	Endowment supports 3 scholars annually
A gift of $100,000	Endowment supports 1 scholar annually

All gifts of any denomination will be recognized publically in the year in which they are given.

Creating a Lasting Legacy

The program's needs require expendable annual support and endowment to provide permanent support. It is anticipated that many campaign gifts will be pledged and paid over a period of five years. Some individuals may also consider providing gifts to support the program through bequests or other forms of planned giving.

Under certain circumstances, testamentary commitments, including irrevocable deferred (or planned) gifts may be counted toward the goal of the campaign. In other instances, donors who arrange for a revocable planned gift will be recognized and their eventual gifts will be gratefully accepted to meet future needs, but their commitments will not be credited toward the $12 million campaign goal.

American Chemical Society
ACS Scholars Program
Feasibility Study Questions

1. How would you describe your overall relationship with ACS?

____ generally positive

____ negative

____ ambiguous

____ no relationship

Comments:

positive - very good

2. How important do you think the ACS Scholars Program should be as a priority for ACS? Why do you think that?

✓ very important

___ somewhat important

___ not very important or not important

Response:

very important to help young students become chemists

3. Based on what you read – or what you already may have known – are there changes that you think need to be made to the program itself?

Response:

Sounds very good

4. Is there anything about the program that concerns you or that you do not favor?

__✓__ no concerns ___ has concerns

Comments:

I am writing to ask for your help in a vitally important study the American Chemical Society will be under regard to the ACS Scholars Program.

As you know, the ACS Scholars Program promotes inclusion by opening doors for underrepresented mino pursue careers in the chemical sciences. Since its establishment in 1994, the program has assisted nearly 2, many of whom have gone on to successful careers in the field.

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I will be most grateful if you are able to meet personally for about 45 minutes with a consultant from the fi a draft of materials describing our preliminary plan for the campaign, and I hope that you will be able to re it carefully. Your thoughtful and candid opinions during the meeting with our consultant would be greatly The meeting will be entirely confidential and the consultant will report only a general summary of findings

To emphasize, the consultant will not be visiting to solicit a gift to the campaign. Rather, the purpose to learn your views on the directions described in our draft material, your assessment of our prelimi your assessment of the feasibility of the proposed campaign.

A member of my staff in the Development Office will call you in the next few days to see when you might for a personal meeting with our consultant.

Thank you in advance for helping us in this important way.

Sincerely,

Madeleine Jacobs

from the
Development Office

June 18, 2013

Dear Alfred and Isabel,

ACS has just released the digital version of the 2012 Annual Report. Donors are recognized beginning on page 25, Thank you!

I also want to share with you letters received via email to you — from Bader Scholars. They were addressed to the Project SEED office. Your scholarships have certainly made an impact for so many young people.

Best regards,

Mary Bet

ACS
Chemistry for Life
American Chemical Society
1155 Sixteenth Street NW | Washington, DC 20036

A.C.S SEED

From: Hilary Wright [mailto:hilarywright.m@gmail.com]
Sent: Tuesday, June 11, 2013 6:53 PM
To: projectseed
Subject: Thank You - SEED Scholarship

Dear Dr. and Ms. Bader,

My name is Hilary Wright, and I am a rising senior at the University of Southern California. I wanted to thank you for the support I received from the SEED Scholarship. Your help has been very influential in allowing me to have a college education. When my parent's divorced 10 years ago, it became clear that going to college was going to be my financial burden to bear. And while I have never been discouraged to pursue an education, I know it would not be possible without the help of people like you. I cannot fully express my gratitude for your scholarship.

Attending USC has been a dream. I have had the opportunity to do research on a project focused on Alzheimer's disease in pathology, and look forward to having my name published on a paper this coming November. I have been able to volunteer in the community, both at a high school, a preschool, and in a local hospital, where I know spend my hours assisting on the Labor and Delivery floor. I have worked for the past two years as a USC Tour Guide, one of the most sought after and competitive jobs on campus, where I have shared with hundreds of potential students the opportunities and gift of a college education. I have started my own club at USC, a local chapter of Challah for Hunger, bringing together my peers to participate in baking, philanthropy, and political advocacy. I have expanded my volunteerism with the March of Dimes Foundation, the leading non-profit organization for supporting the health of women and children. I will be serving this year as Chair of the March of Dimes National Youth Council, a group of 19 college students from around the country who work together to develop and implement programs for youth nationwide, to encourage philanthropy at all ages and spread the mission of the March of Dimes further.

I look forward to applying to medical school within the next few years, and pursuing a speciality in prenatal and neonatal health. I plan to dedicate my life to the service of others through medicine, and I could not be where I am today, pursuing my dreams and aspirations, without the loans, scholarships, and grants I have received over the past several years, including the Project SEED Scholarship. Once again, I cannot thank you enough.

Sincerely,

Hilary Wright

--

Hilary Wright
University of Southern California | Class of 2014
Neuroscience & Biology Pre-Medicine
Tour Guide, USC Office of Guest Relations
Vice Chair, March of Dimes National Youth Council
Support me in the March for Babies at marchforbabies.org/hilarymwright!

Junghyun Lim
428 Cabot Mail Center
60 Linnaean Street
Cambridge, MA 02138
jlim@college.harvard.edu

June 14, 2013

Dear Dr. and Ms. Bader:

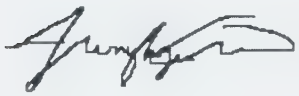
My name is Junghyun Lim, and I am a Project SEED Alumna and recipient of the Project SEED College Scholarship for 2009-2010. I am writing to express my sincere gratitude for your generous contribution to the scholarship.

I am currently a senior at Harvard College, concentrating in Human Evolutionary Biology and Global Health. My studies and extracurricular involvements have greatly expanded my interests in identifying and dissolving complex issues underlying health disparities across the world. After graduation, I hope to further my education in a medical school and work in the field of global health and international development.

I am immensely grateful for your support that has helped me to further my education. Your generosity at the start of my college education helped to reduce the financial burden on my family and greatly enhanced my ability to adjust and focus on my studies.

Thank you very much again. Your generosity truly means much to me. I hope one day I will be able to give back and help students to reach their goals just as you have helped me.

Sincerely,



Junghyun Lim

From: Sinu <msvar15@aol.com>
Date: June 13, 2013, 5:53:08 PM MDT
To: "projectseed@acs.org" <projectseed@acs.org>
Subject: Thank you letter

Dear Dr. and Ms. Bader,

I was one of the recipients of the ACS Project SEED scholarships in the year 2004. I would like to take a moment and extend my heartfelt thanks for your generosity. Your unselfish contributions to this program have surely made a tremendous difference in so many people's lives. It certainly has impacted my life!

I had just started my freshman year at St. John's University and was enrolled in the 6-year Doctor of Pharmacy program when I received the scholarship. Having immigrated to the USA just 4 years earlier, my family was still struggling to make ends meet. Needless to say, the monetary award I received from ACS was a huge blessing for my family and myself.

Today, I'm working as a Registered Pharmacist for Atlantic Health System in New Jersey. It was always my dream to pursue a major in the health care field. You have definitely played a big part in making that dream come true! I want to thank you again from the bottom of my heart.

Sincerely,

Sinu Varghese

Dear Dr. and Ms. Bader,

I am one of the students who has been so fortunate to have benefited from your generosity in contributing to the Project SEED scholarship. I received it my freshman year of college, and it has even benefitted me further by allowing me to receive further scholarships from the American Chemical Society. I really appreciate this much needed help. Because of your kindness and generosity, I will be able to graduate with my bachelor's degree debt free. I don't think I would have been able to pay for tuition and books otherwise.

I have been able to advance in a chemistry bachelor's degree, and I have done very well in all of my classes. I have learned a lot of amazing things, and I am so grateful that I have been able to receive this education. I am so grateful for your help in my educational pursuits.

Thank you so very much.

Sincerely,

Emma Redd

From: Doris Feng <riceteamonkey@ymail.com>
Date: June 14, 2013, 12:26:56 AM MDT
To: "projectseed@acs.org" <projectseed@acs.org>
Subject: Thank You Letter for Dr. Alfred and Isabel Bader
Reply-To: Doris Feng <riceteamonkey@ymail.com>

Dear Dr. Alfred and Isabel Bader,
Thank you for generously contributing to the Project SEED College scholarships; this has helped me a lot in college. If it were not for the scholarship, I would've never been able to afford living a comfortable college life, which is a big matter. During freshmen year, I did not get the type of housing I requested from my college, University of California, Davis. I requested a single person room; however, instead, I got a suite with six people living in it, and I have to share a room inside the suite with someone. I had a very hard time trying to focus because my housemates (including my roommate) were loud, and I get distracted very easily with any noises. I still managed to get through my freshman year with most of my time in the library, but I was very unhappy with my living conditions. I learned and confirmed that I cannot live with a roommate and must obtain a room for myself. Starting of sophomore year is when the Project SEED scholarship helped me. With the Project SEED scholarship, it helped me relief some college fee stress and so I was able to rent a single room for myself. I concentrated a lot better without distractions, which helped me a lot since school is most importantly all about studying. I really needed a nice and quiet place in order for me to study well. Studying well would make me happy, and being happy is a very important factor in life. With a great environment for me to study in, I obtained my first award this 2012-2013 school year called Above and Beyond Award from my scholar program named TRiO (a program for first generation college students). This award is awarded to me for keeping up with my grades while using TRiO resources. I wouldn't have the ability to obtain such an award if I did not have a nice studying environment. Again, thank you very much. I am sincerely grateful for all the help and strength this scholarship (in which you have made it happen) has contributed to my college life so far.
Thank you very much,
Project SEED Scholarship Alumni,
Doris Feng

Alfred Bader Fine Arts

From: Paul Zizelman [Paul.Zizelman@cedarburgpharma.com]
Sent: Tuesday, June 25, 2013 1:58 PM
To: 'baderfa@execpc.com'
Subject: Dinner plans

Alfred and Isabel

I will call you when we return from vacation but I just spoke with Diane and Thursday, July 11,th would be better than Wednesday the 10th for her as she has a doctor's appointment on Wednesday. I thought I would let you know early as opposed to waiting until the Monday prior to the date so you could plan accordingly. I will call you on Monday July 8th to confirm.

We are looking forward to our visit

Paul

ACS
Chemistry for Life™

American Chemical Society
Kalamazoo Section

October 14, 2013

Dear Dr. Bader:

It was great to reach you by phone the other day. I am contacting you as the chair of the **Kalamazoo** Local Section of the **American Chemical Society** (KACS), which is preparing for its gala chemistry dance at the Kalamazoo Institute of Arts (KIA) 7-10 PM on **Friday, November 1**, in downtown Kalamazoo, Michigan.

What would you say about a poster display about your commitment to the fine arts on this occasion? Featuring you in this way as a chemist, entrepreneur and Maecenas would be an inspiration for us all. If this is agreeable would you be able to see your way contributing $250 to make it happen?

The gala is part of our "Chemistry & Culture" series, titled "Elements of Dance". The goal is to connect chemistry topics to cultural elements, to encourage students and to reach out to the general public. The evening will include a dance program as well as an exhibit in the KIA lobby titled "Molecular Foundation of Movement". In collaboration with four local chemistry student groups from Kalamazoo College and Western Michigan University (WMU) we will connect atoms and molecules to exercise science, *i.e.* iron and other minerals in the blood, muscle function, endorphins, and synthetic materials in active wear.

Lastly, Aldrich Vice President of Sales and Marketing Josef Zihlmann encouraged me to share our project with you. He passes on his warmest regards.

Please don't hesitate to contact me should you have any questions.
Thank you for your consideration.

Sincerely,

Elke Schoffers

Elke Schoffers, Ph.D.
Professor - WMU
Chair - ACS Kalamazoo Section

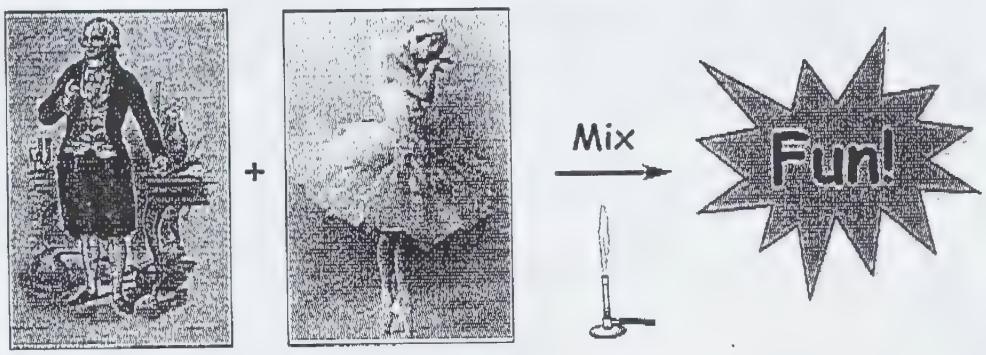
Department of Chemistry
Western Michigan University
3425 Wood Hall
1903 W. Michigan Ave
Kalamazoo, MI 49008-5413

Office (269) 387-2265
Fax (269) 387-2909
Email: elke.schoffers@wmich.edu

http://homepages.wmich.edu/~schoffer/
http://www.wmich.edu/chemistry/
http://kalamazooacs.org/ (KACS)

ACS Chemistry for Life®

Chemistry & Culture: Elements of Dance



Chemist Dancer

A social event with exhibit on "Molecular Foundation of Movement"

Friday, November 1, 2013, 7-10 PM
Kalamazoo Institute of Arts, 314 S. Park St.

Free Admission.
Free Snacks.
Free Dance Lesson.
Dance Showcases.
Puzzles – Win Prizes!
Music: Ballroom, Latin, Swing & Country
Partner not necessary – No dress code.
Open to the general public.

This event is organized by the **Kalamazoo** Local Section of the **American Chemical Society (KACS)**. Event updates will be posted online at www.KalamazooACS.org and on Facebook at www.facebook.com/ACSKalamazoo. Contact Elke.Schoffers@wmich.edu for questions.

Why Chemistry & Culture?

Chemists are not just experts in their field but are also interested in art, history, cooking, baking, brewing, gardening and exercise, among others. The overall goal is to organize events that incorporate "Chemistry and Culture" themes such as "Art Conservation", "Forgery", "Cooking", "Gardening" and "Dancing".

The goals of the **"Chemistry and Culture"** series are...

- To offer a social networking opportunity for members of the Kalamazoo Local Section of the American Chemical Society (KACS) and the public
- To educate the general public about the goals and activities of KACS
- To highlight the connections between "chemistry" and "culture"
- To encourage student participation
- To instill an appreciation for how chemistry contributes to the world in many ways
- To forge ties with the local community

About KACS

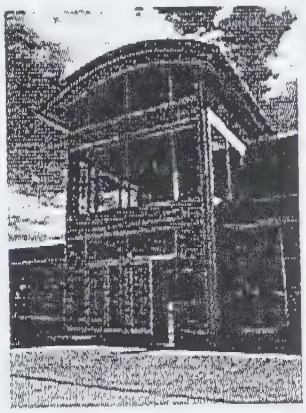
KACS is the **Kalamazoo** Local Section of the **American Chemical Society**, a non-profit, tax-exempt organization that engages in outreach and educational activities for its members and the general public. On our website, http://KalamazooACS.org/ you can find special announcements, copies of our newsletters, flyers of upcoming and passed events, our mission statement, administrative documents and various links.

Please note that our index page currently features pictures of the previous dance event, held at the KIA on Nov. 9, 2012, which became a ChemLuminary Award finalist.

ChemLuminary Awards

Search

About the KIA



Welcome!
The Kalamazoo Institute of Arts is a special place – both a museum and community art school. Since 1924 our mission has been to cultivate both the creation and appreciation of the visual arts.

Art. Each year 10 to 15 changing exhibitions feature art of many styles and periods. Collection highlights include American painting, European and American prints and photographs, and pre-Columbian gold.

Kirk Newman Art School. Nearly 3,000 students of all ages enjoy art classes in 2 and 3-D media, visiting artist workshops, international travel and more.

Events & Programs You'll find many ways to engage with art-plus a chance to enjoy the company of others who share your interest.

Gallery Shop. Unique items, great gifts, great service!

Get Involved. Receive discounts and special privileges as a member of the KIA. Become a volunteer and be part of the fun. Enjoy outstanding lectures on art when you join the Kalamazoo Art League.

Thank You. Our current business partners.

Facility Rental. The KIA is a unique setting for your special event.

Contact the KIA. Staff Directory

Employment. Employment opportunities at the KIA.

KIA History. Learn more about the history of the KIA. View our Quadrennial Report.

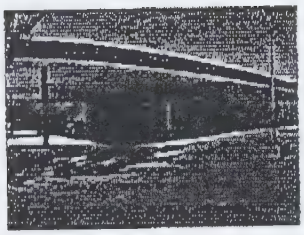
Board of Directors. Current Board List.

Search

KIA History

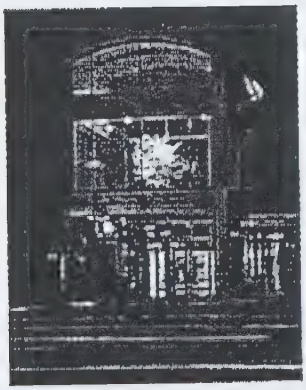
In 1924, the Kalamazoo Chapter of the American Federation of the Arts incorporated as the Kalamazoo Institute of Arts to present classes and establish legal responsibility for the ownership of art objects and the solicitation of funds. The mission of these active artists and art patrons was to encourage the creation and appreciation of art. Small budgets and membership numbers characterized the early years. Staffed primarily with volunteers, the KIA developed distinguished exhibitions and art classes while located in a house loaned by the Kalamazoo Board of Education.

In 1931, the KIA hired its first full-time director and began offering art classes to both children and adults. In 1947 the KIA gained a permanent home when it purchased and a renovated a Victorian mansion at 421 West South Street. In the 1930s and 40s, distinguished guest lecturers such as Diego Rivera, Thomas Hart Benton, Frank Lloyd Wright, and Le Corbusier challenged and informed local audiences about the contemporary art world. An eclectic schedule of exhibitions included work by Picasso and Klee, Japanese prints and ceramics, African Art, Dutch old masters, and even an international kite collection that became a traveling exhibition. Annual juried competitions and exhibitions by local artists and students helped promote and encourage both new and established artists.



In 1951, the KIA launched the Kalamazoo Art Fair to provide an opportunity for local artists to exhibit and sell their work. Held annually on the first weekend in June, Art Fair has grown into a juried fair that attracts artists from across the United States and Canada and a crowd of over 40,000.

In 1961, the KIA built a new facility, the Gilmore Art Center at the Kalamazoo Institute of Arts at its current location. The Skidmore, Owings, and Merrill design was based on architect Mies vander Rohe's plan for a museum in a small city, and illustrated the International style: glass walls, slab construction, exposed columns. With new exhibition areas and storage space, the KIA was able to actively build its collection for the first time. The building included exhibitions galleries, an art library, auditorium, sculpture garden, studio classrooms, and office space as well. In 1988, the KIA developed a new logo, and became known simply as the Kalamazoo Institute of Arts.



In 1994, the KIA began a $14.5 million capital and endowment campaign which resulted in building expansion and renovation designed by the Boston architectural firm of Ann Beha Associates. The addition increased the facility size by nearly 40% to 72,000 square feet. Highlights include a two-story lobby gallery, new auditorium, classrooms, and galleries, gallery shop, art library and an interactive gallery for children of all ages. In 2006, the Art School was named the Kirk Newman Art School to recognize the artist and former Art School director who contributed so much to its development.

Today over 100,000 visitors each year enjoy exciting temporary exhibitions, an outstanding permanent collection of nearly 4,000 works, programs, and events at the KIA. Nearly 3,000 students enroll annually in Kirk Newman Art School classes. The original mission of the KIA to encourage the creation and appreciation of the visual arts continues to guide the institution.

WESTERN MICHIGAN UNIVERSITY
Centennial 1903-2003 Celebration

FAX COVER SHEET

DEPARTMENT OF CHEMISTRY, WESTERN MICHIGAN UNIVERSITY
KALAMAZOO, MI 49008-5413
PHONE: (269) 387-2845
FAX: (269) 387-2909

SEND TO: Dr. Alfred Bader	FROM: ELKE SCHOFFERS
ATTENTION:	OFFICE LOCATION: 3425 WOOD HALL
OFFICE LOCATION:	DATE: 10/14/13
FAX NUMBER: (414) 962-8322	PHONE NUMBER: (269) 387-2265

URGENT ☐ REPLY ASAP ☐ PLEASE COMMENT ☐ PLEASE REVIEW ☒ FOR YOUR INFORMATION ☐

TOTAL PAGES, INCLUDING COVER: 6

COMMENTS:

Dear Dr. Bader,

Please review the enclosed material.

Sincerely, Elke Schoffers

IF THERE IS A PROBLEM RECEIVING THIS MESSAGE, PLEASE CALL (269) 387-2845.

Centennial 1903-2003 Celebration

E-MAIL: ELKE.SCHOFFERS@WMICH.EDU WEB SITE: HTTP://HOMEPAGES.WMICH.EDU/~SCHOFFER/

December 29, 2013

Dear Dr. Alfred and Ms. Isabel Bader,

Words cannot express the gratitude I have for your generosity. My name is Si Li, a third year chemistry student from University of the Sciences in Philadelphia, and I am truly honored to be the recipient of your scholarship. Without your contribution, I would not be where I am today. This scholarship has been a life changer for me. All of the achievements and accomplishments have been made possible due to your scholarship.

Currently, I am a third year chemistry major with a minor in humanities. I am also working on my MBA in pharmaceutical and healthcare business at University of the Sciences. I chose University of the Sciences because it is a small university that is close to home and I can be who I want to be. At USciences, students work very closely with professors to develop and grow into the person they want to become. I can pursue my own interests and not follow a trend. I am a firm believer of "You are your own design," meaning a prestigious name or image does not solely define a person, but rather the uniqueness and accomplishments of that person.

My hobbies include performing arts such as singing and acting. I am involved with the university's chorus, American Chemical Society Association, The Elixir (university's magazine), and student government. My career goals in life include starting my own pharmaceutical company.

In the beginning, when I first planned to attend USciences, I did not know how I was able to attend due to financial hardships. This scholarship is the reason why I am on the path to achieving my career goals. This scholarship not only helped me financially, but also spiritually. The moment that I discovered that I was a recipient; I burst into tears, speechless. From that moment on, I knew you, Raihanah Rasheed, and the ACS Project SEED committee believed in me; becoming a part of my life to not only support me along my academic path, but also my career path as well. This gave me a huge sense of hope and propels me to use my full potential.

Thank you once again for your generous donation. All of my achievements and accomplishments have been made possible because of you. I am determined to succeed in accomplishing my career goals and in life.

On a side note, I deeply apologize for my lateness in writing this thank you letter as I have just received information about this letter. This was solely my fault since I did not see the notification earlier in my inbox and want to apologize. Nonetheless, I still want to personally write to you to express my gratitude and how your contribution helped me during my past few years in college.

This is truly a blessing and I am grateful for this opportunity this holiday season. I hope you and your family had a wonderful holiday and I want to wish you a happy New Year!

Sincerely,

Si Li
3rd year undergraduate
BS of Chemistry Class of 2015
MBA in Pharmaceutical and Healthcare Business Class of 2016

AMERICAN CHEMICAL SOCIETY

FACSIMILE TRANSMITTAL SHEET

TO: Isabel and Alfred Bader	FROM: Mary Bet Dobson
COMPANY:	DATE: 12/31/2013
FAX NUMBER: 414-962-8322	TOTAL NO. OF PAGES INCLUDING COVER: 2
PHONE NUMBER:	SENDER'S TELEPHONE NUMBER: 202-872-4094
RE: Thank you from a Project SEED Bader Scholar	YOUR REFERENCE NUMBER:

☐ URGENT X FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES/COMMENTS:

All best wishes for a happy and healthy New Year!

Warm regards,

Mary Bet Dobson

ACS

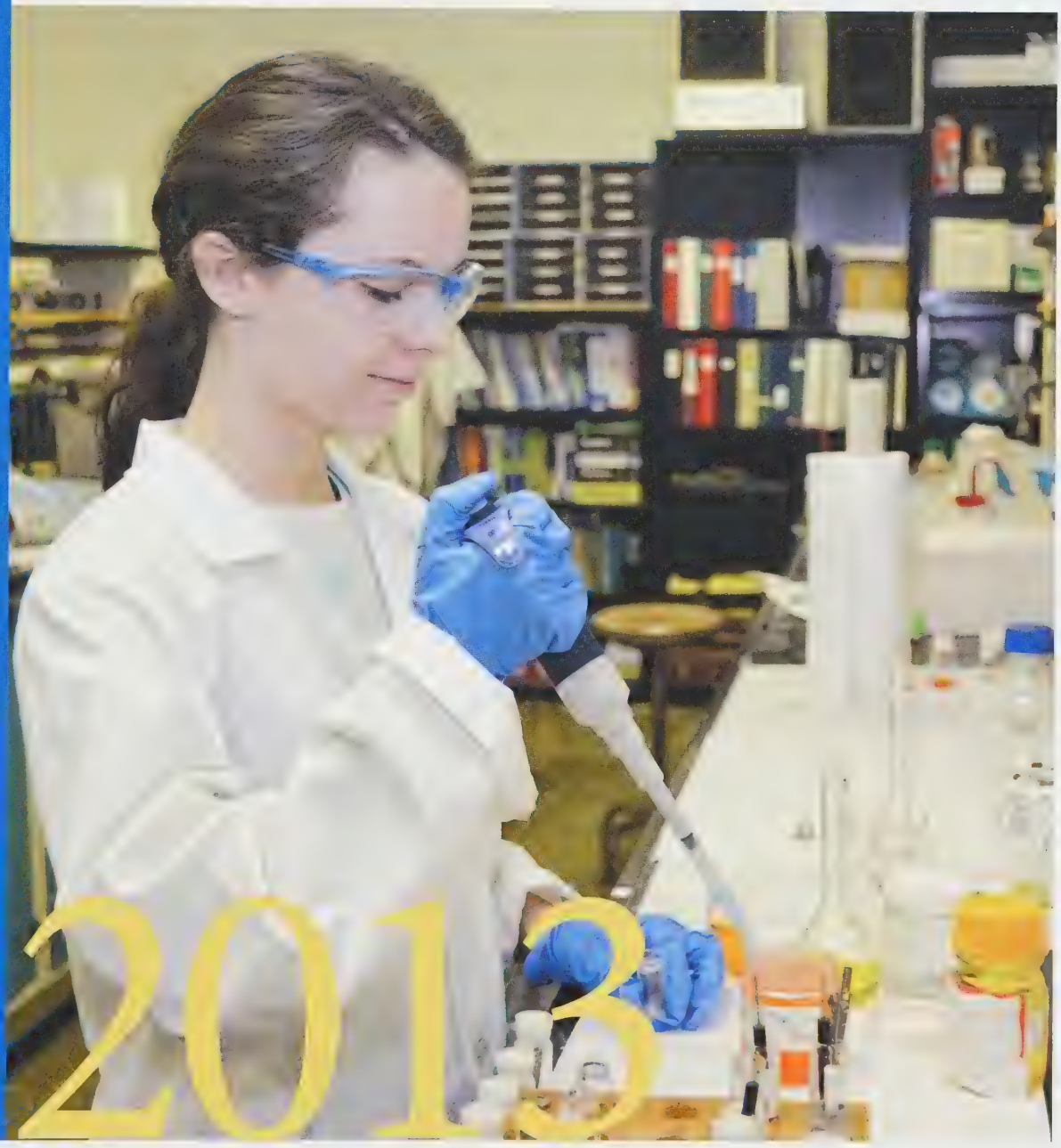
1155 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036

ACS Chemistry for Life®

American Chemical Society

Project SEED
Program Summary

Hands-On Research for High School Students



2013

Chevron - California Local Section

CONTENTS

Project SEED Mission Statement

"To assure that students from economically disadvantaged backgrounds have opportunities to experience the challenges and rewards of chemically-related sciences."

ACS Chemistry for Life®

Project SEED

Executive Summary

Chevron - California Local Section

For 45 years, ACS Project SEED has offered to nearly 9,400 high school students from economically disadvantaged families the opportunity to experience a career in chemistry-related sciences. The program places students in academic, industrial, or governmental laboratories for 8 to 10 weeks during the summer to engage in hands-on science research projects with volunteer scientists. Project SEED Summer I and II students receive individualized attention, as each mentor supervises only one or two students, they discover their ability to learn new skills, develop self-confidence, learn what advanced study is like, and develop a greater interest in scientific and technical areas. Annual exit student surveys indicate that the program continues to stimulate students' interest in science: 83% of the participants reported that the program helped them decide to pursue a career in chemistry-related sciences, 79% plan to go on to higher education and 97% indicate that Project SEED helped them to develop skills and abilities.

This summer, a record number of 493 volunteer scientists and coordinators mentored 442 students, 111 of them Summer II students, in nearly 150 institutions in 36 states, the District of Columbia, and Puerto Rico. To showcase their summer experience, 13 Project SEED students from the Georgia, Indiana, Kansas City, and Pittsburgh local sections presented their summer research at the ACS fall national meeting Sci-Mix poster session. (See pages 4-20.) The total student stipend cost was $1,160,500, supported through funding received from the ACS Project SEED Endowment, industries, foundations, academic institutions, ACS local sections, and ACS friends and members. (See pages 34-37.) ACS provided student stipends and paid all administrative costs.

Since 1993, a total of 576 Project SEED alumni who decided to continue in a chemical science major won a first-year, non-renewable college scholarship of up to $5,000. The scholarships are designed to assist students in their transition from high school to college. The scholarships were funded through the generosity of Alfred and Isabel Bader, Ashland Inc., the Bayer Foundation, the Russel J. Fosbinder Endowment, and the Glenn and Barbara Ullyot Endowment. In 2013, Project SEED awarded 28 scholarships. (See pages 21-25.) In addition, three Project SEED college scholars received the Ciba Specialty Chemicals scholarships for three renewable years beginning in their sophomore year.

ACS Project SEED attributes its 45 years of success to the synergy created by partners committed to ensuring the future vitality of the chemical enterprise through our country's pool of talented, but economically disadvantaged, young people who experience a career in chemistry-related sciences and, ultimately, hope for a better future. Thank you to our mentors and their supporting institutions, volunteer coordinators, our members, and a myriad of financial supporters. We are grateful for your support and generosity!

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students

ALABAMA

Jacksonville State University, Nixon Mwebi
Nixon Mwebi
Donna Perygin

Summer I
Stephanie Benefield
Aisha Gladden

University of Alabama, Huntsville, Emanuel Waddell
Emanuel Waddell

Summer I
Keyana Lewis

ARIZONA

Northern Arizona University, Suman Sirimulla
Andrew Koppisch

Summer I
Dakota Bizoti

CALIFORNIA

California State University, Los Angeles, Linda Tunstad
Ray Garcia
Linda Tunstad
Carlos Gutierrez
Krishna Foster

Summer I
Angel DeLeon
David Galvan
Steven Gonzalez
Fernanda Perez

California State University, Los Angeles, Frank Gomez
Robert Vellanoweth
Alison McCurdy
Frank Gomez

Summer I
Alfredo Arroyo
Edgar Ayala
Betsy Garcia

Summer II
Zachary Perez

Chevron, Elaine Yamaguchi

Summer I

Florence Wu, FeiFei Han	Aemtek, Inc.	Tim Au
Kenneth Forbes	Ashland Distribution Company	Ramiro Guzman Parra
Monika Sommerhalter	California State University, East Bay	Van Huynh
Tao Wei Michael Cheng Yaya Zhu	Chevron Energy Technology Company	Roberto Bernal Lisbet Martinez Petro Shevtchenko
Brendan Miller Lesley Koteles	Chevron Oronite Company LLC	Adelaide Jem Thu Tran
Mike Long	Chevron Products Company	Claudia Gutierrez
Jason Yee	L&L Dental Ceramics	Zijun Liang
Gennady Borinshteyn	Libby Laboratories, Inc.	Palden Jamyang, Tsz Yan Ng
Maggie Woodhouse Michael Freeling	Michael Freeling and Research Group	Timothy Zhong
Andrew Ichimur Robert Yen, Bruce Macher Zheng-Hui He	San Francisco State University	Chang Soo Kim, Amy Lee Ashley Lopez Francisco Ortiz

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
Patrick Morrison	Smith-Emery Company		Tommy Liao
Christine Isborn Patti LiWang, Andy LiWang	University of California, Merced		Mary Kemphaus Amy Vang
Ryan Moffet Jerry Tsai Jianhua Ren Mark Brunell	University of the Pacific		Tosha Monroe Quang Cao, Alyssa Rojas Denisha Hill Christian Lara
Gary Banuelos Maria Clemencia Zambrano Jianchi Chen	USDA-ARS Water Management Research Laboratory		Gabriel Bostic Angela Rivas
Betty Jane Burri	USDA Western Human Nutrition Research Center		Jade Tso
Jennifer Bragg Luisa Cheng Colleen McMahan, Byung-guk Kang, Niu Dong Ron Haff, Eric Jackson Xiaohua He John Beck Sarah Thorne, Dominic Wong	USDA Western Regional Laboratory		Carina Dimas Maya Godfrey Joshua Lenhardt, Braulio Perez Melissa Zaragoza Jeremiah Vongsa Brianna Williams Silvia Xie
			Summer II
Damon Lisch	Michael Freeling and Research Group		Winny Chan
Ken Nelson	Chevron Oronite Company LLC		Maria Gonzalez-Asig
Chul Kim	California State University, East Bay		Hau Truong
Ting Xu	University of California, Berkeley		Eileen Wu
Patti LiWang Erik Menke	University of California, Merced		Rahel Demissie Kristy Verma
John Livesey Michael McCallum	University of the Pacific		Sami Nand Mary Tran
Rialto High School, Stephen Kobernik			
Co-coordinator – James Hammond			**Summer I**
Lelia Hawkins	Harvey Mudd College		Katherine Gonzalez
Stanford University, Kaye Storm			**Summer I**
Fernando Novoa Andrew Spakowitz Yan Xia Nathan Luehr			Vi Le Thao Luong Maria Nguyen Alan Yee
The Scripps Research Institute, Dawn Eastmond			
Co-coordinator – Suzanne Russell			**Summer I**
Elizabeth Thomas Kurt Wuthrich, Pedro Serrano-Navarro Floyd Romesberg, Jorg Zimmermann Hyung Yong Jin, Changchin Xiao			Camille Considine Marchelle Meza Triet Pham William Wey

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
University of California, Davis, Shota Atsumi			
Shota Atsumi			**Summer I**
Louise Berben			Pangying Her
			Aiza Tariq
			Summer II
Kirill Kovnir			Maverick Bellard
Carlito Lebrilla			Van Vo
COLORADO			
Colorado State University, Pueblo, David Dillon			**Summer I**
Sandra Bonetti			Carisa Medina-Abrajan
Matthew Cranswick			Brooklynn Trujillo
DISTRICT OF COLUMBIA			
Chemical Society of Washington, Ajay Mallia			**Summer I**
Adelina Voutchkova-Kostal	George Washington University		Michaela Berger
Vladislav Sadtchenko			Ta-Chung Mou
Akos Vertes			Minh Nguyen
YuYe Tong	Georgetown University		Richard Castro
Richard Weiss			Ellen Kim
Jennifer Swift			Hyo Joung Kim
Travis Holman			Joshua Yoo
Marie-Christine Daniel-Onuta	University of Maryland Baltimore County		Angela Chan
Willie Vann	Center for Biologics Evaluation & Res., FDA		Ji Whae Choi
Zeeshan Ahmad	National Institute of Standards		Harliv Kaur
Fenella France	Preservation Research and Testing Division		Linhchi Nguyen
Zhihong Nie	University of Maryland		Sang Ho Jee
Andrei Vedernikov			Sulin Wu
			Summer II
Kaveh Jorabchi	Georgetown University		Seong Jang
Timothy Warren			Vivian Mensah
Willie Vann	Center for Biologics Evaluation & Research, FDA		Alejandra Torres-Diaz
Daron Freedberg			Diego Torres-Diaz
DELAWARE			
College of Engineering University of Delaware, Melissa Jurist			
Co-coordinator – Michael Vaughan			**Summer I**
Karl Booksh			Breanna Johnson, Luis Sedano
Cecil Dybowski			Paul Muspratt
			Summer II
Thomas Epps			Victoria Muir

2013 PROJECT SEED SUMMER PROGRAMS

Mentors Institutions Coordinators Students

DuPont Central Research & Development, Sharon Haynie
Sharon Haynie

Summer I
Justin Simmons

University of Delaware, Joel Rosenthal
Joel Rosenthal

Summer I
Andreas Elterich
Eric Walker

FLORIDA

Barry University, George Fisher
Rajeev Prabhakar University of Miami

Summer I
Romeo Umana
Alexandria Velez

The University of Tampa, Glenroy Martin
Glenroy Martin

Summer I
Cameron McKenzie
Monica Moore

GEORGIA

Clark Atlanta University, Ishrat Khan
Co-coordinator – James Reed
Ishrat Khan, James Reed, Larry Wang
Michael Williams
Myron Williams

Summer I
Caria Evans
Nigel Hunter
Demba Kah

Georgia State University, Suri Iyer
Alfons Baumstark
Hao Xu
Suazette Mooring
Joan Mutanyatta-Comar

Summer I
Taylor Adkins
William Hardy
Maleka Walker
Eric Ward

Gangli Wang

Summer II
Linwood Kennon

IDAHO

Boise State University, Don Warner
Don Warner
Ken Cornell
Jeunghoon Lee

Summer I
Frank Gigray
Aubrey Thomas
Samantha Ward

Idaho State University, Andrew Holland
Caryn Evilla
Joshua Pak
Rene Rodriguez
Todd Davis

Summer I
Jordan Childs
Autumn Clark
Sarah Finch
Benjamin Poulter

Andrew Holland

Summer II
Jacob Tennant

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students

ILLIONIS

Chicago Local Section, ACS, Tracey Braun

Richard Holz	Loyola University Chicago	**Summer I** Imran Khan Jennifer Ramirez
Dali Liu	Loyola University Chicago	**Summer II** Kristen Alanis
Keith Kostecka	Columbia College of Chicago	Lyba Zia

Illinois State University, David Cedeno

Marjorie Jones		**Summer II** Alexus Rusk

Southern Illinois University, Gabriela Perez-Alvarado

Colleen Scott Michael Lydy		**Summer II** Brian Suarez Brooke Nosovitsky

INDIANA

Indiana Local Section, ACS, Elmer Sanders

Michael Chouinard Jirong Lu David Varie Michael Statnick Zhenqi Shi Sze Wing Wong Anthony Borel Mark LaPack	Eli Lilly and Company	**Summer I** Jessica Duke Mikaela Greer Catherine Jones Jade Keane Stephan Mitchell NataLeigh Mosely Moda Nyema Seth Reasoner
Damon Carl	Heritage Research Group	Judy Maina
John Goodpaster Steve Presse Gabe Filippelli, Deborah Nichols Bruce Ray James Marrs Rajesh Sardar Stephen Wasall	Indianapolis University Purdue University School of Science	Abimola Akintomide Daniel Phillips Ephnaim Belayneh Christina Ho Sarah Liantu Mayra Llamas Sonali Mali Van Thawng
Ann Kimbel-Hill Hiremagalur Jayaram Christophe Poirier, Irina Petrache	Indiana University School of Medicine	Michael Araya Malcom Cabello Phuong Nguyen
Chi-kin Charles Chow Jirong Lu Jesus Gutierrez	Eli Lilly & Company	**Summer II** Lindsay Egan Nathan Kassab
Horia Petrache Jingzhi Pu James Marrs Anna Malkova	Indianapolis University Purdue University School of Science	Daniel Hnin Jacob Lucas Ryan Lucas Munajj Siddeeq

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
Purdue University, Bryan Boudouris			**Summer I**
Yu Xia			Carlos Gonzalez
Suzanne Bart			Gary Leonard
Jeffrey Greeley			Tristan Maxson
Chongli Yuan			Jordan Thorpe
Julie Liu			Maxwell Zubrenic
University of Notre Dame, Mary Prorok			
	Co-coordinator – Phillip Bays		**Summer I**
William Boggess	Mass Spectrometry and Proteomics Facility		Carlton Gary
Michelle Joyce			
Robert Stahelin	Indiana University School of Medicine-South Bend		Zachary Manriquez
Seth Brown	University of Notre Dame		Kateri Chabot
Holly Goodson			Ariel Meece
Vlad Iluc			Lorenzo Murillo
Reginald Hill			Sharon Njeri
Laurie Littlepage			Nicole Osborne
Bradley Smith			Sarah Stroud
Haifeng Gao			Grace Thomas
Franklin Tao			Ryan Tucker
IOWA			
Iowa State University, Javier Vela			**Summer I**
Emily Smith			Maria Abigail Contreras
Javier Vela			Fatmata Jalloh
			Summer II
Malika Jeffries-EL			Luis Martinez-Patino
KANSAS			
Wichita State University, Syed Taher			**Summer I**
Syed Taher			Keison Bakhtiar
			Syed Shawn
KENTUCKY			
Western Kentucky University, Yan Cao			**Summer I**
Yan Cao	Institute for Combustion Science and Environmental Technology		Jack Broaddus
			Julia Gensheimer
Western Kentucky University, Eric Conte			**Summer I**
Eric Conte			John Biechele-Speziale
LOUISIANA			
McNeese State University, Omar Christian			**Summer II**
Omar Christian			Zeadrick Williams

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students

MARYLAND

Morgan State University, Louise Hellwig

Yousef Hijji

Summer I
Corshai Williams

Mount St. Mary's University, Christopher Bradley

Christopher Bradley

Summer I
Brianna Summers

University of Maryland Eastern Shore, Jennifer Hearne
Co-coordinator – Uche Udeochu

Victoria Volkis

Summer I
Iyanuoluwa Ahmed

MASSACHUSETTS

Stonehill College, Cheryl Schnitzer

Louis Liotta

Summer II
Ladan Aden
Joseph Maglio

MICHIGAN

Calvin College, Mark Muyskens

David Benson
Larry Louters

Summer I
Tempestt Anderson
Markayla Johnson

Chad Tatko

Summer II
Alexandra Bogner

Delta College, Bernadette Harkness

Kyle Cissell — Saginaw Valley State University
Jennifer Chaytor
Tami Sivy

Summer I
Courtney Bodrie
Kaele Edsall
Travis Hahn

Anja Mueller — Central Michigan University

Summer II
Ashley Plank

Eastern Michigan University, Harriet Lindsay
Co-coordinator – Maria Milletti

Vijay Mannari
Hedeel Evans

Summer I
Vlad Marcu
Cassidy Morton

Harriet Lindsay

Summer II
Halle Thomas

Henry Ford Community College, Keith Williams

Wen Li — Wayne State University
Howard Matthew
G. Andres Cisneros
Matthew Allen

Summer II
Nadim Bari
Al-Tahbee Hassan
Mumtahena Kadir
Malaysha White

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
Kalamazoo Local Section, ACS, Donald Schreiber			
Gelert Mezei	Western Michigan University		**Summer I** Robert Calco
Ramakrishna Guda Sherine Obare			**Summer II** Mikayla Markus Tayler Martin
Michigan State University, Chrysoula Vasileiou			
Robert Maleczka Dana Spence William Wulff James Jackson Babak Borhan			**Summer I** Mona Balla Cara Jackson Alexandra Marinez Juwahir Mohamud Sareena Withers
Kevin Walker John Frost J. Geiger Merlin Bruening			**Summer II** Asha Abdulahi Basma Al-Masraf Audrey Tappenden Gilliam Tappenden
MINNESOTA			
University of Minnesota, Paul Boswell			
George Barany Lee Penn Jerry Cohen Christian Thill Mark Distefano Philippe Buhlman Jane Wissinger Wayland Noland			**Summer I** Mo Chang Houachee Lee Jiaoyang Li Nicolina Mao Rafael Mendoza Malsee Moua Rosemary Olatumbosum Brian Yang
Paul Boswell			**Summer II** Panhia Yang
University of Minnesota-Morris, Ruben Ceballos			
Ruben Ceballos Ted Pappenfus, Jenn Goodnough			**Summer I** Natalia Batchenkova Calley Hickman
MISSOURI			
Kansas City Local Section, ACS, Eckhard Hellmuth			
Nathan Oyler Anthony Caruso James Durig	University of Missouri - Kansas City		**Summer II** Thuong Nguyen Charles Paquet
University of Missouri, Saint Louis, Keith Stine			
Eike Bauer Keith Stine			**Summer I** Doaa Alkhaleeli Truan Le

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students

MISSISSIPPI

The University of Southern Mississippi, Douglas Masterson

Douglas Masterson
Vijay Rangachari
Faqing Huang

Summer I
Jamarii Robinson
Clintisha Sellers
Shelby Thames

MONTANA

University of Montana, Earle Adams

Edward Rosenberg

Summer II
Tristan Tanner

NEW HAMPSHIRE

Dartmouth College, Ivan Aprahamian

Ivan Aprahamian

Summer I
Audrey Wakefield

NEW JERSEY

Bayonne High School, Marie Aloia

Marie Aloia

Summer I
Abanoub Boules
Abdelrahman Noubani

East Orange Campus High School, Sherene Stephens

Ravi Ravindra — New Jersey Institute of Technology
Carolyn Bentivegna — Seton Hall University

Summer I
Chukwuebuka Dike
Olguine Paul

Urs Jans — City College of NY
Bishambar Dayal — New Jersey Medical School

Summer II
Jacqueline Chou
Jironia Noelvil

Fairleigh Dickinson University, Marion McClary

Marion McClary

Summer I
Catherine Elia
Jonathan Guerrero

Fordham University, Susan Fahrenholtz

James White — Rutgers University
Michael Jaffee — New Jersey Institute of Technology
Danielle Vilanil
Yves Robert Personna
Chitra Narayanan
Cristiano Dias

Summer I
Rempee Kalia
David Marshall

Danny Tandaza
Jolarys Torres
Terrence Williams

David Ribnicky — Rutgers University

Summer II
Yanet Marroquin

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
High Tech High School, Nina Lavlinskaia			
Svetlana Sukhishvil	Stevens Institute of Technology		**Summer I**
Woo Young Lee			Yousef Abdelmotaal
			Daniel Hernandez
Yuhao Wang			**Summer II**
Hongjun Wang			Joyce Elias
			Antoinette Robustelli
New Brunswick Health Sciences Technology High School, Andre Bridgett			
Thomas Hartman	Rutgers University		**Summer I**
Thomas Leustek	Rutgers University, Cook College		Julibeth Hernandez
Don Schaffner	Food Risk Analysis, Rutgers University		Irving Vizcaino
			Thais Pantaleon
Lisa Klein	Rutgers University		**Summer II**
			Nanaama O'Hene
New Jersey City University, Kenneth Yamaguchi			**Summer I**
Kenneth Yamaguchi			Claudia Mendoza
			Natalie Moncayo
Robert Aslanian			Brian Villarreal
New Jersey Health Foundation, Yaakov Saturen			**Summer I**
Mona Batish	New Jersey Medical School		Wesley Colon
Veronique Dartois	NJMS-Rutgers, the St. Univ. of NJ		Mike Salas
Abraham Pinter	PHRI-Center of the NJMS		Robert Smith
William Honnen			
Neeraj Chauhan			Janell Good
New Jersey Institute of Technology, Reginald Tomkins			**Summer II**
Gordon Thomas			Julmar Holguin
Treena Arinzeh			Angie Molina
New Jersey Institute of Technology, Leslie Williams			**Summer I**
Stephanie Maruca, Treena Arenzeh			Anabel Guerra Estevez
Tian Yu			David Franco
			Terry Wulff-Tagoe
North Jersey Local Section, ACS, Bernice Feuer			**Summer I**
Alexis Rodriguez	Rutgers University, Newark		Rafael Nunez
Luis Avila, Tudor Spataru	Columbia University		**Summer II**
			Hany El-Adle
North Jersey Local Section, ACS, Bobbi Gorman			**Summer I**
Thomas Hartman	Rutgers University		Concepcion Astudillo
James White			
Princeton University, Rodney Priestley			**Summer I**
Rodney Priestley			Lisa Burton

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
Ramapo College of New Jersey, Carol Frishberg			**Summer I**
Sandra Suarez			Johan Guzman
William Mitchell			Sami Karmeh
Thomas Owen			Latoni Leary
			Shatoni Leary
Rider University, Danielle Jacobs			**Summer I**
Bruce Burnham			Daisy De Paz
Danielle Jacobs			Nneka Onukwugha
Feng Chen			Nahomie Possible
Rowan University, Gregory Caputo			**Summer I**
Lark Perez			Maribel Juarez
Timothy Vaden, Lei Yu			Emily Mancini
Rutgers University, Piscataway, Shaneika Nelson			**Summer I**
Jing Li	Rutgers, The State University of New Jersey		Aaminah Bhat
			Karif Roper
			Summer II
Lawrence Williams			Marjorie Castro
Ralf Warmuth			Tomas Giraldo
Rutgers University, Newark, W. Huskey			**Summer I**
Frieder Jaekle			Afia Boateng, Dalvin Sejour
Michele Pavanello			Mary Ortiz
Huixin He			Claudia Torres
Darren Hansen			Ebeny Torres
Rutgers, The State University of New Jersey, Deborah Stalling			**Summer I**
Yaoping Lu			Andres Fernandez
Renping Zhou			Vinay Doshi
Science Park High School, Mridula Bajaj			**Summer I**
Alokik Kanwal	New Jersey Institute of Technology		Nana Boachie
			Summer II
N. M. Ravindra			Danielle Peart
Seton Hall University, Cecilia Marzabadi			**Summer I**
Anna Ivasko			Julie Attys
Nicholas Snow			Monique Iluonokhalumhe
Mithileshe Desphande			Kalkidan Yimer
			Summer II
Nicholas Snow			Judeline Noelvil
John Sowa			Chelsie Riche
			Chiamaka Udoye

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
UMDNJ-Medical School, Allene Johnson			
Katina Shafer	Rutgers University-Newark		**Summer I** Michelle De Freitas
			Summer II
George Yap	UMDNJ-Medical School		Young Hun Kim
Alexander Soblevsky			
George Studzins			Veroniqe Raczkiewicz
David Ribnicky			
Union City High School Academy for Enrichment and Advancement, Mina Armani			
Rajesh Dave	New Jersey Institute of Technology		**Summer I** Olvis Hernandez
Christopher D'Ambrose			Maryann Moquete
Union City High School Academy for Enrichment and Advancement, Nadia Makar			
Michael Jaffee	New Jersey Institute of Technology		**Summer I** Alejandra Alcantara
			Tania Mejia
Ravi Ravindra			Willear Glimniene
Bruce Bukiet			Ravindu Gunawardana
Trevor Tyson			Michelle Ling, David Villacis
Lisa Axe			Lorraine Nunes
Xianqin Wang			Rina Rosales
Heping Zhou	Seton Hall University		David Arteaga
Joseph Lopez			Joaquin Melara
Stefan Strauf	Stevens Institute of Technology		Nix Benitez
			Anthony Leon
Stavroula Sofou	Rutgers University		Nicole Broncales, Julio Rivas
James Simon			Jael Estrada
Joseph Wilder			Johanna Gordillo, Jessica Yubi
Marc Cohen	Beth Israel Medical Center		Carol Chacon, Kristy Loricka
William Montgomery	New Jersey City University		Jennifer Chunchi
Robert Aslanian			Carlos Pozas
Kevin Olsen	Montclair State University		Precious Martinez
Luisa Marcos	Union City High School/AEA		Kevin Melendez
James Link	Princeton University		Angelo Villanueva
			Summer II
Bruce Bukiett	New Jersey Institute of Technology		Mavelyn Boza
William Hammond			Victor Chiliquinga
Chung Yang	Rutgers University		Arleni Liriano
James Simon			Jezabel Nunez
Gregory Herzog			Kailyn Rodriguez

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
Howard Stone	Princeton University		Kevin Romero
Philip Leopold	Stevens Institute of Technology		Stephanie Cuaycong Jimmy Villafuerte Fabian Mantilla Sherilyn Nunez Iroshi Seneviratna Eddie Torres
Svetlana Sukhishvilli Hongjun Wang			
Tsan-Liang Su			
Kevin Olsen	Montclair State University		Gissela Vega

NEW YORK

Ellis Preparatory Academy, Jeremy Heyman

Michael Ward Bart Kahr	New York University	**Summer I** Chi Nguyen, Leonel Severino Kelvin Rivera
Colin Nuckolls	Columbia University	**Summer II** Andres Flamenco

George Washington Carver High School for the Sciences, Janice Sutton

Alison Hyslop	St. John's University	**Summer II** Monet Schultz Ashley Walters

Prospect Park Alliance, Charmion Browne

Christopher Blaszczak-Boxe	Medgar Evers College of the City University of New York	**Summer I** Shamika Gentle

Rochester Local Section, ACS, Lea Michel

Gabrielle Gaustad John-David Rocha	Rochester Institute of Technology	**Summer I** Tamia Jones Caleb Whittier

NORTH CAROLINA

North Carolina Local Section, ACS, Kenneth Cutler

Melissa Pasquenelli	North Carolina State University	**Summer I** Timothy Chen
Alan Tonelli	North Carolina State University	**Summer II** Miles Ndukwe
Jeffrey Johnson	University of North Carolina-Chapel Hill	Michael Zhou

University of North Carolina, Charlotte, Tom Schmedake

Michael Walter		**Summer I** Randy Rodriguez
Daniel Rabinovich		**Summer II** Aubrei Fowler

2013 PROJECT SEED SUMMER PROGRAMS

Mentors **Institutions** **Coordinators** **Students**

OHIO

Akron Local Section, ACS, Tama Drenski

Thomas Leeper — University of Akron
Yu Zhu
Chrys Wesdemiotis
Chris Ziegler
Abraham Joy
Jia Li

Summer I
Lilith Freed
Arielle Hooks
Wynter Mason
Maddison Merritt
Ta-Lor Payne
Mariah Wilson

Charles Moorefield, George Newkome

Summer II
Roseanna Helmick

Case Western Reserve University, Carlos Crespo-Hernandez

Sichun Yang
Rajesh Viswanathan
Anna Samia
Carlos Crespo-Hernandez

Summer I
Ayah Abed
Q'Nyjah Britton
Vy Lam
Raymond Santiago

Lei Zhu

Summer II
Julie De La Pena

University of Cincinnati, Hairong Guan

Laura Sagle
Anna Gudmundsdottir
Hairong Guan
James Mack

Summer I
Di'Rajia Evans
Keye'sha Graham
Lindsey Steele
Bna Waldon

Peng Zhang

Summer II
Thomas Houston

University of Toledo, Andy Jorgensen

Cora Lind-Kovacs
Jianglong Zhu
Jared Anderson
Wendell Griffith
Ronald Viola
Dragan Isailovic

Summer I
Pablo Alvarez
Mikayla Becker
Tashiana Carnes
Emmanuel Fevecque
Deborah Okeke
Shival Sinha

Youngstown State University, Sherri Lovelace-Cameron

Sherri Lovelace-Cameron

Ruigang Wang

Summer II
Acealeyah Dothard
Cheryle Reve
Shannon Sharp

OREGON

Eastern Oregon University, Anna Cavinato

Anna Cavinato

Summer I
Jessica Nava

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students

Portland Local Section, ACS, Angela Hoffman
Carl Wamser, Angela Hoffman — Portland State University

Summer I
Henry Ha
Vy Le

PENNSYLVANIA

Duquesne University, Jennifer Aitken
Ralph Wheeler
Jeffry Madura
Stephanie Wetzel
Jacilynn Brant

Summer I
Melissa Fowkes
Deion Grant
Kelly Pesta
Cheyenne Simmons

Summer II
Emily Janicki
Charles Thornton

Kimberly Rosmus
Partha Basu

The Forensics Mentors Institute, Barry Logan
Mandi Arntson, Warren Korn
Angelic Wray
Bryant Roberts
Bronwen Stevens

Summer I
Brittni Deadrick
Grace Pak
Bryant Roberts
Malik Sylla

PUERTO RICO

University of Puerto Rico, Ingrid Montes
Arthur Tinoco
Carlos Cabrera

Summer I
Siul Jesus Munoz Serrano
Ricardo Ramos

Summer II
Kamylle Lamboy-Cruz
Leysa Lopez-Gonzalez

Jorge Colon
Jose Prieto

SOUTH CAROLINA

University of South Carolina, Chuanbing Tang
Qian Wang
Andrew Greytak
Ken Shimizu

Summer I
Briana Abraham
Paolo Milan
Lindsey Smith

Summer II
Eboni Drake
Cody Maddox
Tina Monzavi

Hui Wang
Linda Shimizu
Brian Benicewicz

Winthrop University, Nicholas Grossoehme
Cliff Calloway
Robin Lammi, Jay Hanna
Jason Hurlbert

Summer I
Daisha Holton
Jason Jones
Alana Rosa

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students

TENNESSEE

Middle Tennessee State University, Paul Van Patten
Paul Van Patten

Summer I
Hannah Alsup
Morgan Brewer

The University of Memphis, Ted Burkey
Abby Parrill
Xiaohua Huang
Xuan Zhao

Summer I
Diana Azcarate
Xavier Greer
Marka'us Hackett

TEXAS

Baylor College of Medicine, Oluwatoyin Asojo
Bert O'Malley
Kjersti Aagaard-Tillery
David Rowley
Oluwatoyin Asojo
Francesco DeMayo

Summer I
Jasmine Carino
Willa Hong
Jordan Jones
Gonteria Robinson
Rubi Valenzuela

Greater Houston Local Section, ACS, Carolyn Burnley
Gina Chiarella — Prairie View University
Hua-Jun Fan
Yingchun Li
Gina Chiarella
Aderemi Oki

Summer I
Me'Kelle Caballero
Erick Castillo
Tamar Johnson
Deshuntrice Jones
Edwin Rodriguez, Kevin Yee

B. Montgomery Pettitt — University of Texas Medical Branch
David Thompson — Sam Houston State University

Ashton Cooper, Denwis La
Kelly Gray, Xavier McNeil

Ognjen Miljanic — University of Houston

Summer II
Christine Mai

San Antonio Local Section, ACS, E. Robert Fanick
Ratna Vadlamudi — University of Texas Health Science Center at San Antonio
Zachary Tonzetich — University of Texas San Antonio
Kelly Nash

Summer I
Jocelyn Hernandez Vasquez

Nicanor Muzquiz
Cheyenne Silva

Maoqi (Mark) Feng — Southwest Research Institute

Jesus Perez

Michelle Bushey — Trinity University
Carol Ellis-Terrell — Southwest Research Institute

Summer II
Monette Cardona
Cristian Verdi

University of Texas at Tyler, Neil Gray
Neil Gray, Sean Butler
Blake Bextine
Tanya Shtoyko, Rachel Mason

Summer I
Sarah Shupe
Manshaya Thapa
Jasmine Young

Neil Gray, Sean Butler

Summer II
Matthew Coker

2013 PROJECT SEED SUMMER PROGRAMS

Mentors	Institutions	Coordinators	Students
William B. Travis High School, Jack Jones			
Stacia Rodenbusch	University of Texas at Austin		**Summer I** Christopher Castelan Diana Trujeque
Christopher Sullivan Jon Pierce-Shimomura			**Summer II** Jacqueline Landa Noel Villegas
VIRGINIA			
Institute for Advanced Learning & Research, Tonya Mills			**Summer I** Reshona Blount
James Ciszewski			
VERMONT			
University of Vermont, Rory Waterman			**Summer II** Dylanger Pittman Chi Zhou
William Geiger Jose Madalengoitia			
WISCONSIN			
Medical College of Wisconsin, Michael Mathias			**Summer I** Marisol Madrigal
John Corbett			
Neil Hogg			**Summer II** Cha Lee
University of Wisconsin, Milwaukee, A. Andrew Pacheco			**Summer I** Derek Mizell
A. Andrew Pacheco, Natalia Stein			
WEST VIRGINIA			
Marshall University, Brian Day			**Summer I** Jared Davis
Michael Norton			
Brian Day Derrick Kolling			**Summer II** Tatiana Mickles Dakota Nicely
West Virginia School of Osteopathic Medicine, Kristie Bridges			**Summer I** Garrett Clemons
Kristie Bridges			

2013 Project SEED
College Scholarship Recipients

CONGRATULATIONS!

Project SEED awards a first-year non-renewable college scholarship of up to $5,000 to Project SEED alumni who are planning to continue a career in chemical sciences. The scholarships are designed to assist students in their transition from high school to college.

In 2013, Project SEED awarded 28 scholarships.

2013 Project SEED College Scholarship Recipients

Alfred and Isabel Bader Scholars

Alfred Bader is one of the founders of the Aldrich Chemical Company (1951), today Sigma-Aldrich Corporation. Alfred and Isabel Bader have generously contributed to Project SEED over the years. In 1992 their support started the Summer II program and have since 1997 supported the Project SEED college scholarship. Through their contributions, they have helped nearly 350 Project SEED Alumni. The following are the 20 students sponsored by the Baders for the 2013-2014 academic year.

Kristen Alanis
High School: Proviso East High School, Maywood, Ill.
SEED Institution: Loyola University Chicago, Ill.
SEED Mentor: Dali Liu
University: University of Illinois at Champaign
College Major: Biochemistry

Alexander Bogner
High School: North Muskegon High School, Mich.
SEED Institution: Calvin College, Grand Rapids, Mich.
SEED Mentor: Chad Tatko
University: Calvin College
College Major: Biochemistry

Hei Yu Chan
High School: Whitney M. Young Magnet High School, Chicago, Ill.
SEED Institution: Loyola University Chicago, Ill.
SEED Mentor: Richard C. Holtz
University: University of Illinois-Urbana
College Major: Biochemistry

Peixin (Amy) Chen
High School: Lowell High School, San Francisco, Calif.
SEED Institution: Smith-Emery Company, San Francisco, Calif.
SEED Mentor: Patrick Morrison
University: University of California, Santa Barbara
College Major: Biochemistry/Pharmaceutical Science

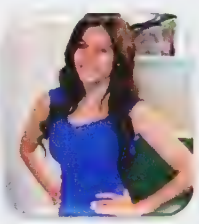
Mahruza Choudhury
High School: John F. Kennedy High School, Patterson, N.J.
SEED Institution: Ramapo College of New Jersey, Mahwah
SEED Mentor: Sandra Suarez
University: Rutgers University, New Brunswick, N.J.
College Major: Biomedical Engineering

Lindsay Egan
High School: Westfield High School, Ind.
SEED Institution: Eli Lilly & Company, Indianapolis, Ind.
SEED Mentor: Jirong Lu
University: University of Alabama, Tuscaloosa
College Major: Biochemistry

Caleb Faulkner
High School: Hattiesburg High School, Miss.
SEED Institution: The University of Southern Mississippi, Hattiesburg
SEED Mentor: Douglas Masterson
University: The University of Southern Mississippi, Hattiesburg
College Major: Chemistry & Biochemistry

Nzaniye Florence
High School: De La Salle North Catholic High School, Portland, Oreg.
SEED Institution: University of Portland, Oreg.
SEED Mentor: Angela Hoffman
University: Concordia University, Portland, Oreg.
College Major: Chemistry

Melissa Flores
High School: Robert E. Lee High School, Tyler, Tex.
SEED Institution: The University of Texas at Tyler
SEED Mentor: Neil Gray
University: University of Texas at Tyler
College Major: Chemistry


ALANIS


BOGNER


CHAN


CHEN


CHOUDHURY


EGAN


FLORES

2013 Project SEED College Scholarship Recipients

Alfred and Isabel Bader Scholars

Karina Guaman
High School: Union City High School, N.J.
SEED Institution: Rutgers University - Ernest Mario School of Pharmacy, Piscataway, N.J.
SEED Mentor: Nanjoo Suh
University: Drew University, Madison, N.J.
College Major: Biochemistry

Trinh Huynh
High School: Oakland High School, Calif.
SEED Institution: Western Regional Research Center, Albany, Caiif.
SEED Mentor: Andrew Breska
University: University of California, Berkeley
College Major: Pharmaceutical

Sidney Lin
High School: Galileo High School, San Francisco, Calif.
SEED Institution: San Francisco State University, Calif.
SEED Mentor: Weiming Wu
University: Amherst College, Mass.
College Major: Biochemistry

Dominique Mason
High School: Freire Charter School, Philadelphia, Pa.
SEED Institution: The Forensics Mentors Institute, Willow Grove, Pa.
SEED Mentor: Sarah Muller
University: Penn State University, Abington
College Major: Biochemistry

Afia Obeng
High School: St. Vincent Academy, Newark, N.J.
SEED Institution: PHRI Center-New Jersey Medical School, Newark, N.J.
SEED Mentor: Rinki Chauhan
University: Colby College, Waterville, ME
College Major: Biochemistry

Salomon Ramirez
High School: Omaha South High Magnet School, Omaha, Nebr.
SEED Institution: University of Nebraska Medical Center
SEED Mentor: Matthew Kelso
University: University of Nebraska-Lincoln
College Major: Food Science & Technology

Joi Stevens
High School: Saint Mary's Hall, San Antonio, Tex.
SEED Institution: Feik School of Pharmacy-University of the Incarnate World, San Antonio, Tex.
SEED Mentor: Adeola O. Grillo
University: Davidson College, N.C.
College Major: Biochemistry

Jacob Logan Tennant
High School: Century High School, Pocatello, Idaho
SEED Institution: Idaho State University
SEED Mentor: Andrew Holland
University: Idaho State University, Pocatello
College Major: Chemistry

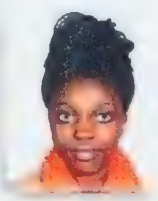
Mary Jane Tran
High School: Bar Creek High School, Stockton, Calif.
SEED Institution: University of the Pacific, Stockton, Calif.
SEED Mentor: Steffi Terrill
University: University of the Pacific
College Major: Biochemistry/Pharmaceutical Science

Dong Ying (Eileen) Wu
High School: Lowell High School, San Francisco, Calif.
SEED Institution: San Francisco State University, Calif.
SEED Mentor: Andrew Ichimura
University: University of California, Berkeley
College Major: Chemical Engineering

Lyba Zia
High School: Niles West High School, Skokie, Ill.
SEED Institution: Loyola University Chicago, Ill.
SEED Mentor: Daniel Becker
University: Loyola University Chicago
College Major: Biochemistry


HUYNH


LIN


OBENG


STEVENS


TENNANT

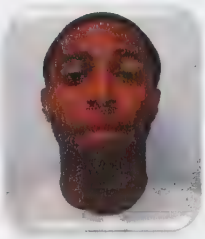

ZIA


WU

2013 Project SEED College Scholarship Recipients

Ashland Inc. Scholars

Ashland Inc. is a leading global company which provides specialty chemicals, technologies and expertise to customers worldwide. Ashland Inc. has sponsored six Project SEED alumni.



Mazi Richburg
High School: West Philadelphia Catholic High School, Philadelphia, Pa.
SEED Institution: University of Pennsylvania, Philadelphia
SEED Mentor: Na Zhang
University: Drexel University, Philadelphia, Pa.
College Major: Environmental Engineering

Brian Tran
High School: Delmar High School, Delmar, Del.
SEED Institution: University of Maryland Eastern Shore, Princess Anne
SEED Mentor: Victoria Volkis
University: University of Delaware, Newark
College Major: Chemistry

The Bayer Foundation Scholars

The Bayer Foundation is a research based company with major businesses in health care and life sciences as well as chemicals and imagining technologies. The Bayer Endowment established in 1993 has supported 63 Project SEED alumni.

Minh-Thu Phan
High School: Morrow High School, Ga.
SEED Institution: Clayton State University, Morrow, Ga.
SEED Mentor: Jonathan Lyon
University: Georgia State University, Atlanta
College Major: Chemistry

Kristy Verma
High School: Golden Valley High School, Merced, Calif.
SEED Institution: University of California, Merced
SEED Mentor: Erik Menke
University: Merced College, Calif.
College Major: Biochemistry

PHAN

VERMA

Van Vo
High School: Woodland High School, Woodland, Calif.
SEED Institution: University of California-Davis
SEED Mentor: Jincui Huang
University: University of California, Los Angeles
College Major: Chemistry

ACS
Chemistry for Life®

January 24, 2014

Drs. Alfred and Isabel Bader
2961 N Shepard Ave
Milwaukee, WI 53211-3435

Dear Alfred and Isabel,

I want to take this opportunity to express my sincere gratitude for your generous donation to Project SEED. Please take a moment to review the attached Program Summary detailing the accomplishments of this program made possible because of your support which is recognized on page 34.

In 2013, Project SEED achieved a new milestone—the highest number of volunteer mentors working with the students. These dedicated individuals not only open doors to the world of science but serve as role models instilling confidence, a solid sense of direction and the hope for a better future.

Your continued support will steer high school students on a pathway to a better life by exposing them to new educational and career possibilities. Thank you!

Sincerely,

Mary Bet Dobson

Mary Bet Dobson
Assistant Director

P.S. If attending an ACS National Meeting this year, I encourage you to visit Sci-Mix and experience firsthand the remarkable work of these promising young students.

American Chemical Society
1155 Sixteenth Street, NW Washington, DC 20036 T [202] 872 6210 F [202] 872 4604 www.acs.org/donate

2013 Project SEED College Scholarship Recipients

CIBA Specialty Chemicals Scholars

CIBA Specialty Chemicals was a global chemical company acquired by BASF in 2008. The Ciba Foundation made a generous legacy gift to establish the Scholars Endowment which expanded the one-year Project SEED college scholarships to a three year renewable scholarship. As of today, 6 of the 14 awardees have graduated in the chemical science.

Alison Logia is a sophomore at Stanford University, Calif. Alison is majoring in Chemical Engineering.

Soany Heredia is a sophomore at Stevens Institute of Technology, Hoboken, N.J. Soany is majoring in Chemical Biology.

Christian Ugaz is a sophomore at Saint Peter's University, Jersey City, N.J. Christian is majoring in Biochemistry.

The Estate of Elizabeth Ernest Fosbinder Scholars

A college scholarship endowment in honor of the late ACS member, Dr. Russel J. Fosbinder was established in 2004 stipulated funding of SEED graduates. The endowment has suported nine students.

Keon Ho Lim
High School: Millburn High School, N.J.
SEED Institution: Rutgers University, Piscataway, N.J.
SEED Mentor: David Case
University: Harvard University, Cambridge, Mass.
College Major: Chemistry

Christine Mai
High School: North Shore Senior High School, Houston, Tex.
SEED Institution: University of Houston, Tex.
SEED Mentor: Mike Matson
University: Rice University, Houston, Tex.
College Major: Natural Science

Project SEED Scholars

Pa Houa Cheng
High School: Stevens Point Area Senior High, N.J.
SEED Institution: University of Wisconsin-Stevens Point
SEED Mentor: Mike Zach
University: University of Wisconsin-Stevens Point
College Major: Chemistry

Levesa Lopez Gonzalez
High School: Jose Collazo Colon School, Juncos, P.R.
SEED Institution: University of Puerto Rico-Rio Piedras, San Juan
SEED Mentor: Jose Prieto
University: University of Puerto Rico, Rio Piedras
College Major: Biotechnology

MAI

LIM

LOPEZ

Student and Mentor

TESTIMONIES

Kristy Verma

"During my Project SEED research experience, I learned about many kinds of chemicals that I would enjoy working with to discover new cures to protect the human body. Getting the opportunity to do research in a chemistry lab provided me with the knowledge of different types of chemicals that may or may not harm you. The different types of chemicals in the chemistry lab made me realize how some chemicals help our body in a certain way, just the way certain chemicals can help make aluminum ion batteries. I want to be able to learn and work with different types of chemicals in the future. I already knew I had the motivation to become a doctor, but after my Project SEED research experience I was definitely sure I wanted to discover new cures as part of my career."

Kristy is majoring in chemistry at Merced College, Calif.

Erik Menke, Mentor
University of California, Merced

"From my perspective, Kristy is an excellent student. She is very hard working and motivated, and able to work independently. During her time here, she had very little help apart from running large instruments, yet made excellent progress, and would often take home reading, coming back the next day with questions about her project. In addition, she is very friendly and personable, and was well liked by everyone in the lab."

Christine Mai

"Project SEED helped me realize that researching something is more than just background information and numbers like what we learn in the classroom. It is learning more and improving new things with hands-on experiments that can impact the world. Project SEED has helped me realize that many scientists go unrecognized in the everyday world. Sure, everybody knows Einstein, but very few people can name the people who invented vaccinations. I have come to learn to respect this silent heroism during the internship and want to be part of it as my future career."

Christine is majoring in natural science at Rice University, Tex.

Michael L. Matson, Mentor
University of Houston, Downtown

"I can say the following with certainty about Christine: She is intellectually curious. Christine was constantly approaching me with questions about next steps and simple curiosity consistently throughout the project. She is a leader. She was a member of a five-student team, and despite having two undergraduates in the group, Christine was making executive decisions on behalf of the group. She coordinated and managed all the individuals working on the project very successfully. She is very creative. For her final assignment in the summer program, she developed an amazing poster/lecture that was both well beyond the scope of the material being presented and yet ensured it was relatable to the other high school members of the course through creative analogies. Christine will be successful wherever she goes."

Student and Mentor

TESTIMONIES

Minh-Thu Phan

"Project SEED has opened many doors for me and helped me grow as a student and person in general. I am grateful for this opportunity to participate in this program. Not only has this research experience given me the opportunity of working in a lab, but it has also provided me with a great deal of responsibility. It was a lot of hard work and determination. However, I was fascinated and interested in what I was doing, and thus enjoyed it. Many people are proud of me for sacrificing my summer to participate in this research experience, but I have never considered "sacrifice" as the word to describe my time here at Project SEED: It was an experience of a lifetime."

Minh-Thu is majoring in chemistry at Georgia State University.

Jonathan T. Lyon, Mentor
Clayton State University

"While in my laboratory, Minh-Thu always arrived to the laboratory on time, and would stay for the entire duration. She quickly learned how to navigate through a UNIX computer and perform theoretical chemical equations on a reaction path from methanol to synthesis gas on a metal catalyst. She also performed relevant literature searches, and studied topics related to the research that were new to her from her textbooks. Experimentally, she did a wonderful job helping to construct a reaction chamber for matrix isolation experiments. She was always eager to learn the next new topic or task."

Jacob Tennant

One of the many things I learned was how an actual chemistry lab compares to a high school chemistry lab. What I found from my experience in the actual lab was that you often didn't know what the result would be. Another thing that this experience taught me was how many of the things I thought were dangerous were actually quite harmless when used carefully and properly with respect. One of the things I was not expecting was how awesome, for a lack of a better word, the people (students and professors) were at the program. The people I actually worked with were probably my favorite part of the experience. The entire summer was extremely fun and enjoyable, and after it was over, I found that I couldn't wait to go back next summer if I were allowed."

Jacob is majoring in chemistry at Idaho State University.

Andrew Holland, Mentor
Idaho State University

"Jacob worked in my lab as a SEED student during the summer of 2012 and was as diligent and productive as most of the undergraduates I've worked with at ISE. I'm looking forward to his return this summer. Although Jacob certainly lacked some of the chemical knowledge of his more experienced colleagues, he readily learned what he needed to as he went along, and I am confident that his aptitude and work ethic will lead him to success in a chemistry degree program and well beyond."

Student and Mentor

TESTIMONIES

Melissa Flores

"My experience in Project SEED was extraordinary. I really liked that we got to do rotations with different professors of chemistry. With each rotation, we got to work on different projects and learned a little bit about what each professor specialized in. We did many different labs; it kept us busy and very interested in all the new things we got to see. We made fmoc-gylcine and fmoc-alenine, and we made pealable polymers with sensor dyes. We got to perform titrations and did different types of chemiluminescent experiments and made nano rods and colloids. It was all so interesting, and it made me really appreciate all the hard work chemists have done to achieve these types of experiments."

This was such a great opportunity, and I'm so glad I was able to be a part of this extraordinary experience. It really helped me realize how versatile a background in chemistry can be to get a good job. It can help me apply to so many different kinds of careers. The SEED program is one of the best programs I have ever heard of, and I am so glad I was able to be a part of it this summer. My experience in the SEED program taught me so many new things. I never knew how much wait time was involved in making solutions and watching reactions, though it helped me learn to be more patient. It also helped me learn that I am really interested in chemistry, so much so that after high school, I am going to pursue a degree in chemistry. The program really opened my eyes to how much I can achieve going into a chemistry-influenced career."

Melissa is majoring in chemistry at University of Texas at Tyler.

Neil Gray, Mentor
University of Texas at Tyler

"Melissa participated in the SEED program in my research group. All of the faculty mentors were impressed by her professionalism, dependability, and sheer academic talent. She demonstrated an academic maturity that is well beyond a typical high school student. She worked hard in the lab, picked up techniques quickly, and developed an understanding of the chemistry that was surprising. This young lady has a natural knack for chemistry and the motivation to develop into a great university student. She contributes to the direction of the experimentation. She often demonstrates a level of critical thinking that is admirable for someone so early in her academic career. I think she will make a great college student."

Van Vo

"After my experience in a university research lab, I am certain that I want to dedicate my future to medicine and research. I believe that, with a combination of the invaluable medical knowledge of a physician and a mastery of chemistry as a researcher, I can contribute something truly valuable to not only our community but our society as a whole."

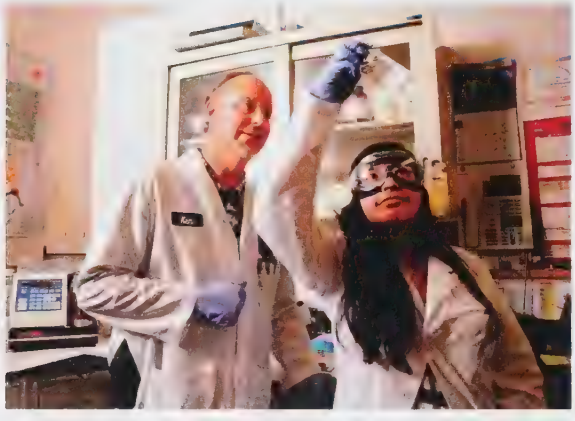
Van is majoring in chemistry at University of California, Los Angeles.

Jincui Huang, Mentor
University of California, Davis

"As her research mentor during this summer, I have observed Van become a superb lab student with good experimental techniques as well as presentation skills. Van was given a project to help me with the purification of one of the most abundant glycoproteins from human milk and the determination of the glycosylation of the protein lactoferrin. During the development of the method, she asked questions and suggested very nice ideas to validate the method. Additionally, she was also helpful not only with the experiment, but also with the analysis."

Summer I Students

SPEAKING FROM THE LAB



"I learned a lot of things in the lab that will benefit me in the future. Also, working with people who are experienced in this field really changed my point of view about science. I really enjoyed the summer program I definitely want to do it another year."

Clintisha Sellers, Miss.

"I am very grateful for Project SEED. Never once did I imagine myself where I am today. I am far more advanced and have a true passion for Chemistry. My fellow co-workers have taught me a lot. As for my mentor, she is a very dedicated individual."

Ashley Plank, Mich.

"Awesome program! It allowed me to experience lab work before I go to college. This program helps by giving you the opportunity to see if chemistry is for you or not."

Maria Abigail Contreras, Iowa

"Project SEED helped me develop my scientific persona and gave me the basic tools for my future life as a researcher."

Leysa Lopez, P.R.

"Project SEED is truly an excellent program. I worked in an organic chemistry lab at the University of Maryland over the summer. The professor and mentor were very dedicated, encouraging and motivating. Also the lab environment was very comfortable."

Sulin Wu, Md.

"Project SEED helped me develop my skills and helped me gain self-confidence. It also helped me develop an interest working as a researcher."

Marisol Madriga, Wis.

"I really enjoyed the experience I had in the program. Thanks to the influence of the supervising doctor, I plan to pursue an education and possibly career in chemistry."

Frank Gigray, Idaho

"It was great to be able to spend a second summer at Calvin College doing research. It prepared me for an advanced chemistry course next year as a freshman in college. My high school did not offer an AP Chemistry class, so this was extremely helpful."

Alexandra Bogner, Mich.

Summer II Students

SPEAKING FROM THE LAB

"I really enjoyed the program. My mentor was very helpful and the project was very interesting. I developed lab, research, and scientific writing skills, and worked at a much higher level than I ever have in high school."

Imran Khan, Ill.

"This program really made me realize that science is my passion and I want to pursue a job in the sciences when I graduate from college."

Melissa Fowkes-Palitti, Pa.

"Project SEED was a lot of fun. I learned a lot about science and gained a lot of lessons in responsibility and maturity."

Ryan Lucas, Ind.

"The SEED Project was such a great experience for me. Being able to do the research not only boosted my curiosity in the sciences, but it also helped me narrow down what college majors I am interested in, and what to look for in colleges."

Benjamin Poulter, Idaho

"I learned a lot of things in the lab that will benefit me in the future. Also, working with people who are experienced in this field really changed my point of view about science. I really enjoyed the summer program and I definitely want to do it another year."

Betsy Garcia, Calif.

"Could not ask for a better opportunity to learn about chemistry. I really enjoyed being part of Project SEED."

Claudia Guiterrez, Calif.

"I am thankful and blessed that I have been a part of Project SEED. This program really opened my eyes and made me realize the different types of chemistry and how we use them in everyday life."

Lindsey Steele, Ohio

"Project SEED was a great way to spend the summer. It was a great learning experience that I would recommend to people. The experience expanded my knowledge about school and helped me decide what I want to pursue when I go to college."

Diana Azcarate, Tenn.

"I would like to say thank you very much for giving me a chance to learn and making my summer the best ever!"

VanBawi Tha Thawng, Ind.

"Project SEED has been one of the best experiences of my life. I never knew I had such a passion for chemistry until I was able to work in a lab side-by-side with brilliant and amazing people."

Halle Thomas, Mich.

"Project SEED has been a great experience over all. I have learned many new things that will help me achieve academic excellence. Thank you so much for allowing me to be part of thing great program."

Mavelyn Boza, N.J.

Project SEED Students
Presenting at 2013 Sci-Mix Event
246th ACS Fall National Meeting
Indianapolis, IN

Project SEED students from Indiana, Georgia, Kansas City, and Pittsburgh local sections presented their summer research projects at Sci-Mix.

Linda Wang/C&EN

Students' Research Projects

Georgia Local Section - Coordinator, Ishrat Khan

Caria Evans	Synthesis of polystrene-b-polydimethylsiloxane-b-polystyrene/carbon nanotubes composites

Indiana Local Section - Coordinator, Elmer Sanders

Michael Araya	Defining the role of various lysines and arginines in Amot lipid binding
Jessica Duke	Bile acids are reduced in kidney by ¾-nephrectomy (NEP) in a mouse model of Chronic Kidney Disease (CKD)
Mikaela Greer	Correlation of viscosity and interaction parameter for antibodies in different formulation
Catherine Jones	Synthesis of Organic Molecules: Chemical Process Design and Development for an Experimental Drug Substance
Nathan Kassab	FACS analysis of antibody binding characteristics
Mayra Llamas	Chemical biology of Wnt signaling in zebrafish fin regeneration
Sonali Mali	Label-free MicroRNA detection using oligonucleotide functionalized gold nanoprisms as sensing platform
Seth Reasoner	Measuring Henry's Law and gas-liquid mass transport parameters

Kansas City Local Section - Coordinator, Eckhard Hellmuth

Thuong Nguyen	Characterizing amorphous hydrogenated films
Charles Paquet	The conformational stability and infrared and Raman spectra of ethyldichlorophosphine

Pittsburgh Local Section - Coordinator, Jennifer Aitken

Emily Janicki	Design and development of High School science laboratories utilizing remote-access scanning electron microscopy
Charles Thornton	Molecular biological and biochemical techniques used in Investigating periplasmic nitrate reductase

Project SEED Student Survey Results

At the end of the summer students were asked to respond to a survey designed to assess the success of the program, of the 442 participants 440 responded. The results of the survey provide information on the background of the students, their educational aspirations, and their assessment about Project SEED. The information is useful in determining whether Project SEED is serving its target population and whether it is achieving its goal to stimulate an interest in science.

Student Gender	Summer I	Summer II	Total %
Male	134	38	39%
Female	196	72	61%

Family Income Level	Summer I	Summer II	Total %
$6,999 or Less	85	26	25%
$7,000 to $16,000	51	22	17%
$17,000 to $25,000	73	25	22%
$26,000 to $35,000	68	14	19%
$36,000 or more	53	23	17%

Demographics by Ethnicity	Summer I	Summer II	Total %
Native American	1	0	0%
Asian or Pacific Islander	67	25	21%
African American (Non-Hispanic)	88	22	25%
Hispanic	100	33	30%
White (Non-Hispanic)	61	21	19%
Other (Non-Hispanic)	13	9	5%

Demographics by State	Summer I	Summer II
Alabama	2	1
Arizona	0	0
Arkansas	0	0
California	54	10
Colorado	2	0
Delaware	6	1
District of Columbia	13	4
Florida	4	0
Georgia	7	1
Idaho	7	1
Illinois	2	5
Indiana	35	6
Iowa	2	1
Kansas	2	0
Kentucky	3	0
Louisiana	0	1
Maryland	3	0
Massachusetts	0	2
Michigan	13	13
Minnesota	10	1
Mississippi	3	0
Missouri	2	2
Montana	0	1
Nebraska	0	0
New Hampshire	1	0
New Jersey	54	17
New Mexico	0	0
New York	30	16
North Carolina	2	3
Ohio	20	6
Oregon	3	0
Pennsylvania	8	2
Puerto Rico	2	2
Rhode Island	0	0
South Carolina	6	3
Tennessee	5	0
Texas	24	6
Vermont	0	2
Virginia	1	0
Washington	0	0
West Virginia	2	2
Wisconsin	2	1
TOTAL	330	110

Project SEED Student Survey Results

Overall, how would you rate your Project SEED experience?	Summer I	Summer II	Total %
Excellent	250	97	79%
Good	68	11	18%
Fair	10	2	3%
Poor	2	0	0%

How likely is it that you will become a scientist?	Summer I	Summer II	Total %
Excellent	187	70	58%
Good	94	25	27%
Fair	44	13	13%
Poor	5	2	2%

Student Research Sites	Summer I	Summer II	Total %
Industrial Laboratory	87	19	24%
Medical Laboratory	25	6	7%
Government Laboratory	20	2	5%
Academic Laboratory	198	83	64%

Students Agreed that Project SEED Helped:	Summer I	Summer II	Total %
Develop skills and abilities	316	109	97%
Develop self-confidence	279	96	85%
Develop responsibility	312	104	95%
Understand the ethical behavior of scientists	241	102	78%
Develop better study habits	298	82	86%
Learn what advance study is like	287	106	89%
Decide to continue my education after high school	311	99	93%
Choose a college major	307	82	88%
Decide to pursue a career in science	277	90	83%
Develop greater interest in scientific/technical areas	210	101	71%

How much education do you expect to complete?	Summer I	Summer II	Total %
High School	69	22	21%
Vocational, Trade	0	0	0%
2-year College	1	0	0%
4-year College	62	12	17%
Graduate/Professional School	198	76	62%

College Majors	Summer I First Choice	Summer II First Choice	Total %
Agriculture	5	4	2%
Architecture	3	0	1%
Astronomy	3	1	1%
Biology & Life Sciences	59	16	17%
Business & Commerce	6	1	2%
Chemistry	76	26	23%
Communications	3	1	1%
Computer Sciences	8	2	2%
Earth Sciences	1	0	0%
Education	1	0	0%
Engineering	44	15	13%
Foreign Languages	0	0	0%
Health Professions	36	10	10%
Home Economics	0	0	0%
Language & Literature	1	0	0%
Library Science	0	0	0%
Mathematics	6	1	2%
Military Sciences	1	1	0%
Pharmacy Sciences	9	7	4%
Philosophy	0	0	0%
Physics	4	4	2%
Social Sciences	6	2	2%
Technical & Vocational	0	0	0%
Other	58	19	18%

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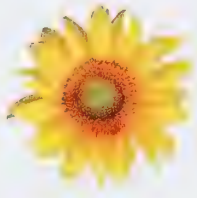

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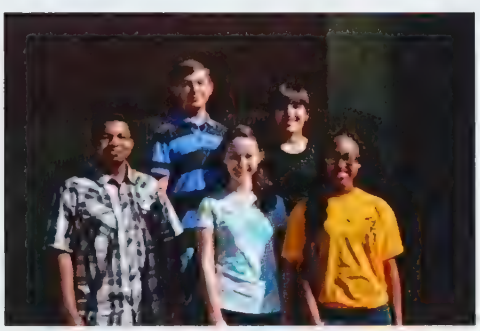

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Afia Boaten, Michelle De Freitas, Rafael Nunez, Mary Ortiz, Thais Pantaleon, Dalvin Sejour, Claudia Torres, Ebeny Torres – *Rutgers University, Newark, N.J.*
Daisy De Paz, Nneka Onukwugha, Nahomie Possible – *Rider University, N.J.*
Johan Guzman, Sami Karmeh, Latoni Leary, Shatoni Leary – *Ramapo College of New Jersey*
Maribel Juarez, Emily Mancini – *Rowan University, N.J.*
Rempee Kalia, Irving Vizcaino – *Rutgers University, Cook College, N.J.*

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Joseph Maglio – *Stonehill College, Mass.*

Rohm and Haas Corporation (10)
Ayah Abed, Q'Nyjah Britton, Vy Lam, Raymond Santiago –*Case Western Reserve University, Ohio*
Di'Rajia Evans, Keye'sha Graham, Lindsey Steele, Bna Waldon – *University of Cincinnati, Ohio*
Tashiana Carnes, Emmanu Fevecque – *University of Toledo, Ohio*

Vincent A. Sedlak (7)
Pablo Alvarez, Mikayla Becker, Deborah Okeke – *University of Toledo, Ohio*
Julie De La Pena – *Case Western Reserve University, Ohio*
Roseanna Helmick, Arielle Hooks, Wynter Mason – *University of Akron, Ohio*

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Keison Bakhtiar, Syed Shawn – *Wichita State University, Kans.*

Xerox Corporation (1)
Leonel Severino – *New York University*

Kang Yang (1)
Christine Mai – *University of Houston, Tex.*

Project SEED Endowment Named Students

Other Award Scholars

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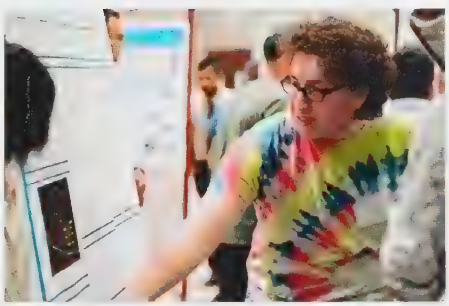
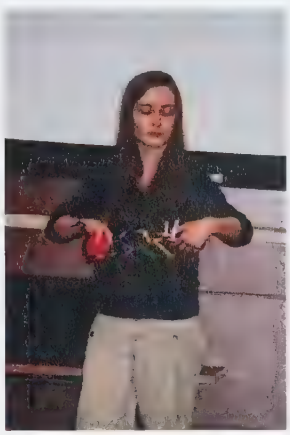
Richard Castro – *Georgetown University, D.C.*
Sang Ho Jee, Sulin Wu – *University of Maryland*
Corshai Williams – *Morgan State University, Md.*

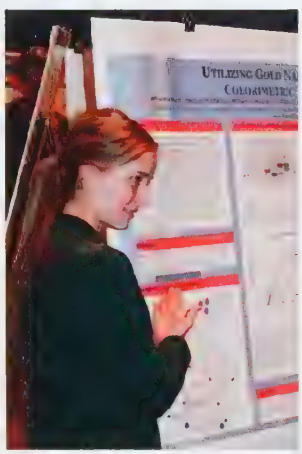
National Travel Award

Ellis K. Fields (5)
Emily Janicki, Charles Thornton – *Duquesne University, Pa.*
Nathan Kassab – *Eli Lilly and Company, Ind.*
Thuong Nguyen, Charles Paquet – *University of Missouri-Kansas City*

Project SEED Students at Boise State University







Committee on Project SEED

Sandra Bonetti, Chair
Colorado State University, Pueblo

MEMBERS

Seth Ablordeppey
Florida A&M University
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Rosenberg, TX

Anna Cavinato
Eastern Oregon University
La Grande, OR

David Cedeno
Illinois State University
Normal, IL

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High School Granada Hills, CA

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Columbia, SC

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Cary, NC

Don Warner
Boise State University, ID

ASSOCIATES

Kimberly Agnew-Heard
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Rockville, MD

Jesse Bernstein
Miami Country Day School
Miami Shores, FL

Michael Cheng
Chevron Energy & Technology Co.
Richmond, CA

Brian Salvatore
Louisiana State University
Shreveport, LA

Jeffery Seyler
University of Southern Indiana
Evansville, IN

Committee on Committees
Amber Hinkle
Bayer Material Science
Baytown, TX

STAFF

Cecilia Hernandez
Staff Liaison

Raihanah Rasheed
Sr. Education Associate

American Chemical Society
Project SEED Program

1155 Sixteenth Street, NW
Washington, DC 20036
projectseed@acs.org
1-800-227-5558 ext. 4380
www.acs.org/projectseed

Česká společnost chemická
Czech Chemical Society
Novotného lávka 5, CZ-116 68 Praha 1
tel. 221 082 383, fax 222 220 184 E-mail chem.spol@csvts.cz

Dr. Alfred Bader
924 East Juneau, Astor Hotel - Suite 622
Milwaukee
Wisconsin 53202, USA
Fax: 001 414 277-0709

Dear Dr. Bader,

June 10, 2014

I would like to inform you that the 2014 winner of the Alfred Bader´s Award in Bioinorganic and Bioorganic Chemistry is Ing. Martin Havlík, Ph..D from the Czech Academy of Sciences.

M. Havlík was elected by the Award's Committee on May 28, winning with 6 votes from 8 cast.

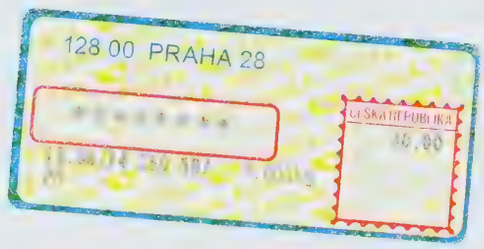
The prize was presented to Dr. Hrubý for the series of 24 original papers focused mainly on Synthesis and study of Tröger´s bases. The most of his papers were published in journals with high impact factor. The prize will be awarded to Martin Havlík at the conference "Advances in organic, bioorganic and pharmaceutical chemistry" to be held in November 2014 at Špindlerův Mlýn. The lecture comprising his results will be presented at this conference.

Best regards,

Prof. Tomáš Trnka
Chairman of the Award Committee

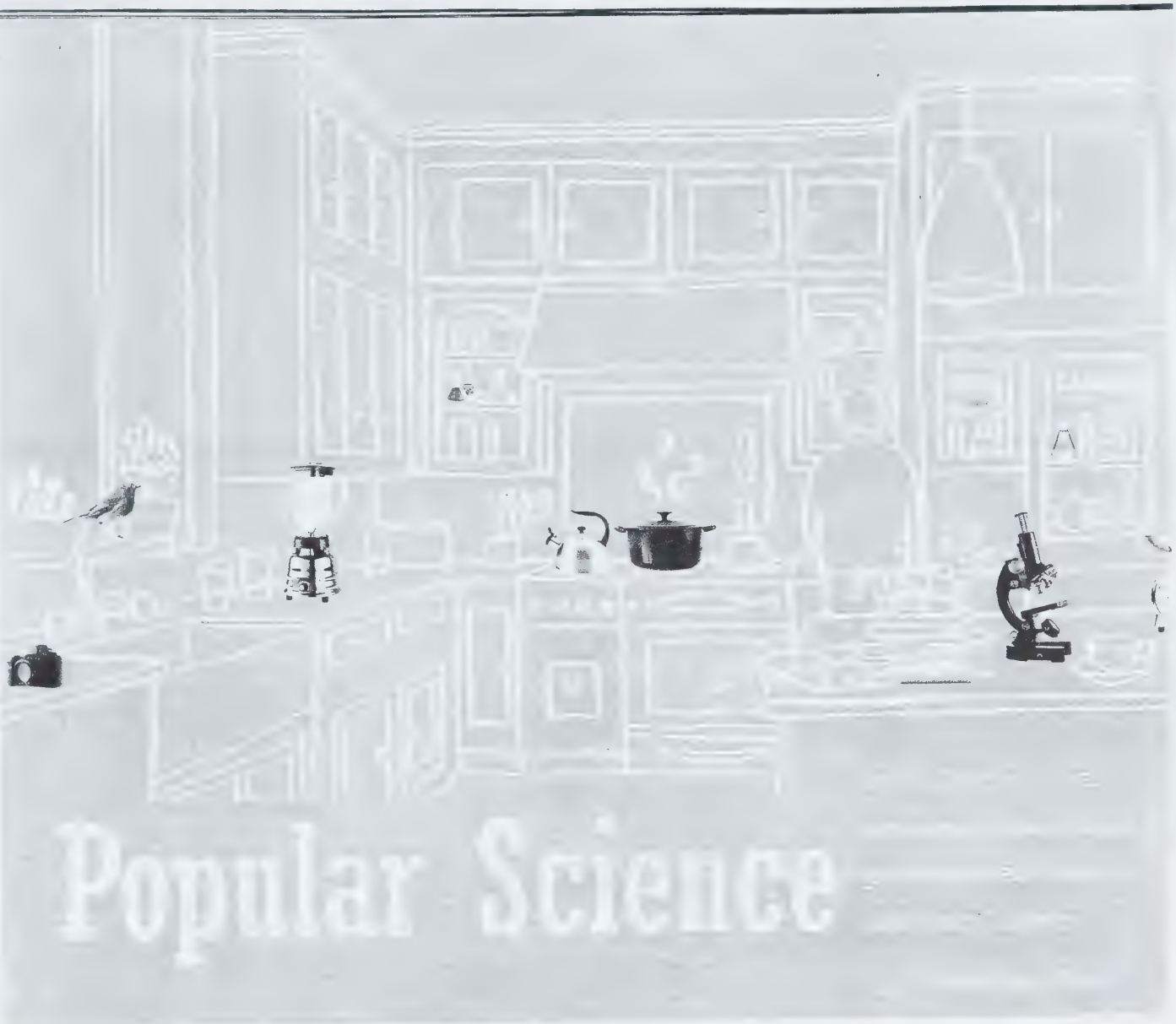
c/o: Mr. Yechiel Bar-Chaim

Prof. TOMÁŠ TRNKA
UNIVERZITA KARLOVA v Praze
Přírodovědecká fakulta
katedra organické chemie
Albertov 6, 128 43 Praha 2
IČO: 00216208, DIČ: CZ00216208
UK - 140
CZECH REPUBLIC
EUROPE



PRIORITAIRE

Dr. Alfred Bader
924 East Juneau,
Astor Hotel - Suite 622
Milwaukee
53202 Wisconsin



For thousands of ordinary people around the world, one of biology's hardest problems is just a game. Both scientists and supercomputers have long struggled to predict the three-dimensional structures of the biological molecules called proteins. These structures are crucial to understanding proteins' roles in fundamental cellular processes and disease, but predicting them is no easy task—which is why some researchers have turned to laypeople for help.

In theory, a protein's structure should be calculable from the molecule's underlying chemistry: from its initial state as a linear chain of chemical building blocks called amino acids, each protein is thought to fold into its most stable possible configuration. But there are infinite structural possibilities for any given amino-acid chain, and a computer, searching through them, faces a daunting challenge.

In the early 2000s, David Baker '84, a biochemistry professor at the University of Washington (UW), Seattle, launched a project called Rosetta@home to outsource the critical scientific work of protein structure prediction from supercomputers to thousands of idle home computers. An algorithm, Rosetta, sifted through the many possibilities while a screensaver showing the various protein-folding permutations kept users updated on its progress.

Then something unexpected happened. Before long, "People started writing in, saying, 'I can see where it would fit better this way,'" Baker told the journal *Nature* in 2010. With that, the Baker lab and researchers from UW's computer-science department began exploring a second possibility: making it possible for those frustrated Rosetta@home hosts to fold proteins on their own. The scientists designed an interface that let users move amino acids with the click of a mouse, and they embedded tools with names like "wiggle" and "shake" that could adjust entire regions of a protein at once. The result was Foldit, a game that let nonprofessionals try their hands at protein-folding problems that had stymied supercomputers.

In 2008, the developers released the game and invited ordinary citizens to play

Illustrations by Mariko Jesse

Foldit is part of a growing trend toward *citizen science*: enabling ordinary people, often without formal training, to contribute to scientific research in their spare time. The range of involvement varies. Some citizen scientists donate idle time on their home computers for use in solving problems large in scale (the search for intergalactic objects, as in Einstein@home) or small (folding proteins). Other projects encourage participants to contribute small bits of data about themselves or their environments. The Great Sunflower Project, for instance, provides a platform for logging and sharing observations of pollinators like bees and wasps. Still other efforts enlist laypeople to tag and analyze images: Eyewire, for example, a game developed by Sebastian Seung '86, Ph.D. '90, a professor of computational neuroscience at MIT, involves participants in mapping neurons in the brain.

"There's a good, long history of people in orthodox scientific domains enrolling members of the public," says Sheila Jasanoff, Pforzheimer professor of science and technology studies at Harvard Kennedy School. In the eighteenth and nineteenth centuries, amateur naturalists like England's Gilbert White played an important role in cataloging local flora and fauna. Active lay communities still exist in fields like astronomy and ornithology, she notes, and frequently, citizen science simply organizes what people already do.

But the Internet and mobile phones now connect more people than ever before, changing how scientists and citizens interact. Today's citizen science is born from and reinforces other shifts in the digital world—"big data," open access, and mobile-phone technology foremost among them—and borrows heavily from aspects of Internet culture: forums, gaming, and social media, to name just a few. For example, the platform eBird, hosted by the Cornell Lab of Ornithology, functions like a Facebook for birders, allowing users around the globe to log their observations and compare their "life lists" of species sighted with those of others. Foldit, by contrast, has players compete in teams to win challenges and climb leaderboards.

There are as many varieties of citizen science as there are of science. In some fields, researchers look to citizen volunteers for help sifting through the deluge of information from microscopes, satellites, and telescopes. In other fields—like ornithology, where lay observations posted on eBird contribute to detailed maps of bird migrations—analytic capabilities have outstripped the available data, and scientists are asking citizens to gather more. Professionals may work side-by-side with small groups of dedicated amateurs in field experiments; alternatively, tens of thousands of citizen scientists participate from the comfort of their own homes, often in moments of boredom and procrastination.

"The common thread that runs through citizen science is that everyday people, who are not trained scientists, can contribute to science and be directly involved, that they understand basic research questions and want to help scientists answer those questions," says Laura Germine, Ph.D. '12, a postdoctoral researcher at Massachusetts General Hospital (MGH). She developed the website Test My Brain, which hosts psychological studies that have gathered more than 850,000 participants in the past five years (see page 57).

Yet for most scientists and laymen, that concept remains foreign. What, exactly, can untrained laypeople contribute to an endeavor as rarefied as scientific research?

Based on Baker's work, the answer seems to be: a lot. In the five years since Foldit (fold.it) was launched, its more than 300,000 registered players (about 2,000 are active, playing more than once a week) can take credit for remarkable achievements. In one three-week challenge, they produced a near-exact model for a protein whose structure had eluded scientists for more than a decade. In another instance, they successfully redesigned an existing protein to increase its efficiency more than eighteenfold. Player strategies, in turn, have been studied by researchers seeking to improve computer algorithms, and Foldit now is challenging its users to design proteins that have never existed in nature. Foldit players—most of whom have little to no biochemistry background and who play the game in their spare time—are authors on four scientific papers, and their gameplay has contributed to several more.

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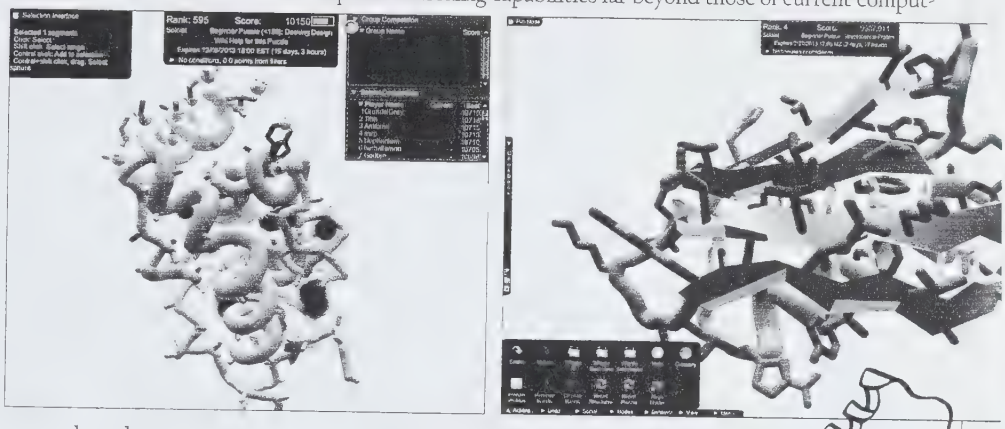

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"Expert hydrogen bonding!" the program commends after a particularly successful move. "+396."

"People are really smart," notes Baker, who occasionally does Skype calls with players to answer questions or discuss improvements to the game. "The ones who get really into Foldit look at Wikipedia, and they learn a lot. The conversations you have with someone who has no scientific background at all, but has been playing Foldit for a while, are pretty high-level." The lab's Foldit support team regularly interacts with players through scientist chats and message boards. "I think it's pretty critical to be responsive," Baker says.

Citizen Scientists

The 2007 launch of the citizen-science project Galaxy Zoo was met with immediate success: a site crash. Spurred by the enormous number of images captured by telescopes each day, astronomers from Johns Hopkins University and, in England, the University of Portsmouth and the University of Oxford had developed a website to involve amateurs in classifying galaxies based on shape—and the turnout stunned them. Initial traffic was 20 times what they had hoped for, and within 24 hours, online participants were tagging more than 60,000 images an hour. More than 150,000 people contributed more than 50 million classifications in the project's first year.

"There are people who believe that computers are better than people at any task, if you're just smart enough to program the computer properly," says professor of astronomy Alyssa Goodman. "In truth, for nearly all pattern-recognition tasks, evolution has made the human brain very, very good—still better than any computer program." Indeed, Galaxy Zoo represents a growing class of citizen-science projects that ask interested members of the public to do what computers still cannot. The citizen classifications, though useful, are not always ends in themselves. "There are tasks where, if you have a lot of *people* looking at data, then that trains the computer," Goodman continues. "Then, the computer can do better than if you just tell it to find the solution."

As part of the Milky Way Project, hosted by citizen-science platform Zooniverse, participants draw ellipses to identify interstellar "bubbles" in telescope images; the regions are thought to promote star formation.

The new field of *human computation* aims to guide this integration of man and machine, combining inputs to tackle problems that neither humans nor computers can solve alone. Classically, computers have used entirely automated operations, but human computation involves tasks like image recognition or text analysis, where the exact process can be difficult to define through traditional programming commands. Rather than explicitly coding the characteristics of a galaxy, for instance, researchers are developing machine-learning methods that enable computers to infer the appropriate patterns from human-generated training sets.

"Astronomy is rapidly moving toward the regime where we're going to have more data than we have any hope of manually looking at," says Chris Beaumont, a software engineer at the Harvard-Smithsonian Center for Astrophysics. For his dissertation, he worked with Goodman to study interstellar "bubbles," areas thought to be hotbeds of star formation. These bubbles, like galaxy shapes, are hard for computers to detect, but in an effort called the Milky Way Project, hosted by the citizen-science platform Zooniverse (an expansion of the original Galaxy Zoo effort; www.zooniverse.org), more than 35,000 citizen scientists identified more than 5,000 bubbles in images from the National Aeronautics and Space Administration's Spitzer Space Telescope.

Beaumont has used these contributions to build more sophisticated algorithms for bubble identification that will cut down on the need for human input: for instance, a computer might screen large datasets and present lay volunteers and experts with only the most ambiguous cases. "If you're looking for something that's rarer, or if you're looking through a much larger dataset, there aren't enough people in the world to do what you need to do," he says.

Moreover, after "learning" from so many amateur identifications, the algorithm can also distinguish between typical and suspicious lay contributions, providing a means to check users' reliability and more accurately make use of data from citizen scientists. As Beaumont says, "We need to learn how to combine computers and humans to scale up to big data."

Crowdsourcing

Human computation frequently taps into a phenomenon called *crowdsourcing*: small contributions from a large base of users—in this case, citizens—can collectively accomplish huge tasks impossible for a small, dedicated group. At Harvard's Center for Research on Computation and Society (CRCS), postdoctoral fellow Edith Law is developing an online citizen-science platform called Curio (www.crowdcurio.com) to crowdsource research tasks. (She plans to launch it this spring.)

She began by interviewing Harvard researchers across multiple disciplines. "I wanted to understand

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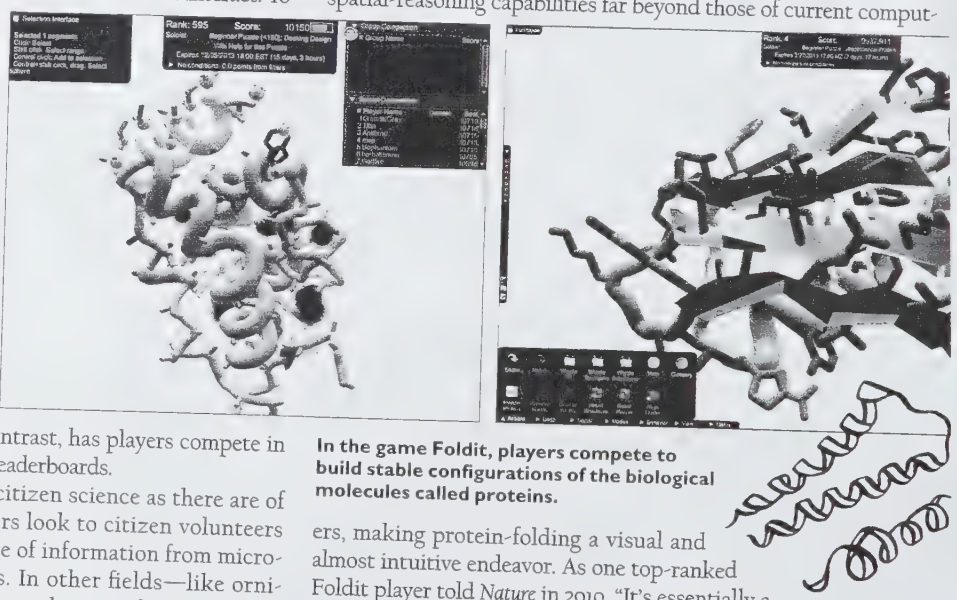

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Dear Alfred—

I thought you would appreciate a copy of the paper that we recently published and dedicated to your 90th birthday. I hope you and Isabel are doing well and we look forward to your next visit.

Best wishes,

—Andrew.

Synthetic Methods

DOI: 10.1002/anie.201410857

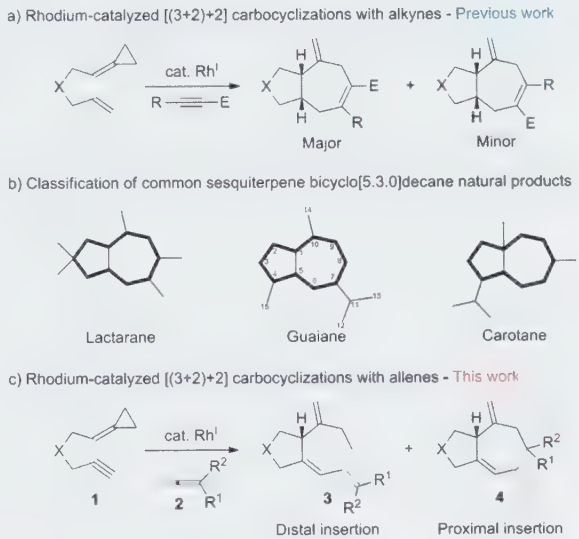
Rhodium-Catalyzed [(3+2)+2] Carbocyclization of Alkynylidenecyclopropanes with Substituted Allenes: Stereoselective Construction of Tri- and Tetrasubstituted Exocyclic Olefins**

P. Andrew Evans, Daniela E. Negru, and Deju Shang*

Dedicated to Dr. Alfred R. Bader on the occasion of his 90th birthday

Abstract: *The development of the stereoselective rhodium-catalyzed [(3+2)+2] carbocyclization of alkynylidenecyclopropanes (ACPs) with substituted allenes is described. This work demonstrates that activated and unactivated allenes preferentially undergo carbometalation at the distal terminus to generate tri- and tetrasubstituted exocyclic olefins with a neutral rhodium catalyst. In addition, this method provides a strategy for the total synthesis of the guaiane family of sesquiterpenes, which are not directly accessible using alkynes as exogenous π-components. Finally, the preparation of the bicyclo[5.4.0]undecane ring system using a homologated ACP tether serves to further illustrate the versatility of this approach.*

The development of new strategies for the atom-economical assembly of architecturally challenging pharmacophores present in bioactive agents remains an important goal for modern synthetic organic chemistry. To this end, metal-catalyzed higher-order cycloaddition reactions provide a powerful and versatile approach for the construction of carbo- and heterocyclic systems through the combination of relatively simple building blocks, namely alkynes and alkenes.[1,2] Indeed, since Reppe reported the first cyclotrimerization of alkynes in 1948 there has been considerable emphasis on the development of new variants using novel π-components to extend the scope of this important class of reactions.[3] In this regard, we recently reported the rhodium-catalyzed [(3+2)+2] carbocyclization reaction of alkenylidenecyclopropanes with activated alkynes for the construction of *cis*-fused bicyclo[5.3.0]decanes (Scheme 1a). Although this process provides an expeditious approach to the lactarane skeleton, as exemplified in the total synthesis of pyrovellerolactone, the reliance on activated alkynes and the inability to reverse the regioselectivity limits the application of this process to the synthesis of the guaianes (Scheme 1b).[4–7] Hence, we envisioned the metal-catalyzed [(3+2)+2] carbocyclization reaction of an alkynylidenecyclopropane (ACP) with a substituted allene as a way to access the guaiane skeleton through the distal insertion of a 1,1-disubstituted allene (Scheme 1c).[8,9] Nevertheless, rhodium-catalyzed higher-order carbocyclizations with exogenous allenes have a number of inherent challenges. For instance, conjugated allenes are generally required since unactivated allenes are either unreactive or provide mixtures of constitutional isomers. Moreover, the products from distal insertion are formed with poor geometrical control irrespective of the type of substituent on the allene. In addition, monosubstituted allenes are either unreactive or provide proximal insertion, thereby making this a challenging problem.[10–13] Herein, we describe the first regio- and stereoselective rhodium-catalyzed [(3+2)+2] carbocyclization of carbon- and heteroatom tethered ACPs (**1**) with activated and unactivated exogenous allenes (**2**) to afford the bicycloheptatrienes **3** with tri- and tetrasubstituted



Scheme 1. Rationale for the development of the rhodium-catalyzed [(3+2)+2] carbocyclization of ACPs with allenes.

[*] Prof. P. A. Evans, D. E. Negru
Department of Chemistry, Queen's University
90 Bader Lane, Kingston, K7L 3N6, Ontario (Canada)
E-mail: Andrew.Evans@chem.queensu.ca
Dr. D. Shang
Department of Chemistry, The University of Liverpool
Crown Street, Liverpool, L69 7ZD (UK)

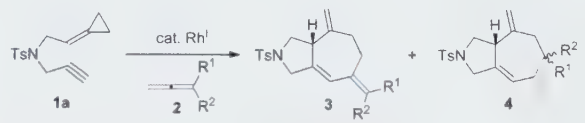
[**] We sincerely thank NSERC for a Discovery Grant and a Tier 1 Canada Research Chair (PAE). We also acknowledge the EPSRC (EP/G010250) for financial support and the Royal Society for a Wolfson Research Merit Award (PAE). Dr. Phillip A. Inglesby is thanked for helpful discussions. We are also grateful to the EPSRC National Mass Spectrometry Service Centre (Swansea (UK)) for high-resolution mass spectrometry. Finally, we thank John Basca for assistance with the crystal structure of **3a**.

Supporting information for this article is available on the WWW under http://dx.doi.org/10.1002/anie.201410857.

exocyclic olefins (Scheme 1c). Additionally, this process provides a rare example of a highly selective distal carbometalation of a mono- or 1,1-disubstituted allene in a metal-catalyzed cycloaddition reaction.

Table 1 outlines the optimization and preliminary substrate scope for the rhodium-catalyzed [(3+2)+2] carbocyclization reaction with substituted allenes. Treatment of the

Table 1: Optimization and preliminary scope for the rhodium-catalyzed [(3+2)+2] carbocyclization of the ACP **1a** with activated and unactivated allenes (**2**).[a]



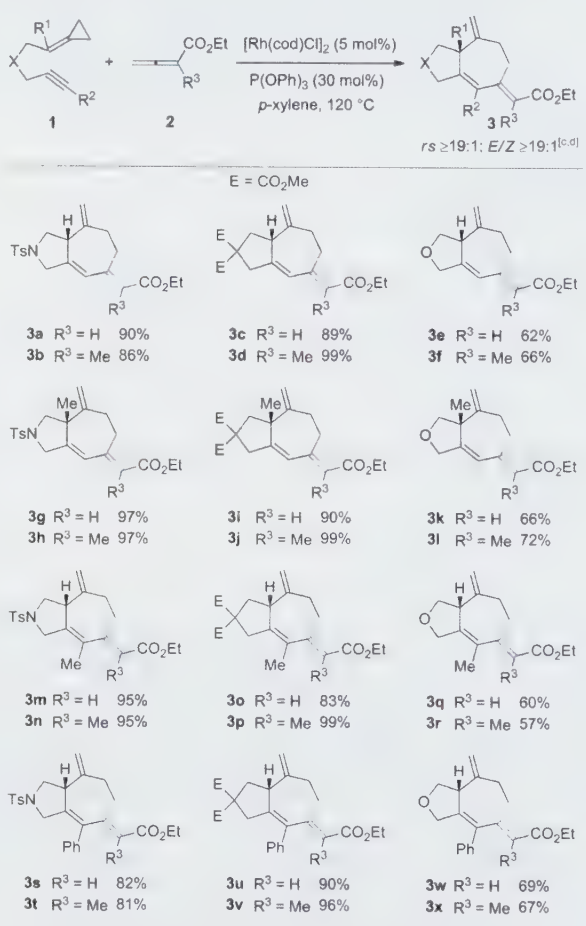
Entry	Allene **2** R^1	R^2	$P(OPh)_3$ (mol%)	T [°C]	**3/3'**[b]	(**3**+**3'**)/**4**[b]	Yield [%][c]
1	CO_2Et	H	20	100	≥19:1	≥19:1	62
2[d]	CO_2Et	H	20	100	≥19:1	≥19:1	24
3[e]	CO_2Et	H	20	100	≥19:1	≥19:1	31
4	CO_2Et	H	30	100	≥19:1	>19:1	71
5	CO_2Et	H	30	120	≥19:1	>19:1	90
6	CO_2Et	Me	30	120	≥19:1	>19:1	86
7	Ph	H	30	120	>19:1	>19:1	73
8	Ph	Me	30	120	10:1	>19:1	71
9	CH_2OBn	H	30	120	≥19:1	1.5:1	81
10	CH_2OBn	Me	30	120	2:1	0.7:1	89

[a] All reactions were performed on a 0.1 mmol reaction scale using 5 mol% $[\{Rh(cod)Cl\}_2]$ modified with $P(OPh)_3$ (30 mol%) and the allene **2** (3 equiv) in *p*-xylene (0.05 M) at 120 °C. [b] The ratios of geometrical isomers **3**/**3'**, constitutional isomers **3**/**4**, and the diastereoisomers **4** (1:1) were determined by 500 MHz ^{1}H NMR analysis of the crude reaction mixture. The stereochemistry of the *E*-isomer for **3** was established using nOe studies. [c] Yields of the isolated products. [d] $[Rh(cod)_2]OTf$ (10 mol%) was used. [e] $[Rh(cod)_2]SbF_6$ (10 mol%) was used. cod = 1,5-cyclooctadiene, Ts = 4-toluenesulfonyl.

ACP **1a**[14] with the activated allene **2** ($R^1 = CO_2Et$, $R^2 = H$) using $[\{Rh(cod)Cl\}_2]$, modified with triphenylphosphite in *p*-xylene at 100 °C, furnished the bicycloheptatriene **3a** as the exclusive constitutional and stereoisomer in 62% yield favoring the *E*-configuration (entry 1).[15–17] Interestingly, the analogous process with cationic complexes also provided **3a** as the major adduct, albeit in significantly lower yield (entries 2 and 3). Hence, the nature of the catalyst does not appear to be an underlying factor for controlling the chemoselective distal insertion.[10,12] Further optimization of the amount of ligand and temperature led to the optimal reaction conditions to afford **3a** in 90% yield (entries 4 and 5). Interestingly, the 1,1-disubstituted allene **2** ($R^1 = CO_2Et$, R^2 = Me) provided analogous results (entry 6), which illustrates the remarkable tolerance to substitution. In an attempt to further understand the origin of selectivity, we elected to examine other activated and unactivated allenes, wherein the latter are generally more challenging substrates. To this end, the phenyl-substituted allene **2** (R^1 = Ph, $R^2 = H$) afforded analogous selectivity (entry 7 versus 5), whereas the 1,1-disubstituted derivative (R^1 = Ph, R^2 = Me) led to a slight reduction in geometrical control (entry 7 versus 8). This trend was further highlighted with the unactivated allene **2** ($R^1 = CH_2OBn$, $R^2 = H$), which furnished the constitutional isomers **3**/**4** in excellent yield as a 1.5:1 mixture (entry 9), albeit the former was produced with ≥19:1 selectivity for the *E*-isomer. In contrast, the 1,1-disubstituted allene **2** ($R^1 = CH_2OBn$, $R^2 = CH_3$), provided both a mixture of constitutional and geometrical isomers, due to the similarity in the size of the substituents (entry 10).[18] Overall, this study outlines the factors that control selectivity in this process, albeit a more detailed theoretical analysis is required to provide further insight into the origin of selectivity.

Table 2 outlines the application of the optimized reaction conditions (Table 1, entry 5) to a range of substituted carbon- and heteroatom-tethered ACPs with activated mono- and 1,1-disubstituted allenes.[19] In each case, the reaction proceeded with excellent selectivity to facilitate the construction of

Table 2: Scope of the rhodium-catalyzed [(3+2)+2] carbocyclization with activated allenes.[a]

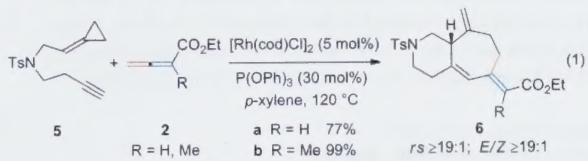


[a] All reactions were performed on a 0.1 mmol reaction scale using 5 mol% $[\{Rh(cod)Cl\}_2]$ modified with $P(OPh)_3$ (30 mol%) and the allene **2** (3 equiv) in *p*-xylene (0.05 M) at 120 °C. [b] Yields of isolated products. [c] Ratio of the constitutional isomers **3**/**4** was determined by 500 MHz ^{1}H NMR analysis of the crude reaction mixture. [d] Only the *E*-isomer was observed for **3**, and was established using nOe studies.

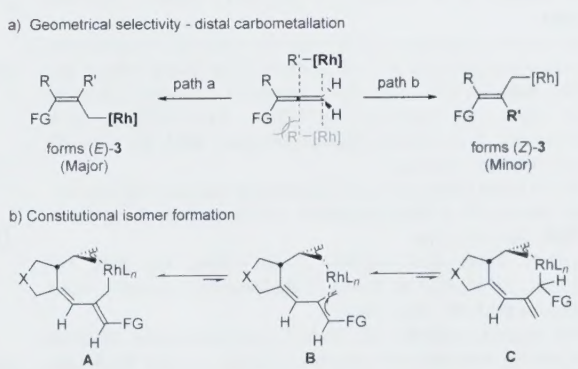
a single constitutional and geometrical isomer (≥19:1 by NMR). Moreover, the nature of the tether is inconsequential in this reaction, albeit the ether tethers tend to be slightly less efficient.[4,20] Additionally, the carbocyclization with the malonate tether provides the basis for constructing the carbon skeleton of the guaianes with the requisite unsaturation for further functionalization (Table 2, **3c,d**). Another key feature with this process is the scope of the reaction, which permits the introduction of angular methyl groups (**3g–l**) and tolerates internal alkynes (**3m–x**). For instance, the methyl- and phenyl-substituted alkyne derivative undergo the selective formation of hexasubstituted heteroannular dienes (**3m–x**). Overall, the efficiency and selectivity is quite striking for a metal-catalyzed cycloaddition with mono- and 1,1-disubstituted allenes.

Table 3 details the examination of activated and unactivated allenes to further illustrate the scope and provide insight into the factors which govern selectivity. Although these allenes proved more demanding substrates owing to their propensity to decompose and/or polymerize under the reaction conditions, the slow addition of the allene by using a syringe-pump circumvented this problem. Hence, a number of challenging allenes participate in the cycloaddition to provide a new paradigm for the types of functional groups that can employed as substituents within the exogenous π-component. For instance, branched alkyl and aryl substituents afforded a single stereoisomer in excellent yield (**3aa**,**ab**), which contrasts the efficiency and selectivity obtained with the phenyl and linear alkyl substituents, respectively (Table 1, entries 7 and 9). Additionally, the vinyl silane **3ac** (Table 3) and vinyl borane **3ad** provide important motifs that enable further functionalization through cross-coupling reactions, whereas the enamine **3ae** and the silyl enol ether **3af** represent important carbon nucleophiles. Moreover, the phenyl allenyl sulfide also underwent the cycloaddition, despite the propensity for sulfur poisoning of the metal center (**3ag**).[21] Finally, extension of the repertoire of electron-withdrawing groups permitted the preparation of the vinyl sulfone **3ah** and vinyl phosphonate **3ai**. Overall, this study provides additional examples of the highly selective cycloaddition, which clearly demonstrates the versatility and tolerance to a variety of useful functional groups in the allene.

Additional studies probed the ability to increase the length of the tether in the ACP, which is generally challenging for related reactions.[6e,g,22] Gratifyingly, treatment of the ACP **5** with the substituted allenes **2** (R = H and Me) under the standard reaction conditions, afforded the 6,7-bicyclic derivatives **6a** (77%) and **6b** (99%), respectively [Eq. 1]. Hence, the ability to readily access the bicyclo[5.4.0]undecane ring system, which is also present in a number of important bioactive natural products, significantly expands the synthetic utility of this process.[23]

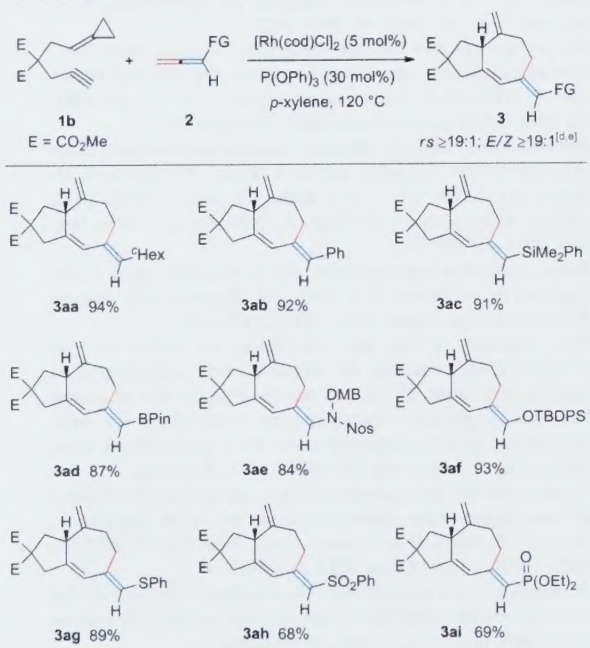


Scheme 2 outlines a plausible explanation for the geometrical control and the formation of the minor constitutional isomer in this process. In accord with our previous studies, the ligands in the key metallacycle intermediate are primarily responsible for efficiency of the insertion.[16] Hence, the



Scheme 2. Proposed rationale for chemo- and stereoselectivity in the rhodium-catalyzed [(3+2)+2] carbocyclization of ACPs with substituted allenes.

Table 3: Scope of the rhodium-catalyzed [(3+2)+2] carbocyclization with functionalized substituted allenes.[a]



[a] All reactions were performed on a 0.1 mmol reaction scale using 5 mol% $[\{Rh(cod)Cl\}_2]$ modified with $P(OPh)_3$ (30 mol%) and allene **2** (3 equiv) in *p*-xylene (0.05 M) at 120 °C. [b] Yields of isolated products. [c] The allene **2** was added dropwise over ca. 2 h. [d] Ratio of the constitutional isomers **3**/**4** was determined by 500 MHz ^{1}H NMR analysis of the crude reaction mixture. [e] Only the *E*-isomer was observed for **3**, and was established using nOe studies. DMB = 2,4-dimethoxybenzyl, Nos = 4-nitrobenzenesulfonyl, FG = functional group, TBDPS = *tert*-butyldiphenylsilyl.

geometrical selectivity is ascribed to the nature of the groups on the allene, which is consistent with distal carbometalation (Scheme 2a; path a) opposite to the functional group (FG). Interestingly, 1,1-disubstituted allenes afford similar selectivity, provided the groups are stereoelectronically orthogonal to disfavor the formation of the opposite geometrical isomer (Scheme 2a, path b). Scheme 2b outlines the proposed rationale for the formation of the constitutional isomer **4**. We envision that the η^1-allyl metallacycle **A** could equilibrate via the bis(η^3-allyl) intermediate **B** to furnish **C** en route to **4**, provided the rate of the isomerization is faster than reductive elimination.[24] Alternatively, proximal carbometalation of the allene can also afford **4**, in which intermediate **C** would be subject to the analogous equilibration process.

In conclusion, we have developed the intermolecular rhodium-catalyzed [(3+2)+2] carbocyclization reaction of carbon- and heteroatom-tethered ACPs with activated and unactivated substituted allenes for the construction of bicycloheptatrienes. This study suggests that the stereoelectronic nature of the substituent on the allene controls distal ligation of mono- and 1,1-disubstituted allenes to permit the construction of tri- and tetrasubstituted exocyclic olefins, which provides a new strategy for the construction of the guaiane family of sesquiterpenes. The process is tolerant to ACP substitution and an array of functional groups on the allene, which expands the scope of functional groups in the exogenous π-component for these types of cycloaddition reactions. In addition, the reaction permits the efficient formation of 6,7-bicyclic structures, which tend to be particularly challenging in related carbocyclization reactions. Overall, this work provides a rare example of the highly selective distal carbometalation of a substituted exogenous allene.

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Keywords: allenes · cyclizations · olefins · rhodium · synthetic methods

[1] For recent reviews of cycloaddition and cycloisomerization reactions, see: *Comprehensive Organic Synthesis II, Vol. 5* (Eds.: P. Knochel, G. A. Molander, A. Fürstner), Elsevier, Waltham, **2014**.

[2] For recent reviews on metal-catalyzed higher-order carbocyclization reactions, see: a) P. A. Inglesby, P. A. Evans, *Chem. Soc. Rev.* **2010**, *39*, 2791 – 2805; b) C. Aubert, M. Malacria, C. Ollivier in *Science of Synthesis, Vol. 3* (Eds.: J. G. De Vries, G. A. Molander, P. A. Evans), Thieme, Stuttgart, **2011**, pp. 145 – 242, and references therein.

[3] For the first metal-catalyzed cyclotrimerization of alkynes, see: W. Reppe, W. J. Schweckendiek, *Justus Liebigs Ann. Chem.* **1948**, *560*, 104 – 116.

[4] a) P. A. Evans, P. A. Inglesby, *J. Am. Chem. Soc.* **2008**, *130*, 12838 – 12839; b) P. A. Evans, T. Baikstis, P. A. Inglesby, *Tetrahedron* **2013**, *69*, 7826 – 7830.

[5] For related examples of [3+2+2] carbocyclization reactions involving stoichiometric amounts of metal, see: a) J. Barluenga, R. Vicente, P. Barrio, L. A. López, M. Tomás, J. Borge, *J. Am. Chem. Soc.* **2004**, *126*, 14354 – 14355; b) C. M. Older, R. McDonald, J. M. Stryker, *J. Am. Chem. Soc.* **2005**, *127*, 14202 – 14203.

[6] For examples of inter- and intramolecular metal-catalyzed [3+2+2] reactions, see: a) S. Saito, M. Masuda, S. Komagawa, *J. Am. Chem. Soc.* **2004**, *126*, 10540 – 10541; b) S. Komagawa, S. Saito, *Angew. Chem. Int. Ed.* **2006**, *45*, 2446 – 2449; *Angew. Chem.* **2006**, *118*, 2506 – 2509; c) W. Zhao, J. Zhang, *Chem. Commun.* **2010**, *46*, 7816 – 7818; d) G. Bhargava, B. Trillo, M. Araya, F. López, L. Castedo, J. L. Mascareñas, *Chem. Commun.* **2010**, *46*, 270 – 272; e) L. Saya, G. Bhargava, M. A. Navarro, M. Gulías, F. López, I. Fernández, L. Castedo, J. L. Mascareñas, *Angew. Chem. Int. Ed.* **2010**, *49*, 9886 – 9890; *Angew. Chem.* **2010**, *122*, 10082 – 10086; f) M. Araya, M. Gulías, I. Fernández, G. Bhargava, L. Castedo, J. L. Mascareñas, F. López, *Chem. Eur. J.* **2014**, *20*, 10255 – 10259; g) L. Saya, I. Fernández, F. López, J. L. Mascareñas, *Org. Lett.* **2014**, *16*, 5008 – 5011.

[7] For a concise total synthesis of the lactarane natural product pyrovellerolactone using the rhodium-catalyzed [(3+2)+2] carbocyclization reaction, see: P. A. Evans, P. A. Inglesby, K. Kilbride, *Org. Lett.* **2013**, *15*, 1798 – 1801.

[8] G. Vidari, P. Vita-Finzi in *Studies in Natural Products Chemistry, Structure and Chemistry, Vol. 17* (Ed.: Atta-ur-Rahman), Elsevier, Amsterdam, **1995**, pp. 153 – 206.

[9] The rhodium-catalyzed [(3+2)+2] reaction of the ACP **1** with the allene **2** can in principle deliver up to four constitutional and 16 stereoisomers, including enantiomers. For a graphical representation, see the Supporting Information.

[10] For an example of the challenges associated with the rhodium-catalyzed [5+2] cycloaddition of a vinylcyclopropane with substituted allenes, see: H. A. Wegner, A. de Meijere, P. A. Wender, *J. Am. Chem. Soc.* **2005**, *127*, 6530 – 6531.

[11] For an example of the use of propargylic silanes to circumvent the problems associated with the incorporation of exogenous allenes, see: P. A. Wender, F. Inagaki, M. Pfaffenbach, M. C. Stevens, *Org. Lett.* **2014**, *16*, 2923 – 2925.

[12] For an example of a rhodium-catalyzed [2+2+2] carbocyclization which favors proximal incorportation of an activated allene, see: A. T. Brusoe, E. J. Alexanian, *Angew. Chem. Int. Ed.* **2011**, *50*, 6596 – 6600; *Angew. Chem.* **2011**, *123*, 6726 – 6730.

[13] For other metal catalysts that favor selective proximal and distal carbometalation of allenes, see: a) T. Miura, M. Morimoto, M. Murakami, *J. Am. Chem. Soc.* **2010**, *132*, 15836 – 15838; b) H. Clavier, K. Le Jeune, I. de Riggi, A. Tenaglia, G. Buono, *Org. Lett.* **2011**, *13*, 308 – 311.

[14] For a multigram scale synthesis of the precursor used in the synthesis of ACPs, see: O. S. Ojo, P. A. Inglesby, D. E. Negru, P. A. Evans, *Org. Chem. Front.* **2014**, *1*, 821 – 824.

[15] The structure of **3a** was confirmed by X-ray analysis (CCDC 1025060 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif.). All other cycloadducts were assigned by analogy using ^{1}H NMR and NOE studies.

[16] For the isolation and characterization of the rhodacycle involved in these higher-order carbocyclizations, see: P. A. Inglesby, J. Basca, D. E. Negru, P. A. Evans, *Angew. Chem. Int. Ed.* **2014**, *53*, 3952 – 3956; *Angew. Chem.* **2014**, *126*, 4033 – 4037.

[17] Although we have demonstrated the stoichiometric variant with an *alkenyl*idenecyclopropane, the catalytic version provides an inseparable mixture of at least six products.

[18] Interestingly, the octyl-substituted allene **2** ($R^1 = C_8H_{17}$, $R^2 = H$) provides the constitutional isomers **3**/**4** with 2.5:1 selectivity, thereby illustrating that the lower selectivity with the benzyloxymethyl group is not due to the Lewis basic nature of the benzyl ether group.

[19] Interestingly, the cycloaddition does not require the Thorpe–Ingold effect; for example, the methylene tethered ACP **1** (Table 2, $X = CH_2$, $R^1/R^3 = H$, $R^2 = Ph$) provides the cycloadduct **3** in 76% yield with $\geq$19:1 selectivity for the *E*-isomer.

[20] The lower efficiency with the ethereal tethers is consistent with previous studies, see: a) S. Mazumder, D. Shang, D. E. Negru, M.-H. Baik, P. A. Evans, *J. Am. Chem. Soc.* **2012**, *134*, 20569–20572; b) P. A. Evans, A. J. Burnie, D. E. Negru, *Org. Lett.* **2014**, *16*, 4356–4359.

[21] a) T. Kondo, T.-a. Mitsudo, *Chem. Rev.* **2000**, *100*, 3205–3220; b) S. Cimino, L. Lisi, *Ind. Eng. Chem. Res.* **2012**, *51*, 7459–7466.

[22] For a recent example which illustrates the challenges with longer tethers in a rhodium-catalyzed [(3+2)+1] carbocyclization, see: S. Kim, Y. K. Chung, *Org. Lett.* **2014**, *16*, 4352–4355.

[23] A. K. Miller, C. C. Hughes, J. J. Kennedy-Smith, S. N. Gradl, D. Trauner, *J. Am. Chem. Soc.* **2006**, *128*, 17057–17062, and references therein.

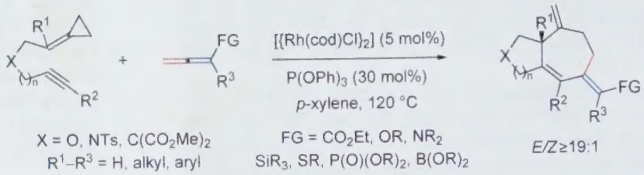
[24] For examples of allene insertion in a carbometalation as a result of C–H activation, see: a) H. Wang, F. Glorius, *Angew. Chem. Int. Ed.* **2012**, *51*, 7318–7322; *Angew. Chem.* **2012**, *124*, 7430–7434; b) D. N. Tran, N. Cramer, *Angew. Chem. Int. Ed.* **2013**, *52*, 10630–10634; *Angew. Chem.* **2013**, *125*, 10824–10828.

Communications

Synthetic Methods

P. A. Evans,* D. E. Negru,
D. Shang ——————— ■■■■–■■■■

Rhodium-Catalyzed [(3+2)+2] Carbocyclization of Alkynylidenecyclopropanes with Substituted Allenes: Stereoselective Construction of Tri- and Tetrasubstituted Exocyclic Olefins



At a distance: The development of the title reaction demonstrates that activated and unactivated allenes preferentially undergo carbometalation at the distal terminus to generate tri- and tetrasubstituted exocyclic olefins with a neutral rhodium catalyst. cod = 1,5-cyclooctadiene, Ts = 4-toluenesulfonyl.

