

## 2010 INNOVATION DAY STEERING COMMITTEE

**James Alder**, Senior Vice President, Operations and Technical,  
Celanese Corporation

**Carl Bilgrien**, Vice President, Research & Development,  
W. R. Grace & Co.

**Ryan Dirkx**, Vice President, Research & Development, Arkema, Inc.

**Michael C. Kerby**, Global Chemical Research Manager,  
ExxonMobil Chemical

**Wayne Ranbom**, Director, Research & Development, Arkema, Inc.

**Alex Valcke**, Vice President, Innovation, Arch Chemicals, Inc.

**Gregg A. Zank**, Senior Vice President and Chief Technology Officer,  
Dow Corning

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# SPONSORING ORGANIZATIONS

## About the Chemical Heritage Foundation

The Chemical Heritage Foundation (CHF) fosters an understanding of chemistry's impact on society. An independent nonprofit organization, we strive to

- Inspire a passion for chemistry;
- Highlight chemistry's role in meeting current social challenges; and
- Preserve the story of chemistry and its technologies and industries across centuries.

CHF maintains major collections of instruments, fine art, photographs, papers, and books. We host conferences and lectures, support research, offer fellowships, and produce educational materials. Our museum and public programs explore subjects ranging from alchemy to nanotechnology.

## About the Society of Chemical Industry

The Society of Chemical Industry is an international association that seeks to further the application of chemistry and related sciences for the public benefit. Headquartered in London since its founding in 1881, SCI has sections in the United States, Canada, Australia, Ireland, and India. Established in 1894, the American Section was the first society in the United States to bring together scientists and business leaders in industrial chemistry. The Perkin Medal was established in 1906 to commemorate the 50th anniversary of the discovery of mauveine. Past recipients include Nobel laureates Glenn T. Seaborg, Carl S. Marvel, and Herbert C. Brown; Donald F. Othmer, chemical engineer; Stephanie Kwolek, inventor of Kevlar; Paul S. Anderson, medicinal chemist, and Gordon E. Moore, the founder of Intel.

## PREMIER SPONSOR

### **About the Schlinger Symposium**

The Schlinger Symposium is named in honor of Warren G. Schlinger, a Ph.D. graduate of the California Institute of Technology with a distinguished career in industrial innovation. In Schlinger's 35 years at Texaco, he was a pioneer in gasification technologies now widely used for production of hydrogen, other chemicals, and power. Among other benchmarks, Schlinger had 15 U.S. patents issued during his career. He has been honored with the AIChE Technical Achievement Award, the Chemical Engineering Practice Award, and by the National Academy of Engineering.

## ABOUT INNOVATION DAY

The chemical industry faces many challenges and opportunities at the start of the 21st century, including the rapid emergence of new fields and the maturing of existing methods for research and manufacturing. Only a renewed focus on innovation will harness promising technologies and spur industry growth.

To promote early career innovation, the Chemical Heritage Foundation (CHF) and the Society of Chemical Industry (SCI) America International Group jointly organize an annual Innovation Day, consisting of the Warren G. Schlinger Symposium, the SCI Gordon E. Moore Medal, and the SCI Perkin Medal. The Schlinger Symposium brings together promising young scientists and technology leaders from across the chemical industries with a focus on frontiers of chemical R&D. Plenary and breakout sessions are oriented to areas where the chemical industry interfaces with other emerging business sectors. In combination with the medal ceremonies, the Schlinger Symposium offers participants the opportunity to learn about cutting-edge science and technology, exchange ideas with peer industrial researchers and entrepreneurs, and prepare to be innovation leaders.

## SCHEDULE

### WEDNESDAY, SEPTEMBER 22

- 3:30–5:30 p.m. **Innovation Day Pre-Session**  
*Franklin Rooms I & II, CHF Conference Center, 2nd Floor*  
**“Materials Innovation Case Studies”**  
Moderator: **Hyungsub Choi**, Program Manager, Emerging Technologies Center for Contemporary History and Policy, CHF  
Speakers: **Yu Meng**, Georgia Institute of Technology  
**Rachel Parker**, Science and Technology Policy Institute
- 5:30–6:30 p.m. **Opening Reception**  
*Jacobs Reading Room, 3rd Floor*
- 6:30–9:00 p.m. **Dinner and Evening Plenary Address**  
*Ullyot Meeting Hall, 1st Floor*  
**“21st Century Innovation”**  
**Thomas M. Connelly, Jr.**, Executive Vice President and Chief Innovation Officer, DuPont

### THURSDAY, SEPTEMBER 23

- 8:00 a.m. **Continental Breakfast**  
*Ullyot North, 1st Floor*
- 8:30–9:25 a.m. **Schlinger Symposium Opening Plenary Address**  
*Ullyot Meeting Hall, 1st Floor*  
**“Alternative Energy from Biomass Conversion”**  
**Jingguang Chen**, Claire D. LeClaire Professor of Chemical Engineering, University of Delaware
- 9:30–11:00 a.m. **Breakout Sessions: Presentations**  
*CHF Conference Center, 2nd Floor*  
*CHF Conference Room, 6th Floor*

## ABOUT THE SCI GORDON E. MOORE MEDAL

The Society of Chemical Industry (SCI) has established the SCI Gordon E. Moore Medal to recognize early-career success in innovation, as reflected both in market impact and improvement to quality of life. By highlighting extraordinary individuals and their work, SCI aims to promote public understanding of research and development in modern chemical industries, enhance the interest of students in applied chemistry by providing role models, and emphasize the role of creative research in the global economy. For more information, see SCI Gordon E. Moore Medal on the SCI Web site.

### Past SCI Gordon E. Moore Medalists

- Emma Parmee (2009)  
Edmund M. Carnahan (2008)  
Paul A. Sagel (2007)  
Jonathan M. McConnachie (2006)  
Jeffrey John Hale (2005)  
George Barclay (2004)

# ABOUT THE 2010 SCI GORDON E. MOORE MEDALIST

**Emmett Crawford** will receive the 2010 SCI Gordon E. Moore Medal for the invention of Eastman Tritan Copolyester and leadership in the development and commercialization of this new family of plastics.

Crawford's innovations involved the development of a new monomer-2,2,4,4-tetramethyl-1,3-cyclobutanediol (TMCD). Tritan provides a higher glass-transition temperature than traditional copolyesters, which translates to superior heat resistance. Higher heat resistance allows molded products to withstand dishwasher environments without crazing, cracking, or hazing from continual exposure to high heat, humidity, and aggressive cleaning detergents and sanitizers. Tritan is manufactured without bisphenol-A.

Tritan has enjoyed remarkable early commercial success. Nine companies have chosen to enter into ingredient brand licenses with Eastman. Backed by nearly 100 patent applications filed around the world, two new manufacturing plants have already been built.

Crawford holds a B.S. in chemical engineering from North Carolina State University and a Ph.D. in polymer science and engineering from the University of Massachusetts. He joined Eastman Chemical Company in 1999 as an advanced research scientist.

## Sustainable Chemistry and Engineering

Moderator: **Wayne Ranbom**, Director of Research and Development, Arkema, Inc.

Speakers: **Michael Gonzalez**, Primary Investigator for Green Chemistry and Engineering for Chemical Synthesis, U.S. Environmental Protection Agency

**Wunmi Sadik**, Professor of Chemistry and Director of the Center for Advanced Sensors and Environmental Systems, SUNY Binghamton

## Challenges for Water Resources

Moderator: **James Alder**, Senior Vice President, Operations and Technical, Celanese Corporation

Speakers: **Paul T. Bowen**, Water Technology Director, Coca-Cola Company

**Steven Rosenberg**, Research and Development Fellow, Dow Water and Process Solutions

## Chemistry of Energy Sources

Moderator: **Michael C. Kerby**, Global Chemical Research Manager, ExxonMobil Chemical Co.

Speakers: **Hugh Helferty**, Corporate Strategic Research Manager, ExxonMobil Research and Engineering Company

**Keith Moser**, Innovation Manager, Exelon Nuclear

## Emerging Global Economies

Moderator: **Carl Bilgrien**, Vice President of Research & Development, W. R. Grace & Co.

Speakers: **Raj Rajagopalan**, Director for Process Research and Engineering, W. R. Grace & Co.

**Dan Futter**, Vice President, Business and Technology Incubator, Dow Corning

**Dipak Chowdhury**, Division Vice President of Display Technologies, Corning, Inc.

## Organizational Strategies for Innovation

Moderator: **Hyungsub Choi**, Program Manager, Emerging Technologies,  
Center for Contemporary History and Policy, CHF

Speakers: **Jonathan A. Goldhill**, Senior Vice President, Kline & Company  
**Parry M. Norling**, Research Fellow, Center for Contemporary  
History and Policy, CHF

### 11:00–11:30 a.m. **Poster Session**

*Dow Public Square, 3rd Floor*

### 11:45 a.m.–2:00 p.m. **SCI Gordon E. Moore Medal Ceremony and Luncheon**

*Ullyot Meeting Hall, 1st Floor*

Gordon E. Moore Medal Lecture

**Emmett Crawford**, Eastman Chemical Company

### 2:00–3:30 p.m. **Breakout Sessions**

Same topics as morning breakout sessions

*CHF Conference Center, 2nd Floor*

*CHF Conference Room, 6th Floor*

### 3:45–4:30 p.m. **Schlinger Symposium Closing Plenary Session**

*Ullyot Meeting Hall, 1st Floor*

**Stephen D. Pryor**, Vice President, Exxon Mobil Corporation,  
and President, ExxonMobil Chemical

**Fred E. Festa**, Chairman, President and Chief Executive Officer,  
W. R. Grace & Co.

**James P. Rogers**, President and Chief Executive Officer, Eastman  
Chemical Company

**Ronald Reynolds**, Director, Center of Contemporary History  
and Policy, CHF

### 5:30 p.m. **SCI Perkin Medal, Ceremony, Reception, and Dinner**

*Hyatt Regency Philadelphia at Penn's Landing*

William Henry Perkin Medal Address

**Ronald C. D. Breslow**, Columbia University

Sadik serves as nanotechnology editor for the *Journal of Environmental Monitoring*. She is chair of the 2011 Environmental Nanotechnology Gordon Research Conference. She holds 3 U.S. patents and has presented 380 scientific papers, book chapters, and lectures focused on biosensors, bioelectrochemistry, and environmental and materials chemistry.

She received a Ph.D. in chemistry from the University of Wollongong in Australia and did postdoctoral research at the U.S. Environmental Protection Agency.

## ABOUT THE BREAKOUT SESSIONS

Rogers serves on the board of directors of the Lord Corporation, a private technology company, and he is a member of the American Section of the Société de Chimie Industrielle. Rogers is also active in the United Way of Greater Kingsport. He earned a high-distinction B.A. in psychology from the University of Virginia and an M.B.A. from the Wharton School of the University of Pennsylvania.

**Steven Rosenberg** is a fellow in R&D for the Dow Water and Process Solutions business unit of The Dow Chemical Company. In this role, he leads application-development research globally, including the piloting and field demonstrations of complete water systems utilizing Dow's advanced purification technologies.

From 2006 to 2009 Rosenberg resided in Shanghai and was responsible for developing new advanced ultrafiltration products and for their integration into desalination systems as a reverse-osmosis pretreatment technology. Since he returned to the United States, his research activities have expanded to include complete system design and component integration in desalination systems and membrane-filtration plants.

Rosenberg holds a B.S. in chemistry and mathematics from the State University of New York at Albany and a Ph.D. in chemistry from Pennsylvania State University.

**Wunmi Sadik** is a professor of chemistry and director of the Center for Advanced Sensors and Environmental Systems at the State University of New York (SUNY) at Binghamton. Sadik has held appointments at Harvard University, Cornell University, and the Naval Research Laboratories. Her current research centers on interfacial molecular recognition processes, sensors and biomaterials, and immunochemistry with tandem instrumental techniques.

Sadik is a recipient of Harvard University's Distinguished Radcliffe Fellowship, the National Science Foundation's Discovery Corps Senior Fellowship, the SUNY Chancellor Award for Research, the Australian Merit Award, the Chancellor Award for Outstanding Inventor, and the National Research Council COBASE fellowship.

Each breakout will explore real-world challenges that can be solved through new materials, processes, or products from R&D labs in the chemical industry. The breakouts will seek to connect industry's innovation push to global-market pull. Each will focus on a specific issue, with speakers presenting perspectives based on their expertise and discussion groups dividing up to explore interdisciplinary methods for solving problems. Attendees can participate in two of these sessions.

## BREAKOUT 1

### Sustainable Chemistry and Engineering

As sustainability becomes an economic necessity and social imperative, fundamentally new chemical transformations must be developed using green and sustainable chemistry and engineering to minimize environmental impact. Following the principle of "better to prevent waste than to clean up after it," researchers need to replace harmful solvents and improve catalytic selectivity and efficiency in chemical reactions that also provide cost savings.

Presentations and discussion will explore issues of (molecular) design and engineering in the creation of more sustainable products.

## BREAKOUT 2

### Chemistry of Energy Sources

With fossil fuel production at or near its peak, the chemical industry is intensifying its search for alternative energy sources that are more abundant, renewable, and environmentally friendly. Methods that show promise include bio-based fuels and chemicals, fuel cells, hydrogen fuel, conventional and nanotechnology-enhanced advanced solar systems, wind turbines, methane hydrate from the sea floor, and safer, less wasteful nuclear power. Meanwhile innovations that minimize waste from generation to transmission to consumption lead to more efficient energy use.

Presentations and discussion in this session will focus on novel approaches for new energy sources, especially algae-based biofuels, as well as emerging nuclear technology for power generation.

## BREAKOUT 3

### Challenges for Water Resources

The availability of clean water for high-tech manufacturing in biotechnology, electronics, and other sectors; the minimization of water use within a chemical operation; and operation of a zero-discharge chemical plant offer challenges and opportunities to chemical innovation. As water-intensive manufacturing and populations continue to expand in regions such as India, China, and the American Southwest, water quality and availability issues are becoming urgent. The chemical industry must find new technologies for treating and delivering fresh water.

Presentations and discussion in this session will explore new processes to manufacture compounds using less water, materials to recoup water and transport fresh water over long distances, bioremediation and other techniques for cleaning water, nanotechnological approaches to potable water creation, and delivery of industrial quantities of clean water for new manufacturing centers in developing countries.

nongovernmental organizations from the London School of Economics. She received a Ph.D. in sociology with an emphasis in global and international studies from the University of California, Santa Barbara.

**Stephen D. Pryor** has been vice president of ExxonMobil Corporation since 2004 and president of ExxonMobil Chemical Company, a subsidiary, since 2008. Previously he served as president of ExxonMobil Refining & Supply Company and as executive vice president of ExxonMobil Chemical Company. Pryor joined ExxonMobil as a marketing representative in 1971 and held a variety of supervisory assignments in Europe and Asia before becoming president of Mobil Asia Pacific, International Marketing and Refining, and ExxonMobil Lubricants & Petroleum Specialties Company in the late 1990s.

Pryor is a director of American Chemistry Council and a trustee of Lafayette College. He received a B.S. in biology from Lafayette College and an M.B.A. from Harvard University.

**Raj Rajagopalan** is director of Process Research and Engineering at W. R. Grace & Co. His recent responsibilities include geographic expansion of R&D capabilities and integration of global R&D resources.

Rajagopalan has 29 years of experience in industrial R&D. Since joining Grace, he has held several R&D management positions. Rajagopalan holds a Ph.D. in chemical engineering from the University of Houston.

**James P. Rogers** is president and CEO of Eastman Chemical Company and serves on its board of directors. He joined Eastman as senior vice president and CFO in 1999 and four years later was named executive vice president, president of Eastman Division, and president of the Chemicals and Fibers Business Group. Rogers was previously executive vice president of International Specialty Products, executive vice president and CFO of GAF Corporation, treasurer of Amphenol Corporation, and vice president in corporate finance of Morgan Guaranty Trust Company.

## BREAKOUT 4

develop and manage Exelon Nuclear's BWR Reactor Internals program and in this role developed numerous innovations that are used worldwide.

**Parry M. Norling** is a research fellow at CHF. He is also an instructor at the Osher Lifelong Learning Institute at the University of Delaware and a fellow of the American Association for the Advancement of Science (AAAS). From 2001—2003 Norling was AAAS Science and Technology Policy Fellow at the Science and Technology Policy Institute at the RAND Corporation's Washington, D.C., office. He retired in 1998 after 33 years with DuPont, where he held a number of R&D and manufacturing management positions and served as corporate director of health and safety.

Norling is a former chairman of the International Union of Pure and Applied Chemistry's CHEMRAWN (CHEMical Research Applied to World Needs) committee and a former chairman of the Industrial Research Institute. He recently wrote an article for *Research-Technology Management* and contributed a chapter to *Innovation, Science, and Institutional Change: A Research Handbook* (Oxford University Press, 2006). Norling received a B.A. in physical sciences from Harvard College and a Ph.D. in polymer chemistry from Princeton University

**Rachel Parker** is a former research fellow at the Center for Nanotechnology in Society, where she worked on a comparative project investigating Nanotechnology Policy in China and the United States. This fall Parker will begin a new position as a research staff member at the Science and Technology Policy Institute.

As a recipient of the National Science Foundation East Asia and Pacific Summer Institute Fellowship, Parker spent three months conducting interviews on nanotechnology R&D in China and Taiwan. She is interested in how nano and other emerging technologies can be used to harness equitable development and environmental remediation.

Parker received a bachelor's degree in sociology from Brandeis University and a master's degree in management of

### Emerging Global Economies

Globalization and the rapid growth of emerging economies present dramatic prospects for growth and diversification into new markets and new sites of innovation. Newly emerging economies in China, India, Latin America, and Eastern Europe boast sophisticated scientific and technical research infrastructures that have begun to rival those of advanced industrial countries. In these new centers of excellence, rapid progress is being made in virtually all aspects of applied chemistry and materials science, from energy and construction to manufacturing processes.

Presentations and discussions in this session will focus on the multifaceted challenges of facilitating and streamlining the flow of knowledge between old and new centers, as well as the role of social, cultural, and political contexts in performing R&D. The presenters will speak from their extensive experiences in organizing the network of R&D outposts in various parts of the world in an age of globalization.

## BREAKOUT 5

### Organizational Strategies for Innovation

Technological innovation is typically a prolonged process, from the inception of a new idea to manufacturing and marketing of the final product. While innovation is at the heart of all high-technology enterprises, not all have been effective in dealing with the many pitfalls throughout the process. Maintaining a sound communication channel between the corporate laboratory and the operating divisions presents an obvious challenge. Observers have pointed out the difficulties that successful companies face in reaping the benefits of their own innovations. This breakout session will shed light on successful organizational strategies for sustaining technological innovation, with presentations by technology-management consultants and technology managers.

## ABOUT THE POSTER SESSION

We are grateful to those Innovation Day participants who have agreed to present posters highlighting innovative work in their laboratories or new products coming to market. This informal session allows all attendees to get a flavor for developments in the industry and to establish networking relationships with their counterparts.

## POSTER PRESENTERS

**Ross Eppler**, Air Products  
Eplerrk@airproducts.com

**Roman Korotkov**, Arkema, Inc.  
roman.korotkov@arkema.com

**Bhuma Rajagopalan**, DuPont  
Bhuma.rajagopalan@usa.dupont.com

**Jeff Swartzentruber**, Hexion Specialty Chemicals  
Jeff.swartzentruber@hexion.com

**Gavin Towler**, UOP LLC  
Gavin.towler@uop.com

named planning and performance analysis manager for Imperial's Downstream.

In 1994 Helferty transferred to Sarnia as technical manager for the Sarnia Refinery and Chemical Plant. In 1997 he moved to Exxon Engineering as manager of the Environmental, Safety, Civil, and Marine Division. In 2000 Helferty joined ExxonMobil Process Research as director of the Fuels Processes Laboratory. In March 2005 he became the products research and technology manager for ExxonMobil Research and Engineering Company.

Helferty received a B.S. in chemistry from Queen's University (Ontario) and a Ph.D. from the University of Toronto.

**Yu Meng** is a Ph.D. candidate in the School of Public Policy at the Georgia Institute of Technology. She specializes in gender issues in science, science and technology (S&T) policy in interdisciplinary sciences, S&T policy in China, and patent and bibliometric analysis.

As a research assistant in Georgia Tech's NSF ADVANCE program and Program of Science, Technology, and Innovation Policy, and as a visiting researcher at the Fraunhofer Institute for Systems and Innovation Research, Meng has been involved in various projects pertaining to her research focus. Her dissertation investigates how gender disparities are related to gendered patterns of collaboration and patenting in nanotechnology.

**Keith Moser** developed and manages the innovation process at Exelon Nuclear, a business unit of Exelon Generation. Since introducing the process in 2006, Exelon Nuclear has developed over 120 innovations that represent 940 person-rem of radiation exposure savings, over \$685 million in cost savings, and a record 18 Nuclear Energy Institute Top Industry Practice Awards. Since 2001, Moser has been either the team lead or a team member on eight such awards.

Moser is also the technical point of contact for Exelon Nuclear's international technical exchange program, which partners with Electricité de France, Tokyo Electric Power Company, and Korea Hydro and Nuclear Power. He joined the company in 1996 as a steam-generator and reactor-vessel engineer. He went on to

## ABOUT THE SPEAKERS AND MODERATORS

consulting services and its global technology and innovation practice. Goldhill's clients are major players in the chemicals, energy, and consumer products sectors. Examples of his client engagements include: assessing best practices in technology and innovation management to identify and close performance gaps; realigning R&D strategy, processes, and organization to reflect changing business and technology drivers; and developing new processes, funding mechanisms, and incentives to manage the interface between corporate and business R&D.

Prior to joining Kline, Goldhill was a vice president of Arthur D. Little, where he led the company's global chemicals practice, and CEO of Cellestian, which was acquired by Kline in 2005. He has authored articles and has been a guest speaker on many topics, including turning commoditization into a competitive advantage. Goldhill obtained an honors degree in engineering from King's College London and subsequently read law there as well.

**Michael Gonzalez** is a primary investigator for the Green Chemistry and Engineering for Chemical Synthesis project at the U.S. Environmental Protection Agency. His research efforts are focused on the development of sustainable chemical processes that incorporate a holistic view.

Gonzalez's areas of expertise include green catalyst development, catalytic processes for the oxygenation of saturated hydrocarbons, biorenewables as a potential feedstock for chemical production, and the use of water as a reaction medium and process intensification.

Gonzalez obtained a B.S. in chemistry from the University of Texas at El Paso and a Ph.D. in inorganic chemistry at the University of Florida.

**Hugh Helferty** is manager of corporate strategic research at ExxonMobil Research and Engineering Company. In this capacity he is responsible for providing the fundamental scientific base that supports and drives innovation throughout ExxonMobil.

Helferty joined Imperial Oil's Research Department in 1981. After a leave to earn an MBA, he moved to the Refining Department in 1985. In 1988 Helferty became supply manager of Imperial's Dartmouth, Nova Scotia, refinery and in 1991 he was

**Paul T. Bowen** joined the Coca-Cola Company in 1999 and currently works in the Environment and Water Resources Department, where he leads water-efficiency and wastewater-compliance efforts for the Global Water Stewardship Team. He also assists with water- and wastewater-treatment issues and the development of water-treatment technologies for Coca-Cola worldwide. Bowen is Coca-Cola's representative on the Beverage Industry Environmental Roundtable (BIER), an organization he helped start.

Outside of Coca-Cola, Bowen is a trustee of the Water Environment Federation and serves on the board of directors of Water for People, a nonprofit group that provides sustainable water and sanitation systems in areas of need around the world. He has an M.S. and Ph.D. in environmental systems engineering from Clemson University.

**Jingguang Chen** is the Claire D. LeClaire Professor of Chemical Engineering at the University of Delaware, where he first accepted a faculty position in 1998. He served as director of the Center for Catalytic Science and Technology (CCST) from 2000 to 2007 and as the interim director of the University of Delaware Energy Institute (UDEI) from 2008 to 2010.

Chen has over 200 journal publications and 16 U.S. patents. He is very active in the catalysis and energy communities, serving as catalysis secretariat of the American Chemical Society and sitting on the board of the North American Catalysis Society. He has also chaired the Philadelphia Catalysis Club and the Gordon Research Conference on Catalysis. Chen spent one year as a Humboldt Research Fellow before starting his career at Exxon Corporate Research Laboratories in 1989. He received his B.S. from Nanjing University and his Ph.D. from the University of Pittsburgh.

**Dipak Chowdhury** is division vice president for display technologies at Corning. Chowdhury joined Corning in 1993 as a research scientist in the Mathematical Modeling group in Science and Technology. In 1998 he was appointed manager of the Photonic Modeling and Process Engineering group, and in 2001 he became research manager of the Process Engineering and Modeling group. He was appointed research director of the Modeling and Simulation directorate within Science and

Technology in 2002. In 2007 he was appointed director of the Corning European Technology Center. Additionally, in 2008, he became president of Corning S.A.S., the company's European entity.

Chowdhury is the author of 30 technical publications, and he has made 24 presentations at technical conferences. He holds 12 patents in the area of optical communication. He is a member of the Optical Society of America and the Institute of Electrical and Electronic Engineers, and he is an editor for journals and other publications connected to these societies. In 2008 he was elected a fellow of the Optical Society of America. His professional honors include the Science and Technology People Development Award and the Demonstrating Inclusive Behaviors Award from the group Creating Inclusive Culture.

Chowdhury received a bachelor's degree in electrical engineering from Bangladesh University of Engineering and Technology and master's and doctoral degrees from the Electrical Engineering Department of Clarkson University. Before joining Corning he spent two years at the Applied Physics Department of Yale University as a postdoctoral fellow on a joint appointment from Yale University and New Mexico State University.

**Thomas M. Connelly, Jr.**, is executive vice president and chief innovation officer at DuPont. He joined the company in 1977, as research engineer at the DuPont Experimental Station.

He has held a number of technical and leadership roles including laboratory director in the United Kingdom and Switzerland. He led a number of major DuPont businesses including Delrin and Kevlar, while based in the United States, Europe and Asia.

Connelly graduated from Princeton University with degrees in chemical engineering and economics. As a Winston Churchill Scholar, he received his doctorate in chemical engineering from the University of Cambridge. He serves in advisory roles to the U.S. Government and the Republic of Singapore.

**Fred E. Festa** is chairman, president, and CEO of W. R. Grace & Co. Festa joined Grace as president and COO in 2003 and assumed CEO responsibilities in 2005, ultimately being named

chairman of the board in 2008. He helped create the Grace Research Council to oversee greater R&D collaboration and generate an active innovation pipeline.

Festa came to Grace from Morgenthaler Private Equity Partners, where he was a partner since 2002. From 2000 to 2002, he was president and CEO of ICG Commerce. Festa's knowledge of manufacturing was established during a seven-year tenure at AlliedSignal, now Honeywell. He worked in the company's specialty chemical, polymer, chemical intermediaries, and fibers businesses in a series of increasingly responsible positions in general management, business development, and finance. Festa began his career at General Electric, where he spent 12 years in financial management positions. Festa received a B.S. in finance from the State University of New York at Oswego.

**Dan Futter** is vice president of Dow Corning's Business and Technology Incubator (B&TI), which is chartered with discovering and building significant new business opportunities. He started in this role in 2008.

Futter joined Dow Corning in 1994 as a technical manager for packaging development in Belgium, and in 1998 became commercial manager for thermoplastics. He moved to Ireland in 2001 to serve program manager for Dow Corning's Plasma Solutions, a novel start-up exploring atmospheric plasma-based dry-coating technology and markets. In 2004 Futter became global industry director for the corporation's Coatings and Additives Business.

Before joining Dow Corning, Futter spent six years with ExxonMobil Chemical Company, holding various positions in sales, customer, and technical service. He serves on the boards of the Specialty Chemicals Business at Dow Corning, the MidMichigan Innovation Center, and the Midland Community Tennis Center. Futter obtained an honors B.S. in biochemistry and biotechnology from the University of Birmingham.

**Jonathan A. Goldhill** is a senior vice president of Kline & Company, a Philadelphia-based management consulting and market research firm. He is responsible for Kline's management