



Council for  
**Chemical Research**

*Improving Chemical Innovation Through Collaboration and Advocacy*

Council for **Chemical Research**

annual  meeting

Alexandria, VA • May 4-6, 2015 • Hilton Alexandria Mark Center

# **DISRUPTION:** IMPACTS AND OPPORTUNITIES FOR THE CHEMICAL ENTERPRISE

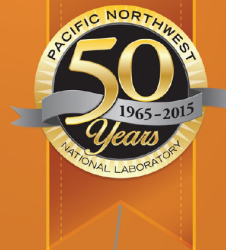


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## **FINAL PROGRAM**

# DISCOVERY *in Action*

Through the years



**Pacific Northwest**  
NATIONAL LABORATORY  
Proudly Operated by **Battelle** Since 1965

At Pacific Northwest National Laboratory, we are advancing science and solutions to solve complex problems in energy, the environment, and national security. We accomplish this mission through the power of our interdisciplinary teams, bringing together experts from multiple disciplines to tackle complex problems. PNNL's science and technology inspires and enables the world to live prosperously, safely and securely.

*Collaborate with us as we transform the world through courageous discovery and innovation.*

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**1989** Engineers developed a holographic imaging system that rapidly identifies hidden weapons, explosives and other contraband—through clothing. Today the technology is in use at airports and has been adapted for other uses including within retail clothing stores.



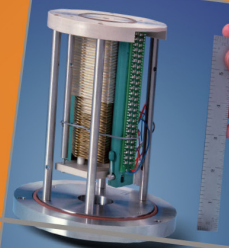
**1974** PNNL invented a technique called optical digital recording that stores information as a track of dots about one micron in diameter. This innovation served as the critical design element for compact discs and players.



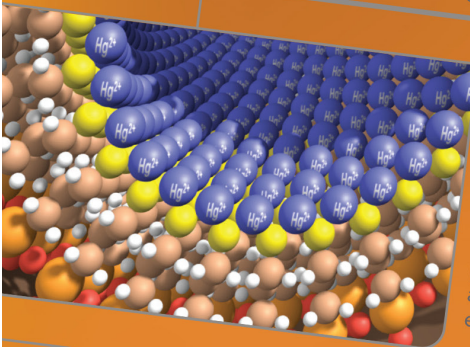
**1991** Early stages of portable acoustic inspection devices were designed for the U.S. Department of Defense. Since then, the technology has been used by other agencies.



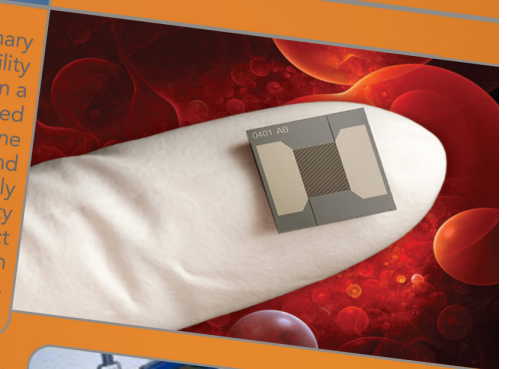
**1999** The award-winning Electrodynamic Ion Funnel designed at PNNL significantly improved the sensitivity of certain mass spectrometry tools and other analytical instruments.



**1998** Researchers engineered the ceramic called SAMMS, self-assembled monolayers on mesoporous supports, to remove hazardous mercury and other heavy metals from water and other liquids. The product was commercialized and is used to solve global environmental challenges.



**2010** Revolutionary ion mobility separations in a microchip, developed at Owlstone Nanotech and PNNL, dramatically improve the ability to rapidly detect specific molecules in complex samples.



**2012** Purification systems are critical to thousands of sailors isolated deep underwater in submarines. PNNL's Advanced Carbon-Dioxide Removal Unit, developed with support from the Naval Sea Systems Command, captures carbon dioxide directly from the atmosphere within a submarine; that creates a healthier underwater environment.



**2013** A continuous chemical process that produces useful crude oil minutes after harvested algae is added. With additional conventional refining, the crude algae oil is converted into aviation fuel, gasoline or diesel fuel.



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# DISRUPTION: IMPACTS AND OPPORTUNITIES FOR THE CHEMICAL ENTERPRISE



## PROGRAM AGENDA

All events are in the Magnolia Ballroom/Foyer unless noted otherwise.

SUMMARY

### MONDAY, MAY 4, 2015

11:00 AM – 12:00 PM • *New  
Chairs Workshop (Hickory)*

1:00 PM – 3:00 PM • *Safety Workshop*

3:00 PM – 3:15 PM • *Coffee Break*

3:15 PM – 5:15 PM • *Interest Groups Sessions,  
Role of Masters' Degree (Poplar), Chemical  
Engineering Chairs (Chestnut), Chemistry Chairs (Walnut  
A/B), Industry/Government Labs (Hickory)*

5:30 PM – 7:30 PM • *Student Poster Session and  
Reception*

### TUESDAY, MAY 5, 2015

7:30 AM – 8:00 AM • *Continental Breakfast*

8:00 AM – 8:15 AM • *Welcome/Meeting Overview*

8:15 AM – 9:15 AM • *Plenary Session: Brien Stears*

9:15 AM – 9:30 AM • *Coffee Break*

9:30 AM – 12:00 PM • *Disruption from Shale Gas*

12:00 PM – 1:30 PM • *Lunch and Plenary Session:  
George Atkinson*

1:45 PM – 3:45 PM • *Disruption from Climate Change*

3:45 PM – 4:00 PM • *Coffee Break*

4:00 PM – 5:00 PM • *Plenary Session, Steven Ashby*

5:00 PM – 7:30 PM • *Rising Star Posters and  
Reception*

### WEDNESDAY, MAY 6, 2015

7:30 AM – 8:00 AM • *Continental Breakfast*

8:00 AM – 9:00 AM • *Plenary Session, Madeleine  
Jacobs*

9:00 AM – 9:15 AM • *Coffee Break*

9:15 AM – 11:45 AM • *Disruption in Biotechnology and  
Process Chemistry*

11:45 AM – 12:45 PM • *Lunch/Awards and Business  
Meeting*

1:00 PM – 3:00 PM • *Leadership Forum*

### MONDAY, MAY 4, 2015

11:00 AM – 12:00 PM

**New Chairs Workshop** (Hickory)

*Workshop Moderator: Mark Benvenuto, PhD*

1:00 PM – 3:00 PM

**Safety Workshop**

This workshop will focus on the ongoing efforts to enhance the safety culture at university departments of chemistry and chemical engineering.

*Chair: Bill Tolman, PhD*

*Amy Haberman, PhD*

*Liz Mackey, PhD*

3:00 PM – 3:15 PM

**Coffee Break**

3:15 PM – 5:15 PM

**Interest Groups Sessions**

**Role of Masters' Degree** (Poplar)

*Chair: Paul Craig, PhD*

**Chemistry Chairs** (Walnut A/B)

*Chair: Matt Sanders, PhD*

**Chemical Engineering Chairs** (Chestnut)

*Chair: Mario Eden, PhD*

**Industry/Government Labs** (Hickory)

*Chairs: Francine Palmer, PhD*

*Bill Provine, PhD*

5:30 PM – 7:30 PM

**Opening Reception and Student Poster Session**

The student presenters in this poster session are nominated by CCR member organizations as future leaders in the chemical enterprise whose research has the potential to be disruptive.

### TUESDAY, MAY 5, 2015

7:30 AM – 8:00 AM

**Continental Breakfast**

8:00 AM – 8:15 AM

**Welcome/Meeting Overview**

*Kelly O. Sullivan, PhD*

8:15 AM – 9:15 AM

### Plenary Session

*Brien Stears*

*Associate R&D Director, Alternative Feedstocks and  
Dow Chlorine Products*

#### **The Ever Changing Landscape of Feedstocks and its Impact on the Direction of R&D**

The chemical industry has always existed in an environment where the choice of feedstock to supply intermediate chemicals for products changes on a continuous basis. With natural gas liquids increasing in supply with fracking technology releasing light hydrocarbons from previously inaccessible reservoirs, the primary feedstock slate for steam crackers has resulted in a significant trend towards lighter feeds. While this trend has enabled a wave of investment in ethane crackers and PDH for supply of ethylene and propylene, it simultaneously results in lower production of key by-products. Additionally, the production from the new shale plays is ultimately limited by the demand for natural gas, which would be enhanced by chemical technologies using methane to provide the carbon backbone for various chemicals. Alternative routes to produce steam cracking by-products such as aromatics and C4 olefins, options for methane as a feedstock, and use of new process technology to adapt to these changes will be directions that successful R&D programs will address moving forward.

9:15 AM – 9:30 AM

### Coffee Break

9:30 AM – 12:00 PM

### Disruption from the Rise in Shale Gas

The rise in shale gas has had a strong influence on the business strategies of many companies and is influencing the key research questions that need to be addressed by the chemical enterprise. In this session, speakers will discuss how shale gas is influencing the strategic decisions of their organizations.

*Vann Bush, The Gas Technology Institute*

*Brian Anderson, PhD, West Virginia University*

*Nazeer Bhore, PhD, ExxonMobil*

*Ruela Pabalan, PhD, Solvay*

*Jeff Siirola, PhD, Purdue University and Carnegie Mellon University*

12:00 PM – 1:30 PM

### Lunch and Plenary Session

*George H. Atkinson, PhD*

*Founder and Executive Director, Institute on  
Science for Global Policy (ISGP)*

#### **Disruptions: Perceptions of Science and Technology**

Many of the most critical, potentially disruptive issues now facing individuals and communities worldwide involve how to respond to the remarkable, often transformational, scientific and technological advances. Questions range from the appropriate role for vaccines to acceptable methods to ensure food safety to evaluating environmental changes and their impact. For decades, scientific and technological advances have exceeded expectations with opportunities to dramatically alter how we live. The successes of scientists and technologists, however, have not been matched by the effectiveness of how societies decide which of these advances to embrace and which to reject. These processes are often haphazard and influenced by ideologies and viewpoints well removed from credible scientific understanding. While the advances themselves might be potentially disruptive, the uneven approach to evaluating their benefits and disadvantages can be equally disruptive both publicly and in private sector enterprises. Can individuals trust the recommendations based on scientific understanding? Public perceptions and trust of science and technology, especially emanating from the private sector, may be a dominating factor in minimizing disruption in the 21st century.

1:45 PM – 3:45 PM

### Disruption Due to Climate Change

The well documented changing climate is having impacts globally including ocean acidification and changes in resource availability. The speakers in this session will cover a wide range of topics on how the changing climate is impacting the chemical enterprise.

*John Farrell, PhD, The Arctic Research Council*

*Dwight Gledhill, PhD, NOAA*

*Paul Shepson, PhD, Purdue University*

3:45 PM – 4:00 PM

### Coffee Break

4:00 PM – 5:00 PM

### Plenary Session

*Steven Ashby, PhD*

*Director, Pacific Northwest National Laboratory*

#### **Disrupting Our Way to a Sustainable Energy Future**

Our economy and society are increasingly dependent on electricity and the 100-year-old system we use to generate and manage it. This system depends on a number of energy sources

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(generation) ranging from coal, oil, and gas to nuclear and renewables. Today this system is being disrupted by technologies in fossil fuel extraction (such as fracking), more efficient and cost-competitive renewable sources (e.g., new photovoltaics), and grid-scale energy storage (such as flow batteries) that is allowing incorporation of intermittent renewables (e.g., solar and wind). These disruptive technologies are decentralizing the energy system and enabling consumers to double as generators in a dynamic marketplace. At the same time, our efforts to enable all energy devices in the system to share information and cooperative control are creating new data streams that offer the promise of a more efficient and reliable electric grid—assuming that we can reinvent the power grid to make use of this data. To do this, we must leverage the power of information technology (disruptive in its own right) to transform the way we manage electricity in the 21st century. This presentation will describe this rapidly evolving landscape.

5:00 PM – 7:30 PM

## Reception and Rising Stars Poster Session

The posters presented in this session will represent those individuals whom each sector has nominated as someone they expect to be an influential leader in future years.

11:45 AM – 12:45 PM

horizon. In this session we will discuss these changes and their impacts on the chemical enterprise.

*Donna Blackmond, PhD, The Scripps Research Institute*

*Spencer Dreher, PhD, Merck*

*Mike Grady, DuPont*

*Douglas Mans, PhD, GlaxoSmithKline*

*Sophie Vallon, PhD, Corning*

## Lunch/Awards and Business Meeting

1:00 PM – 3:00 PM

## Leadership Forum

In this moderated forum, leaders from each sector will discuss what “keeps them up at night” and how collaboration with the other sectors of the chemical enterprise might be able to help them solve those problems.

*Moderator: Chris Musso, PhD, McKinsey&Company*  
*Steve Ashby, PhD, Pacific Northwest National Laboratory*

*Gary Calabrese, PhD, Corning*

*Bob Curry, PhD, Latterell Venture Partners*

*Spiros Dimolitsas, PhD, Georgetown University*

*Marc Donohue, PhD, Johns Hopkins University*

*Laurie Locascio, PhD, NIST*

*Patrick Maestro, PhD, Solvay*

*Tanja Pietrass, PhD, Department of Energy*

*Jeffery Roberts, PhD, Purdue University*

## WEDNESDAY, MAY 6, 2015

7:30 AM – 8:00 AM

## Breakfast

8:00 AM – 9:00 AM

## Plenary Session

*Madeleine Jacobs, D.Sc.(h.c.)*

*President and Chief Executive Officer, Council of Scientific Society Presidents*

## Black Swans and Other Disruptions: How Can We Predict Them?

Speaking from the perspective of 21 years at the American Chemical Society, Jacobs will discuss how nonprofit organizations seek to understand potential disruptions to their business models and prepare for the future.

9:00 AM – 9:15 AM

## Coffee Break

9:15 AM – 11:45 AM

## Disruption in Biotechnology and Process Chemistry

The biotechnology sector, and process chemistry in general, have undergone significant radical changes in recent years and more is on the

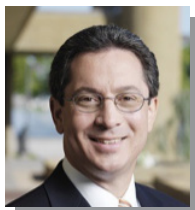
## SPEAKERS' BIOS



**BRIAN J. ANDERSON, PhD**  
**Director of the West Virginia University (WVU) Energy Institute and the GE Plastics Materials Engineering Professor in chemical engineering at WVU**

Brian J. Anderson is the Director of the West Virginia University (WVU) Energy Institute and the GE Plastics Materials Engineering Professor in chemical engineering

at WVU. He was awarded the 2012 Presidential Early Career Awards for Scientists and Engineers, the highest honor bestowed by the US government on science and engineering professionals in the early stages of their independent research careers and a 2014 Kavli National Academy of Science Frontiers of Science Fellow. He has been a NETL-RUA Faculty Fellow at the National Energy Technology Laboratory since 2008 where he is the coordinator of the International Methane Hydrate Reservoir Simulator Code Comparison study. In 2011, he was awarded a Secretary Honor Achievement Award from the Secretary of the Department of Energy for his role on the Flow Rate Technical Group, a team spanning multiple National Laboratories that worked in response to the Deepwater Horizon oil spill. Dr. Anderson received his Bachelor's degree in chemical engineering in 2000 at WVU and his MS and PhD in chemical engineering from the Massachusetts Institute of Technology in 2004 and 2005 respectively. After joining the faculty at WVU in January of 2006, he coauthored the MIT report, "The Future of Geothermal Energy: Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century." He serves on the technical advisory board of AltaRock Energy and in the 2011, along with colleagues from Stanford, MIT, Cornell, University of Utah, Southern Methodist University, and the University of Nevada, he cofounded the National Geothermal Academy. His research interests include molecular, reservoir, and multiscale modeling applied to energy and biomedical systems.



**STEVEN ASHBY, PhD**  
**Director, Pacific Northwest National Laboratory**

Dr. Steven Ashby has served as the Director of the Pacific Northwest National Laboratory (PNNL) since April 2015. He is responsible for establishing the Laboratory's vision and setting its strategic direction. Under his leadership, PNNL's exceptional staff are advancing the frontiers of

science and addressing complex challenges in energy, the environment, and national security. In particular, the Laboratory is providing national leadership in climate science, the power grid, nuclear nonproliferation, and environmental remediation.

Dr. Ashby previously served as PNNL's Deputy Director for Science and Technology, and was responsible for integrating PNNL's science and technology capabilities to meet national needs. Toward that goal, he led institutional

strategic planning activities, stewarded an \$80M discretionary research portfolio, and promoted Laboratory-wide efforts to elevate PNNL's standing in the broader scientific community. He also oversaw the Laboratory's technology commercialization, government relations, and research integrity functions. He served as a member of DOE's Laboratory Operations Board and was past chair of the DOE National Laboratory Chief Research Officers Working Group, which advises the National Laboratory Director's Council on scientific and programmatic issues.

Before joining PNNL in 2008, Dr. Ashby spent nearly 21 years at Lawrence Livermore National Laboratory (LLNL), ultimately serving as Deputy Principal Associate Director for Science and Technology. He previously oversaw the activities of the 500-person Computing Applications and Research Department. Dr. Ashby was the founding director of LLNL's Center for Applied Scientific Computing, which was established in 1996 and has since matured into one of the world's premier scientific computing research organizations.

Dr. Ashby is widely recognized as a leader in computational science and has worked to advance it as a discipline throughout his career. His research focused on computational mathematics and scalable numerical algorithms; he is considered an expert in polynomial iterative methods and adaptive preconditioning techniques for large sparse linear systems. He has published numerous papers, and he has worked in a variety of areas, including large-scale scientific simulation (with application to electromagnetics and subsurface flow and transport), numerical linear algebra, massively parallel computing, and applied computer and data sciences. He remains active in the computational science community, including participation in the Society for Industrial and Applied Mathematics.

In 2013, Dr. Ashby was elected a Fellow of the American Association for the Advancement of Science in the mathematics section for "exceptional technical contributions and scientific leadership in applied mathematics and computational science, particularly the development of novel numerical methods and robust software for parallel computers, as well as for exemplary service to the field of computational science and engineering." He also was elected to the Washington State Academy of Sciences in 2013.

He holds a BS in mathematics/computer science from the University of Santa Clara. He earned his MS and PhD in computer science from the University of Illinois at Urbana-Champaign.



**GEORGE H. ATKINSON, PhD**  
**Founder and Executive Director of the Institute on Science for Global Policy (ISGP) Emeritus Professor of Chemistry, Biochemistry, and Optical Science at the University of Arizona**

Dr. George Atkinson is the Founder and Executive Director of the Institute on Science for Global Policy (ISGP) and is an

Emeritus Professor of Chemistry, Biochemistry, and Optical Science at the University of Arizona. His professional career has involved academic teaching, research, and administration, roles as a corporate founder and executive, and public service at the federal level. He is former Head of the Department of Chemistry at the University of Arizona, the founder of a laser sensor company serving the semiconductor industry, and Science and Technology Adviser (STAS) to US Secretaries of State Colin Powell and Condoleezza Rice. Dr. Atkinson is the current president of Sigma Xi, The Scientific Research Society, a 127-year-old honor society for scientists and engineers committed to supporting innovative ethical research especially among young students. He launched the ISGP in 2008 as a new type of international forum in which credible experts provide governmental and societal leaders with the objective understanding of the science and technology that can be reasonably

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anticipated to help shape the increasingly global societies of the 21st century. Dr. Atkinson has received a Senior Fulbright Award, the SERC Award at Oxford University (U.K.), the Senior Alexander von Humboldt Award (Germany), a Lady Davis Professorship (Israel), the first American Institute of Physics' Scientist Diplomat Award, the Distinguished Service Award (Indiana University), an Honorary Doctorate (Eckerd College), the Distinguished Achievement Award (University of California, Irvine), and was selected by students as the Outstanding Teacher at the University of Arizona. He received his BS (high honors, Phi Beta Kappa) from Eckerd College and his PhD in physical chemistry.



## **DONNA G. BLACKMOND, PhD, NAE**

**Professor of Chemistry at The Scripps Research Institute, La Jolla, CA**

Donna G Blackmond received a PhD in chemical engineering from Carnegie-Mellon University in 1984.

She has held professorships in chemistry and in chemical engineering in the US, Germany, and the UK, and she has worked in industrial research in the pharmaceutical industry at Merck & Co., Inc. In 2010 she moved from a research chair and joint professorial appointments in chemistry and chemical engineering at Imperial College London to her present position as Professor of Chemistry at The Scripps Research Institute in La Jolla, California.

Professor Blackmond has received Royal Society of Chemistry awards in Physical Organic Chemistry and in Process Technology, a Royal Society Wolfson Research Merit Award and an ACS Arthur C. Cope Scholar Award. She has been a Woodward Visiting Scholar at Harvard and a Miller Institute Research Fellow at Berkeley. She received the Max-Planck-Society's Award for Outstanding Women Scientists, and she was an NSF Presidential Young Investigator. She has received the Paul H. Emmett Award in Fundamental Catalysis from the North American Catalysis Society and the Paul Rylander Award from the Organic Reactions Catalysis Society. In 2013, she was named a Simons Foundation Investigator in the Simons Collaboration on the Origins of Life. Professor Blackmond was elected as a member of the US National Academy of Engineering in 2013.

Professor Blackmond's research focuses on kinetic and mechanistic studies of catalytic reactions for pharmaceutical applications, including asymmetric catalysis. She has pioneered the development of Reaction Progress Kinetic Analysis (RPKA), which makes use of in-situ tools to monitor reaction progress and employs novel graphical manipulations for rapid and straightforward analysis of the kinetics of solution-phase reactions. Other major areas of Prof. Blackmond's research include the investigation of nonlinear effects of catalyst enantiopurity in stoichiometric, catalytic and autocatalytic reactions as well as studies of enantioenrichment based on the phase behavior of chiral molecules. This work has led both to practical application as well as to fundamental studies probing the origin of the homochirality of biological molecules.



## **NAZEER BHORE, PhD** **Manager of Downstream Breakthrough Research, ExxonMobil Research and Engineering**

Nazeer Bhore is the Manager of Downstream Breakthrough Research in ExxonMobil Research and Engineering, Clinton, NJ. He has more than 25 years' experience at ExxonMobil and its affiliates in various refining, chemical, marketing

and corporate functions such as research, innovation, engineering, planning, technical services, and technology licensing.

Nazeer holds a BE from the University of Bombay and a PhD. from the University

of Delaware, both in chemical engineering. He is also a graduate of the Wharton Management Program.

In his current role, Nazeer is responsible for Front-end of the technology pipeline for Downstream Business and the Innovation Health of EMRE's R&D Organization.



## **VANN BUSH** **Managing Director of Energy Supply and Conversion at the Gas Technology Institute**

Mr. Bush is Managing Director of Energy Supply and Conversion at the Gas Technology Institute, where he has worked for the past 11 years. He has 38 years of experience in energy technology development and demonstration. He oversees research and development

programs for advanced unconventional gas production, thermochemical conversion of fuels (coal or biomass or natural gas), electrochemical processes, and the cleanup and reforming of natural gas and synthesis gas for use in power, chemicals, and liquid fuels production. Research and development programs are under way to optimize the environmental performance and productivity of hydraulic fracturing production, provide commercial design support for a biofuels production process, pilot a natural gas partial oxidation reactor, develop an electrochemical gas-to-liquids process, and prove CO<sub>2</sub> capture and utilization technologies.



## **GARY S. CALABRESE, PhD** **Senior Vice President of Global Research, Corning**

Gary Calabrese joined Corning in 2008 and is senior vice president and head of Global Research. Previously he worked at Polaroid, Allied-Signal, and Rohm and Haas where he headed their corporate research laboratory and later became vice president and chief technology officer.

Dr. Calabrese holds a BS degree in chemistry from Lehigh University, and a Ph. in inorganic chemistry from MIT. He is a Fellow of the American Association for the Advancement of Science, a member of the National Academy of Engineering, the American Institute of Chemical Engineers and the American Chemical Society. Calabrese has served on many advisory boards including the Council for Chemical Research, Chemical & Engineering News, and the American Chemical Society. He currently is an advisory board member for Cornell University's Department of Chemical and Biomolecular Engineering, and most recently was named to the Visiting Committee for the Department of Chemical Engineering at M.I.T. He has over 60 patents and technical publications.



## **BOB CURRY, PhD** **Partner, Latterell Venture Partners**

Dr. Curry has 28 years of healthcare venture capital investing experience including active involvement with 38 start-up or early stage companies, of which 32 achieved an IPO or successful merger. Prior to his VC activities, he started two companies of his own, one of which was a diagnostics lab, and the other was a diagnostic product

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company. Bob also held an academic professorship at the University of Delaware, as well as being the Director of Technology at Becton Dickinson.

Prior to joining LVP, Bob was a partner at Alliance Technology Ventures where he invested exclusively in healthcare ventures. Before ATV he was the original healthcare partner at the Sprout Group (the venture affiliate of Donaldson, Lufkin & Jenrette), and prior to Sprout he was the President of Merrill Lynch Venture Capital and Merrill Lynch R&D Management Inc. Successful portfolio companies include: Adeza Biomedical, Genoptix, Gen-Probe, Idec Pharmaceuticals, Idexx, Ligand Pharmaceuticals, Pathology Partners, Prometheus, Regeneron, and Tripath Imaging, among others.

Bob holds a PhD and an MS in chemistry from Purdue University where he was a Smith Kline Fellow, and he received his BS in physics from the University of Illinois at Urbana where he was a James Scholar. He also served for many years as the Board Chair at the Keck Graduate Institute of Applied Life Sciences at the Claremont Colleges.



## **SPIROS DIMOLITSAS, PhD** Senior Vice President for Research & Chief Technology Officer Georgetown University

Spiros Dimolitsas was appointed Senior Vice President for Research & Chief Technology Officer at Georgetown University in July 2011. In this newly created role, he leads Georgetown's development of innovation alliances and

partnerships with the industry, universities, and national laboratories domestically and overseas to address complex socio-technical problems of our time in such fields as health, security and sustainability. He works collaboratively with leaders across the University to promote research, secure investments in University-based programs, and oversee multi-disciplinary and multi-institutional research programs, and the Office of Technology Commercialization.

Prior to this role, Dr. Dimolitsas was Senior Vice President and Chief Administrative Officer of Georgetown University from November 2001 until July 2011. In that role he was responsible for a number of functions that included facilities, information technology, public safety, technology commercialization, human resources, and student dining and housing among others.

Dr. Dimolitsas' expertise in large-scale science and technology, high-tech/high-risk project management and technology commercialization has formed the basis for advice that has been provided on innovation and on complex-systems risk management to the US government and others. He also represents Georgetown University in a variety of fora on climate issues, including the World Economic Forum's Global University Leadership Forum on Sustainability.

Dr. Dimolitsas holds a BS in theoretical physics with Honors from Sussex University in England; a MS in nuclear engineering from Imperial College and Queen Mary College –London; and a PhD in electrical and computer engineering from Sussex University



## **MARC DONOHUE, PhD** Professor, Johns Hopkins University

Marc Donohue served as the Vice Dean of Research for the JHU Whiting School of Engineering from 2007-2011 before rejoining the Department of Chemical and Biomolecular Engineering. He received his PhD from the University of California, Berkeley in 1977, and his BS from Clarkson College of Technology with Great Distinction as

the class valedictorian.

Marc also served on the Council for Chemical Research Governing Board for nearly 20 years as its treasurer before being elected to the Chair. He was the Chair of the Governing Board of CCR in 2013.



## **SPENCER DREHER, PhD** Catalysis and Automation Group at Merck

Spencer Dreher was born in Toledo Ohio in 1971 and then journeyed to Macalester College in St. Paul, MN for an undergraduate degree in chemistry. A mid-western boy at heart, Spencer moved to the big city to attend Columbia University, where he obtained a PhD in 1999 in the labs of Thomas Katz. He then stayed at Columbia

to work as a post-doctoral fellow with James Leighton. After finishing school, Spencer started work at Merck in the Department of Process Research in 2001, where he worked in scale-up development for six years then moved into his true niche, the Catalysis and Automation group, where he has spent the past six years developing new tools for chemistry discovery and development. His goal in his professional life is to work with forward-thinking organic chemists to create a future, high-tech, big-data vision for organic chemistry.



## **JOHN FARRELL, PhD** Executive Director of the U.S. Arctic Research Commission

Dr. John Farrell is the Executive Director of the U.S. Arctic Research Commission, an independent federal agency of Presidential appointees that advises the White House and Congress on Arctic research. He previously served as the Associate Dean of Research at the Graduate School of Oceanography at the University of Rhode Island. He was also Director of the \$65M/year international Ocean Drilling Program that involved over 20 nations. Farrell helped organize and conduct the first successful international scientific ocean drilling expedition to the high Arctic in 2004. He participated in a US ocean mapping effort aboard the icebreaker US Coast Guard Cutter Healy in 2012. He obtained a PhD and ScM in geological sciences from Brown University and a BA in geology from Franklin and Marshall College. He was a NSF-funded Post-Doctoral Fellow at Brown University and an NSERC-funded Senior Research Associate at the University of British Columbia.



## **CHARLETTE GEFFEN, PhD** Director for the Atmospheric Sciences and Global Change Division Fundamental & Computational Sciences Directorate

**Pacific Northwest National Laboratory**

Dr. Geffen is the Director for the Atmospheric Sciences and Global Change (ASGC) Division at the Pacific Northwest National Laboratory (PNNL), and also serves as the Laboratory



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Research Manager for the Climate and Environmental Sciences Programs at PNNL. As the Division Director, she directs research to understand the atmospheric processes that drive regional and global earth systems, and interactions with precipitation, land surface and human activities. The Division has a primary focus on cloud physics and aerosol-cloud-precipitation interactions; global- and regional-scale climate modeling, including hydrologic systems and human systems (particularly energy-climate interactions), and complex regional meteorology and aerosol chemistry. The Joint Global Change Research Institute, a partnership between PNNL and the University of Maryland, located in College Park, MD, is also under her leadership as a part of the ASGC Division. As a leader for the Climate and Environmental Sciences Program, she provides leadership for PNNL programs across a broad integrated Earth sciences spectrum, with a vision to advance the predictive capability and utility of climate and Earth system models to inform solutions that enable effective mitigation of impacts and adaptation to change.

Dr. Geffen has served in lead roles at conferences and on advisory groups. Her most recent appointments are to the EPA Board of Scientific Counselors (Air, Climate and Energy subcommittee) and to the UCAR Board of Trustees. She was a lead author on a National Research Council report on collaborations between DOE national laboratories and universities. Dr. Geffen has published more than 50 articles and full-length reports and is a reviewer for the International Journal of Operations Management. She has served in a variety of research and leadership positions during her career at PNNL, as well as an adjunct faculty member at Washington State University.

Dr. Geffen earned her PhD from the Massachusetts Institute of Technology. She has an MBA from the University of Washington, and a BS in civil engineering from Stanford University.



## DWIGHT GLEDHILL, PhD Deputy Director, NOAA Ocean Acidification Program

Dr. Gledhill serves as the Deputy Director of the NOAA Ocean Acidification Program office in Silver Spring, MD. Previously he was an associate scientist with the UM/RSMAS Cooperative Institute of Marine & Atmospheric Sciences (CIMAS) with NOAA's Atlantic Oceanographic &

Meteorological Laboratory Ocean Chemistry Division where he advanced ocean acidification research primarily related to monitoring and understanding the process of ocean acidification within coral reef ecosystems.

He was instrumental in establishing the NOAA Coral Reef Conservation Program (CRCP) Atlantic Ocean Acidification Test-bed (AOAT) in La Parguera, Puerto Rico and recently another test-bed within the Florida Keys National Marine Sanctuary. He also has worked on the development of a satellite-based ocean acidification data synthesis product for the Greater Caribbean Region that scales up discrete ship-based observations of surface ocean carbonate chemistry. The model produces synoptic monthly fields of carbonate chemistry including aragonite saturation state and CO<sub>2</sub> partial pressure that can be used to track regional and seasonal changes in carbonate chemistry related to ocean acidification

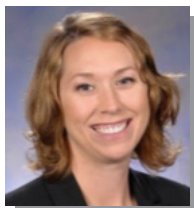
Gledhill has been a contributor to numerous strategic planning documents related to ocean acidification within NOAA including leading the development of the Southeast/GOM Regional Strategic Plan on ocean acidification and CRCP OA science plan. Gledhill received his MS and PhD from the Department of Oceanography at Texas A&M University in 2005 where he primarily investigated carbonate mineral kinetics in complex electrolyte solutions as well the sediment biogeochemistry associated with methane clathrates in the Northern Gulf of Mexico.



## MIKE GRADY, PhD Technology Manager/Senior Technical Fellow with DuPont Industrial Biosciences

Mike Grady is a Technology Manager/Senior Technical Fellow with DuPont Industrial Biosciences, leading a process technology group dedicated to commercialization of bioactives, biomaterials and biofuels. He has over 35 years' experience with DuPont: twenty-five in Performance

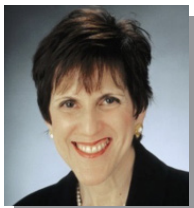
Coatings, five in Central Research and more recently in Industrial Bioscience. Mike has over 20 patents and 30 publications. His DSc in material science is from ETH in Zurich; his MSc in chemical engineering is from the University of Pennsylvania, and his BSc in chemical engineering is from Drexel University. He is currently an Adjunct Professor of Chemical Engineering at Drexel and Rowan Universities.



## AMY HABERMAN Director of Laboratory Safety for the College of Engineering at the University of Florida

Ms. Amy Haberman is the Director of Laboratory Safety for the College of Engineering at the University of Florida. She has held the position since July of 2013, during which she has consulted with the various departments within the college to provide EHS guidance and assistance and

identify ways to implement best practices. She has over 10 years' experience in EHS in various industries, including biotech, agriculture and manufacturing. She holds a BS in Occupational, Environmental, Safety and Health and is also an Associate Safety Professional as recognized by the Board of Certified Safety Professionals. Amy is the incoming Chair for the Lab Safety Community of Practice, within the Campus Safety Health and Environmental Management Association. Prior to coming to UF she was the Manager of EHS for the Wisconsin Institutes of Discovery a multi-disciplinary research facility at the University of Wisconsin. Amy focuses on empowering students to be leaders in safety by influencing cultural change at the department level.



## MADELEINE JACOBS, D.Sc. (h.c.)

### President and Chief Executive Office of the Council of Scientific Society Presidents

Madeleine Jacobs was Executive Director and CEO of the American Chemical Society from 2004 to February 2015.

She also served for 10 years as Managing Editor and Editor-in-Chief of ACS's weekly newsmagazine, Chemical and Engineering News (C&EN), where she worked early in her career. She spent 21 years at the National Institute of Allergy and Infectious Diseases, the National Institute of Standards and Technology, and the Smithsonian Institution, where she was chief science writer and director of the Office of Public Affairs. Jacobs is now President and Chief Executive Officer of the Council of Scientific Society Presidents, an organization of scientific federations and societies.

Jacobs holds a BS in chemistry with honors and distinction from George Washington University (GWU) and an honorary Doctor of Science from GWU.

She is a member of the GWU Board of Trustees and numerous other boards. Among her awards are the New York Academy of Sciences Women's History Month Award, the ACS Award for Encouraging Women into Careers in the Chemical Sciences, and the American Crystallographic Association Public Service Award. She is a Fellow of the American Association for the Advancement of Science and was chosen in 2012 as one of 100 Women in STEM (Science, Technology, Engineering, and Math) by STEMconnector™.

Jacobs is the author of nearly 500 editorials and major articles in Chemical & Engineering News, Physics Today, Smithsonian, Smithsonian News Service, and other publications. She has received more than three dozen national science writing awards and is the recipient of 17 named lectureships at US universities and companies.

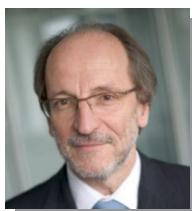


**Laurie E. Locascio, PhD**  
Director, Material Measurement  
Laboratory, NIST

Laurie E. Locascio is the director of the Material Measurement Laboratory at the National Institute of Standards and Technology. The Material Measurement Lab has ~1000 staff members and visiting scientists and serves as the nation's reference laboratory for measurements

in the chemical, biological and materials sciences through activities ranging from fundamental research in the composition, structure and properties of industrial, biological, and environmental materials and processes, to the development and dissemination of certified reference materials, critically evaluated data and other measurement quality assurance programs. The Material Measurement Laboratory serves a broad range of industry sectors ranging from transportation to biotechnology, and provides research, measurement services and quality assurance tools for addressing problems of national importance ranging from assessment of climate change, to the investigation of new sources of renewable energy, to improved diagnostics and therapies for health care.

Dr. Locascio received her BSc in chemistry from James Madison University, MSc in bioengineering from the University of Utah, and PhD in toxicology from the University of Maryland School of Medicine. She has published more than 100 scientific papers and holds eight patents in the fields of microfluidics, biosensors and sensor/flow systems. Some of her honors and awards include the US Department of Commerce Silver Medal, US Department of Commerce Bronze Medal Award, ACS Division of Analytical Chemistry Arthur F. Findeis Award, the NIST Applied Research Award. She is a Fellow of the American Chemical Society (ACS).



**Patrick Maestro, PhD**  
Scientific Director, Research and Innovation,  
Solvay

Dr. Maestro started his career in 1980 within Rhône-Poulenc, holding several positions as a researcher on the physics and chemistry of inorganic compounds, particularly rare earths, and their applications in luminescent materials,

pigments, magnetic materials, catalysis...

P. Maestro was named a Fellow Scientist of Rhône-Poulenc in 1994, then a member of the Scientific Council of RP, and then Rhodia. He was named Scientific Director of Rhodia in 2004. He established long-term orientations for the group in the domains of physical-chemistry, inorganic chemistry, materials science, polymers, renewable chemistry...

Since 2013, he has been Scientific Director, Research and Innovation, at Solvay. He has put in place several collaborations with the academic world, particularly with four joint teams with French CNRS and universities. He holds 12 Patents, 60 Publications, and 20 invited talks at International Conferences.

P. Maestro is a member of the French Academy of Technologies and has a PhD in solid state physics and chemistry, University of Bordeaux, France, Laboratory of Solid State Chemistry.



**Liz Mackey, PhD**  
Safety Program Coordinator for Material  
Measurement Laboratory at NIST

Dr. Elizabeth Mackey completed her BS in chemistry at Boston College in 1984, worked as a laboratory technician at Johns Hopkins for two years, and then applied to graduate school. She completed her PhD in nuclear chemistry at the University of Maryland, College

Park in 1991 and then worked for 20 years as a research chemist at NIST with a focus on fate of metals in the environment, standard reference materials and quality systems. Dr. Mackey became the Safety Program Coordinator for the Material Measurement Laboratory at NIST in 2010 and has developed a number resources needed to manage safety in a dynamic research environment.



**Douglas Mans, PhD**  
Director, Technology Development Lead/  
Technology Industrialization Lead  
Advanced Manufacturing Technologies,  
RD Platform Technology & Science,  
GlaxoSmithKline

Douglas Mans joined GSK in 2006 in Product Development working on new route development, process optimization, and scale-up for transfer to manufacture. Following five years of process chemistry work, he accepted a sabbatical into a role as one of three original Platform Technology and Sciences (PTS within R&D) Seekers involved in searching out disruptive technologies that are transformative to the PTS discovery and development processes. Most recently Douglas had moved into his new co-roles as the Technology Development Lead for Chemical Catalysis and the Technology Industrialization Lead for Continuous Primary Technology. Douglas has a PhD from the University of Michigan and completed a NIH funded post-doctoral training from University of Texas in synthetic organic chemistry.



**Christopher Musso, PhD**  
Principal, McKinsey&Company

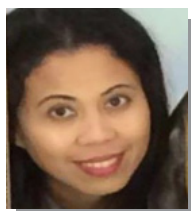
Chris co-leads McKinsey's Americas Product Development Practice and is very active in the Chemicals Practice. He is also the co-managing partner of the Denver Office, where he is helping to invest in the economic development of the greater Mountain West region. As an advisor to executives, Chris focuses on setting effective strategies and driving sustainable business growth. In his strategy work, he helps design R&D approaches, shape product strategy, and optimize the business portfolio. In

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his growth work, he fosters business development through innovation, pricing, and mergers and acquisitions.

With a particular emphasis on boosting growth through improved product performance, Chris helps clients optimize their products from both a cost and a feature perspective. While he works with a range of product-focused companies, Chris brings particular expertise in the chemicals and basic materials sectors.



## **RUELA PABALAN, PhD** **Strategic Technology Manager, Solvay** **Novocare – Oil and Gas**

Dr. Ruela Pabalan is currently the Strategic Technology Manager of Solvay Novocare – Oil and Gas. She is responsible for assessing new external and internal technologies as part of innovation. Prior to this, she managed the North America O&G Research and

Innovation laboratory in Bristol, served as project leader and commercialized products jointly with customers. Dr. Pabalan is also an author to several peer-reviewed publications, US and International patents.

Dr. Pabalan received her PhD from the University of Texas at Austin and joined Solvay (then Rhodia) in 2000. She volunteers in the local outreach, and she was a co-founder of their Science Ambassador Program, where Solvay scientists become a direct link to teachers and students in local schools and carry out science experiments.



## **TANJA PIETRASS, PhD** **Director, Chemical Sciences, Geosciences,** **and Biosciences Division, Office of Basic** **Energy Sciences, Office of Science, US** **Department of Energy**

Dr. Pietrass is the Director of the Chemical Sciences, Geosciences, and Biosciences Division in the Office of Basic Energy Sciences, Office of Science, US Department of

Energy. She previously served as the Deputy Division Director and Acting Director of the Chemistry Division at the National Science Foundation, and as Program Director in the Experimental Physical Chemistry, Chemical Structure and Dynamics, and Chemical Measurement and Imaging programs in the same Division.

Prior to her service at the National Science Foundation, she was a faculty member and Chair in the Chemistry Department at New Mexico Tech, where she rose through the ranks to full professor. Her research interests centered on solid-state nuclear magnetic (NMR) resonance spectroscopy and optical techniques to enhance the nuclear spin polarization with applications to gas sorption in porous materials, surface characterization, optical pumping in semiconductors, heterogeneous catalysis, and ion mobility in batteries. She was a NATO DAAD postdoctoral fellow and received the New Mexico Tech Distinguished Research Award. Dr. Pietrass is the author of approximately 55 peer-reviewed articles and is a member of the American Chemical Society. She earned her BS/MS and PhD in Chemistry from the Technical University of Munich.



## **JEFFREY ROBERTS, PHD** **Frederick L. Hovde Dean of Science,** **Purdue University**

Jeffrey Roberts is the Frederick L. Hovde Dean of Science at Purdue University in West Lafayette, Indiana. Dr. Roberts was born in California and completed his undergraduate studies there, first at Santa Rosa Junior College and then at the University of California, Berkeley, where he earned a BS in Chemistry in 1982. His doctoral research, on ultrahigh vacuum surface chemistry,

was conducted under the direction of Cynthia Friend at Harvard University. Upon completing his PhD in 1988, he became a post-doctoral associate in the Department of Chemical Engineering at Stanford University, working in the group of Robert Madix. He joined the University of Minnesota as an Assistant Professor in 1990, and was promoted to Associate Professor in 1996 and Professor in 2003. He served as Chair of the Department of Chemistry there from 2005-09. Dr. Roberts assumed his current position in 2009. The College of Science at Purdue is comprised of seven academic departments, has approximately 325 tenured and tenure-track faculty members, and serves over 4000 undergraduate and graduate students. Dr. Roberts is the third chemist to be Dean of Science at Purdue.

Dr. Roberts has authored or co-authored over 100 peer-reviewed papers, as well as several book chapters and monographs. His research interests focus on aerosol surface chemistry, with emphases on heterogeneous processing at atmospheric aerosol particles and surface modification of aerosol nanoparticles for materials applications. Prof. Roberts is the recipient of several awards, including a Special Creativity Award from the National Science Foundation (2003) and a Sloan Fellowship (1996). He was elected a Fellow of the American Association for the Advancement of Science in 2008.



## **PAUL B. SHEPSON, PhD** **Jonathan Amy Distinguished Professor–** **Analytical and Atmospheric Chemistry,** **Purdue University**

The Shepson group is involved in fundamental studies of the chemistry of the Earth's atmosphere, and specifically, photochemistry that occurs in the lowest 10-15 km, i.e. the troposphere. Most of our research questions ultimately relate to understanding factors that influence tropospheric ozone, a toxic but also essential component of the lower atmosphere. Research activities involve a wide and interconnected array of laboratory experiments, analytical methods development, field measurement campaigns, and supporting computer modeling activities. We currently are pursuing problems in three broad areas: Studies of the impact of forest-derived natural hydrocarbons; Studies of the role of snow phase photochemistry in the Arctic; and Analytical methods development for rapid and trace level atmospheric measurements. Dr. Shepson received his BS from SUNY College at Cortland, and his PhD from Pennsylvania State University.



## **JEFF SIIROLA, PhD** **Professor of Engineering Practice at Purdue** **University and Distinguished Service** **Professor of Sustainable Energy Systems at** **Carnegie Mellon University**

Jeff Sirola retired in 2011 as a Technology Fellow at Eastman Chemical Company in Kingsport Tennessee where he had been for more than 39 years. He now holds half-time positions as professor of engineering practice at Purdue University and Distinguished Service Professor of Sustainable Energy Systems at Carnegie Mellon University. Sirola received a BS in chemical engineering from the University of Utah in 1967 and a PhD in chemical engineering from the University

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of Wisconsin-Madison in 1970. His areas of interest include chemical process synthesis, computer-aided process engineering, design theory and methodology, process development and technology assessment, resource conservation and recovery, sustainable development and growth, carbon management, and chemical engineering education. Sirola is a member of the National Academy of Engineering and was the 2005 President of the American Institute of Chemical Engineers.



## BRIEN STEARS

### Associate R&D Director, Alternative Feedstocks and Dow Chlorine Products

Mr. Stears has 25 years of experience at Dow in R&D, finance, strategic planning and manufacturing Technology Centers. Early R&D efforts focused on reactor design, optimization and control and kinetic modeling. He held finance and manufacturing

roles leading strategic planning, capital authorization, and project development for Dow's global Aromatic Derivatives business. Brien returned to R&D as Manager for Next Generation Olefins working on natural gas monetization, methane activation with a leveraged role leading R&D portfolio management for the Basics, Plastics and Hydrocarbons businesses. He was the R&D lead for Dow's US Gulf Coast Competitiveness team defining business options leading to the current investment strategy for Dow on the US Gulf. In his current role as Associate R&D Director, his team conducts research directed at advanced Propane Dehydrogenation technology, breakthroughs in shale gas utilization, syngas conversion technologies as well as responsibility for process R&D and technical support for Dow's propylene and chlorine envelopes. Mr. Stears has a BS in Chemical Engineering from the University of Colorado – Boulder and is a Certified Six Sigma Black Belt. He holds two US patents with seven patents pending and has authored or co-authored over 60 internal and external papers.



## KELLY O. SULLIVAN, PhD

### Interim Director of Institutional Strategy, Pacific Northwest National Laboratory

Dr. Kelly O. Sullivan has served as the Interim Director of Institutional Strategy at the Pacific Northwest National Laboratory (PNNL) since April 2015. In that role, she provides leadership in developing PNNL's long-term scientific vision and strategy for distinguishing PNNL within

the scientific community. She also oversees PNNL's institutional S&T investments, S&T performance methods, and strategic business capture and proposal management functions. In addition, she manages the Linus Pauling Distinguished Postdoctoral Fellowship program.

Dr. Sullivan joined PNNL in 2001 and has had multiple roles at the Laboratory. She has led the Laboratory's institutional S&T investments—an \$80M annual investment portfolio for capability and business development—since April 2012 and has managed the Linus Pauling Postdoctoral Fellowship Program since its inception in 2009. Prior to coming to PNNL, she was a chemistry professor at Mankato State University in Minnesota and at Creighton University in Nebraska. Dr. Sullivan's

research interests focus on the electronic structure of small molecules and ions. She received a BS in chemistry from Christian Brothers College and a PhD in physical chemistry from Texas Tech University.



## BILL TOLMAN, PhD

### Distinguished McKnight University Professor, University of Minnesota

William B. Tolman obtained a BS degree from Wesleyan University in 1983, where he performed organometallic chemistry research under the direction of Alan R. Cutler. He did graduate research with K. Peter C. Vollhardt at the University of California, Berkeley, that culminated

in a PhD in 1987. He was then introduced to bioinorganic chemistry during a postdoctoral period, 1987-1990, in the laboratory of Stephen J. Lippard at the Massachusetts Institute of Technology. He was appointed as assistant professor in the Department of Chemistry at the University of Minnesota in 1990 and has risen through the ranks there to his current position as Distinguished McKnight University Professor. He is a member of the Centers for Metals in Biocatalysis and Sustainable Polymers and currently is serving as Chair of the Department of Chemistry. Among the honors he has received are the Searle Scholars, NSF National Young Investigator, Camille & Henry Dreyfus Foundation Teacher-Scholar, and Alfred P. Sloan Foundation Awards, the Buck-Whitney Medal from the American Chemical Society, and a Research Award from the Humboldt Foundation. He is a Fellow of the American Association for the Advancement of Science and the American Chemical Society. Tolman served as Associate Editor (2009-2012) and now as Editor-in-Chief of Inorganic Chemistry (2013-present), and serves on the governing boards of the ACS Petroleum Research Fund and the Council for Chemical Research. He also served as Chair of the Gordon Research Conferences on Inorganic Reaction Mechanisms (2005) and Metals in Biology (2011). Current research in his group encompasses synthetic bioinorganic and organometallic/polymer chemistry.



## SOPHIE VALLON, PhD

### Technology Manager for Corning® Advanced-Flow™ Reactors

Dr. Sophie Vallon graduated in solid state physics and semiconductors from Ecole Polytechnique, France in 1991 and obtained her PhD degree in Physics from the same institution in 1996. She joined Corning in 1997 where she has held different functions in research and development.

Recently she has led a portfolio of projects on glass substrates for photovoltaics applications. She is now the technology manager for Corning® Advanced-Flow™ Reactors. Her team has recently launched a photochemical reactor which is both a process development tool and a pilot scale production tool.



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## COUNCIL FOR CHEMICAL RESEARCH AWARD WINNERS

### COLLABORATION AWARD

The Dow Chemical Company and the Center for Life Cycle Engineering (CALCE) at the University of Maryland

### DIVERSITY AWARD

**Rigoberto Hernandez, PhD**  
Professor of Chemistry, Georgia Institute of Technology

### RISING STAR POSTER AWARDEES

**Mahdi Abu-Omar**  
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**Christy Haynes**  
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**Brian Miller**  
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**Jordan Musser**  
NETL

**Yue Wu**  
Iowa State University

**Justin Zook**  
NIST

### PRUITT AWARD

**Gintaras 'Rex' Reklaitis, PhD**  
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Purdue University

### SAFETY AWARDS

School of Chemical and Biomolecular Engineering, Georgia Institute of Technology  
Department of Chemistry, Stony Brook University

### STUDENT POSTER AWARDEES

**Ryan Barton**  
North Carolina State University

**Reem Eldawud**  
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**Ahmed Gomaa**  
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**Katherine Harry**  
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**Sehinde Owoseni**  
Tulane University

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## 2015 Annual Meeting Program Committee

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## ABOUT

CCR is a not-for-profit organization whose members are companies/corporations, universities, and government laboratories which conduct research in chemistry, chemical engineering, and related disciplines in the United States. Member representatives are influential leaders who can make personal and organizational commitments to ensure that chemistry-related research fulfills its potential in creating a better world. Smaller companies and international organizations can also participate in CCR activities as Affiliate Members.



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