# AIChExtra

## "When I Come Home to You..."

*AIChE Returns to SF After 9-Year Absence with Largest Program Ever*

This year's AIChE Annual Meeting will be a "technical smorgasbord." With a program featuring 18 topical conferences and more than 4,000 paper presentations in 550 sessions—all record numbers for an AIChE conference—the 2003 Annual Meeting at the San Francisco Hilton and Towers in San Francisco, CA, will offer something for every chemical professional from November 16-21. Sessions cover topics ranging from advances in fundamentals, to the newest developments in emerging technologies like bioengineering, nanotechnology, sustainability, and more. More than 4,000 engineers and scientists from academia, government agencies, and industry are expected to attend.

The meeting marks a return after nine years to what had been one of the Institute's most popular meeting sites, San Francisco. The last time an AIChE meeting was held in the City by the Bay was 1994.

Because of the unprecedented number of papers scheduled for presentation during the meeting, the daily format is being expanded to three session blocks per day. Technical programming will begin at 8 a.m. and run until 5:45 p.m. To reduce some scheduling conflicts, one block of time—from 10:45 to 11:30 a.m.—has been set aside for committee meetings, except for Wednesday, when that slot is reserved for the 55th Institute Lecture, to be delivered by George Stephanopoulos, Arthur D. Little Professor of Chemical Engineering at the Massachusetts Institute of Technology. His talk will address "Invention and Innovation in a Product-Centered Chemical Industry: General Trends and a Case Study."

Combining 18 topical conferences at one location creates an environment where professionals across interrelated disciplines can share insights, broaden perspectives, and make new contacts for continued professional growth. Short courses, tutorials, workshops, and special networking events offered in conjunction with the topicals create additional opportunities to meet engineers and managers within one's specific discipline, or in other areas of interest.

Topical conferences are loosely grouped in areas including biomedical,

process technologies and research, nanotechnology, biotechnology, and microelectric technologies, and green and sustainable technologies. A sampling of topical conference themes appears below. A full list of topicals and their respective sessions can be found at http://www.aiche.org/annual.

### Biomedical

- Discovery, Development, and Delivery of Medicines
- Bioinformatics and Functional Genomics
- Electrophoresis Society Annual Meeting
- Biochemical Engineering: Fundamentals, Innovations and Technology

### Process Technologies & Research

- Engineered Particle Systems: Synthesis, Processes, and Applications
- Advanced Membrane-Based Separations
- Polymerization and Polymer Processing
- Process Research and Innovation
- Pilot Plants in Process Development
- Conference of Food Engineering (CoFE '03)

### Nano, Bio, NanoBio, and Microelectric Technologies

- Computing and Simulation at Work (Cosponsored by SIAM)
- Nanotechnology
- Advanced Microelectronic Processing
- Electrodeposition Processes in Semiconductor Device Fabrication
- Sensors

### Green and Emerging Technologies

- Sustainability and Lifecycle Assessment
- Envisioning Biorefineries: Chemicals and Materials from Renewable Feedstocks
- Fuel Cell Technology

Should you need a break from all this education and networking, the conference also offers the charms of its host city. Named the world's top city twice, and the top U.S. city seven times since 1988 by readers of *Condé Nast Traveler*, San Francisco offers a mix of great restaurants, ethnic diversity, tradition and history, and a wealth of cultural venues.

**Student & Special interest Activities**

AIChE's Annual Student Conference will open the meeting's activities on Saturday, November 15, and run through Monday. The San Jose State and Oregon State University chapters serve as co-hosts for the program which includes a "Leadership Breakfast," on Saturday morning, where student chapter presidents get to mingle with AIChE officers from all levels, and career workshops ranging from a discussion of what constitutes "business etiquette," to a look at strategies for after-graduation success. On Sunday, from 3 to 5 p.m., the "Chem-E-Car" competition rides again, as 30-plus student-designed vehicles go head-to-head.

All AIChE Fellows are invited to the Fellows Breakfast to be held on Tuesday, November 18 from 7:15-10 a.m. To avoid overcrowding and difficult last-minute adjustments, please register for the Fellow's Breakfast when you submit your meeting registration form.

Registration is now available online at the Web site listed above, or by phone at 1-800-242-4363. Early registration discounts apply until October 10th.

### And the Nominees Are...

With ballots for the 2004 election mailed, AIChE President Dianne Dorland is beginning to put together the Nominating Committee that will select candidates for the 2005 elections. If you are interested in serving on the committee—or in recommending names for the committee's consideration—contact Dr. Dorland at president@aiche.org.

## Upcoming Meetings & Conferences

The **18th Annual CCPS International Conference and Workshop** convenes at the Camelback Inn in Scottsdale, Arizona, from **September 23-25**. Under the theme "Managing Chemical Reactivity Hazards and High Energy Release Events," the program includes talks by John L. Henshaw, Assistant Secretary of Labor for OSHA; Deborah Dietrich, director of the EPA Chemical Emergency Preparedness and Prevention Office; Carolyn W. Merritt, chair and CEO of the U.S. Chemical Safety and Hazard Investigation Board; and Guillermo Camacho-Uriate, environmental, health and safety manager for PEMEX Mexico. To register, or for additional information, go to http://www.aiche.org/ccps/icw or call 800-242-4363 or 212-591-8100.

The **12th Coating and Drying Technology Seminar,** will be held **October 20 to 23**, followed by the **9th Adhesion Technology Seminar, Oct. 23 to noon, Oct. 24,** at the Best Western TLC Hotel in Waltham, MA. The Coating and Drying Technology Seminar features 26 sessions on such topics as "Fluid Preparation and Delivery," "Electrostatic Safety," and "Troubleshooting Coating Defects," while the Adhesion Technology Seminar's 14 sessions cover such topics as "Historical Aspects of Adhesion Science" and "Adhesive Classification." For more information, contact Dr. Edgar B. Gutoff at 617-734-7081 or ebgutof@coe.neu.edu, or see http://www.coe.neu.edu/~ebgutof/.

Looking ahead to 2004, **the Stationary Source Sampling and Analysis for Air Pollutants Conference XXVIII** will be held **March 7-12, 2004** at the Kiawah Island Resort, in Kiawah Island, South Carolina. The conference will focus on implementing environmental regulations, new and developing emissions measurement technologies, field and laboratory problem-solving, data management, and data quality measures. For additional details and registration information, go to the Source Evaluation Society Web site at http://www.sesnews.org.

## *Drivers for/Barriers Against Adopting Sustainable Technologies Explored at DC Workshop*

A workshop participant votes on needs and barriers.

Industry and government agencies have, for the most part, recognized the significance and urgency of moving to more sustainable technologies to stay competitive in the global marketplace, and to meet the demands of global environmental stewardship. Yet, in practice, it is often still "business as usual."

Why aren't these environmentally-friendly technologies catching on? Based on presentations made at a recent workshop cosponsored by AIChE's Institute for Sustainability (IfS), perceptions and attitudes may be the biggest problems—less-tangible barriers like inertia, "silo mentality" between government agencies and corporations, and funding procedures that limit effective partnerships. "Accelerating the Adoption of Sustainable Technologies: The Role of Government Funding," held June 23-24, in Washington, DC, in conjunction with the 7th Annual Green Chemistry and Engineering Conference, drew 46 participants, somewhat evenly divided between representatives of industry and government agencies, along with a small number of academic and association people. In addition to IfS, the workshop was sponsored by the U.S. Environmental Protection Agency (EPA), the National Institute of Standards and Technology (NIST), and the Green Chemistry Institute (GCI) of the American Chemical Society.

The first day of the workshop began with a general presentation on the role of government in launching, and nourishing green technologies, delivered by Dr. Paul Anastas from the National Security and International Activities Division of the Office of Science and Technology Policy. The overview presentation was followed by three "case studies" of sustainable technologies that have been transitioned to the marketplace, and a panel discussion featuring representatives from several programs within the Department of Energy (DOE), the National Science Foundation (NSF), EPA, and NIST.

The second day was devoted to brainstorming. Jo Rogers of IfS lead this session in which drivers for, and barriers against, the development and implementation of sustainable technologies were identified. A list of what might be needed—in terms of tools, materials, and programs—to overcome these barriers was developed, and attendees voted on which needs can, and should, be addressed by the government first. Voting results showed no clear consensus on a single "immediate priority," but there appeared to be a need for a clearer understanding of all issues involved—including "true costs," and the "true story" of why industry should develop these products, and customers should want them.

A white paper summarizing perspectives from the workshop, with recommendations, is currently being prepared. Look for additional information on the IfS Web page at http://www.aiche.org/sustainability/ and in *AIChExtra* and *Environmental Progress.*

## *PSP* Editor Ventrone to Retire; Coeditors to Assume Reins in 2004

Theodore A. Ventrone, founding editor of *Process Safety Progress (PSP)*—AIChE's quarterly covering prevention of process accidents, and mitigating the impact of those that do occur—will be stepping down at the end of the year after 21 years of dedicated service. The December 2003 issue will be the last under his editorial direction.

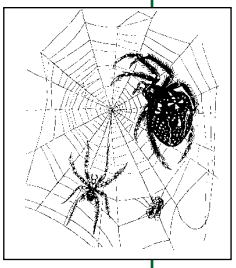
Starting with the March 2004 issue, Dr. Daniel A. Crowl, the Herbert H. Dow Professor for Chemical Process Safety in the Department of Chemical Engineering at Michigan Technological University, and Dr. Joseph F. Louvar, Research Professor at Wayne State University, will take over as coeditors. Both are active members of AIChE's Safety and Health Division and have distinguished backgrounds within the process safety field.

During this transitional period prospective authors should submit manuscripts to AIChE's Technical Publications Department in New York. *PSP* staff will take care of routing them to the proper place.

A tribute to Ventrone, *PSP's* only editor since its launch in 1982, and profiles of the new coeditors will appear in the December 2003 issue of *PSP*, and will be excerpted in the December or January issues of *AIChExtra.*

# Chemical Engineering Discoveries in the News

Several interesting research projects involving chemical engineers and, in one case, an AIChE member, have recently rolled across the desks of *Extra* as press releases or news clippings. From time to time, *Extra* will spotlight such projects in this space. This month, the "research initiatives in the news" are creating artificial spider silk, and isolating an enzyme from a hot springs pool that could improve the environmental outlook for industrial bleaching.



Spider silk is so unusual—due to its low weight, elasticity, and strength—that researchers have spent decades trying to reproduce it in the laboratory. Now a team at MIT is approaching the problem from two directions, since spider silk is essentially a polymer with two distinct alternating regions. One is soft and elastic, while the other forms small, hard crystallites. Researchers believe this structure is responsible for its remarkable properties.

"The main goal is to be able to reproduce the enormous energy absorption and strength-bearing properties of spider silk," said Paula T. Hammond, an associate professor in MIT's Department of Chemical Engineering, and AIChE member. "[We want] to be able to obtain a material in large quantities and cheaply…without DNA techniques, which are expensive." And, without spiders— which are territorial and cannibalistic— making them difficult to domesticate.

Hammond and her graduate students' research is focused on creating materials that emulate web properties for such applications as artificial tendons, specialty textiles, and lightweight bullet-proof gear. These synthetic polymers are then studied to learn how changes in the chemical structures of the polymers affect the physical properties.

Greg Pollack is studying the interfacial material between crystallites in spider silk and the soft region around them. LaShanda James-Korley's work focuses on the soft segment of spider silk, studying polymers made of two types of materials to see if they will form separate phases, such as oil and water do when mixed. When two-phased soft segments are combined with a hard segment, it may produce a three-phase material with some of the desired properties.

James-Korley and Pollock's work, which was presented last spring at the American Chemical Society meeting, is part of a larger collaborative effort funded by the U.S. Army Institute for Soldier Nanotechnologies. Another group is developing a resin-spinning process that may help create durable fibers while maintaining the material's unique properties.

Another research project making headlines is a newly discovered enzyme that could hold the key to "greener" industrial bleaching. The enzyme was discovered in a microbe that thrives in Yellowstone National Park hot springs. Chemical engineer Vicki Thompson, and biologists William Apel and Kastli Schaller, all from the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory, announced at the American Society of Microbiologists meeting in May that the catalase enzyme from a *Thermus brockianus* microbe flourishes in both high-temperature and high-pH (alkaline) environments, making an enzymatic process a possible alternative to the more toxic traditional bleaching processes.

Hydrogen peroxide ($H_2O_2$) is frequently used in bleaching processes for the textile and pulp and paper industries because it's less environmentally harmful than other methods. But few options exist to process the generated wastewater. Chemical treatments to break down $H_2O_2$ cancel out environmental benefits, and diluting wastewater increases its volume.

Catalase enzymes split $H_2O_2$ into water and oxygen, but most commercially available ones require cool wastewater temperatures and low pH conditions, which could cost significant energy, time, and money. However, *T. brockianus* prefers extreme conditions, performing best at around 194° F, and in a high alkaline pH of more than 9. In laboratory tests, it worked for up to 360 hours, compared to 15-20 minutes for other catalases.

The next step towards commercial development is to produce the enzyme at an industrial volume. For more information, see http://www.inel.gov.

## PEOPLE NEWS

The Society of Plastics Engineers recently named **Dr. Marino Xanthos**, a professor of chemical engineering and director of the Polymer Processing Institute at New Jersey Institute of Technology, a Society Fellow. The honor recognizes his research into new applications for recycled plastics, and his work in helping to advance polymer engineering as an academic discipline. Xanthos recently used plastic soft drink bottles to produce a new type of insulation material.

**John O. Cronk**, a consultant formerly with Air Liquide America Corp., was named a Fellow of ASTM International this spring, and honored with the organizations's 2003 Award of Merit. The award acknowledges his contributions to standards activities, particularly through Committeee G04 on Compatibility and Sensitivity of Materials in Oxygen-Enriched Atmospheres.

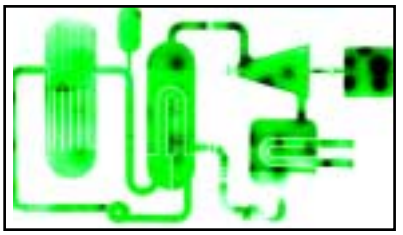
## Obituaries

**Norio Arai, 59**
Nagoya, Japan
**David Brandon, 78**
Woodland Hills, CA
**John Carney, 57**
Cedar Knolls, NJ
**Donald E. Danly*, 74**
Pensacola, FL
**Henry Elliott, 78**
Walnut Creek, CA
**George P. Gladis, 86**
Cranford, NJ
**Hal Hart, 85**
Laguna Woods, CA
**James W. Johnson, 73**
Rolla, MO
**William P. Krywko, 31**
Sarnia, Ontario, Canada
**Charanjit Rai, 74**
Houston, TX
**Ronald R. Ruegg, 72**
Baton Rouge, LA
**Alfred Salomon, 65**
West Caldwell, NJ
**Ritesh Shetty, 26**
Ithaca, NY
**John L. Tschernitz, 80**
Madison, WI
**E.P. Wells, 81**
League City, TX
**Joseph E. Wolf, 84**
Wheaton, IL

** Fellow Grade*

# Defining "Green Engineering"

## Multidisciplinary Group Sets Principles for Practice



In 1998, Drs. Paul Anastas and John C. Warner established in their book *Green Chemistry: Theory and Practice,* a set of 12 guiding principles for "green chemistry." These principles, which ranged from creating safer chemicals to designing for degradation, gave those who worked with chemicals a tangible framework for reducing the environmental impact of their operations.

This past May, a multidisciplinary group of 65 engineers met in Sandestin, Florida, to establish an equivalent set of green principles for engineers to use in the design or redesign of products and processes. Organized by Engineering Conferences International, with technical cosponsorship from AIChE, the American Society of Mechanical Engineers, and the Society of Automotive Engineers, the four-day conference, entitled "Green Engineering: Defining the Principles," focused on defining the scope and tone of green engineering relative to all disciplines, including chemical, mechanical, civil, electrical, and environmental.

"The principles are not intended to be a set of prescriptive rules," notes AIChE member Martin Abraham, associate dean of research and graduate studies in the College of Engineering at the University of Toledo in Ohio and one of the conference's cochairs. Rather, they should be viewed as guidelines "that will improve the environmental performance of a design as it interacts in a larger system that, in turn, can affect global ecosystems."

A series of 25 oral presentations and poster sessions provided background for the main work of the conference—refining the initial set of green engineering principles drafted by another AIChE member, Nhan Nguyen, chief of the Chemical Engineering Branch of EPA's Office of Pollution Prevention and Toxics. This initial set was drawn from more than a dozen resources in academia, government, industry, and nongovernmental organizations that fundamentally address ideas of sustainability, including the United Nations' Rio Declaration on Environment and Development, the Hannover Principles, the 12 Principles of Green Chemistry, and the CERES (Coalition for Environmentally Responsible Economies) Principles.

Discussion groups tackled whether the principles under development were sensible, sufficiently comprehensible, and included appropriate terminology. In doing so, attendees kept three central themes in mind:

- What are the drivers for green engineering and how consistent are they across various engineering disciplines?
- How do we measure progress and evaluate performance? What are the metrics to determine the "greenness" of a product or process? What are the tools that are unique to green engineering? How can they be applied across various disciplines? What are their limitations?
- What is the connection between the process/product design and improvements to the environment (i.e., "systems approaches")?

During the closing session, attendees combined the principles into a draft document. The draft version was later distributed to attendees for comments that were incorporated into the current document, which appears below.

"The principles do a very good job defining what green engineering is all about," Abraham says. "But clearly there is more work to be done to establish what the individual principles mean and how they can be applied across different disciplines. We hope to do that over the coming months as we evaluate what we have done and develop it further."

The organizers plan to disseminate the current set of principles as broadly as possible in the engineering community. A second green engineering conference has been tentatively set for 2005.

Funding for the conference was provided by the U.S. Environmental Protection Agency, the National Science Foundation, the Department of Energy (Los Alamos National Laboratory), and the American Chemical Society's Green Chemistry Institute. For more information on the conference, go to http://www.enviro.utoledo.edu/Green/index.htm.

### Draft Principles of Green Engineering

Green engineering transforms existing engineering disciplines and practices to those that promote sustainability. Green engineering incorporates the development and implementation of technologically and economically viable products, processes, and systems to promote human welfare while protecting human health and elevating the protection of the biosphere as a criterion in engineering solutions.

To fully implement green engineering solutions, engineers use the following principles:

1. Engineer processes and products holistically, use systems analysis, and integrate environmental impact assessment tools.
2. Conserve and improve natural ecosystems while protecting human health and well-being.
3. Use life-cycle thinking in all engineering activities.
4. Ensure that all material and energy inputs and outputs are as inherently safe and benign as possible.
5. Minimize depletion of natural resources.
6. Strive to prevent waste.
7. Develop and apply engineering solutions, while being cognizant of local geography, aspirations, and cultures.
8. Create engineering solutions beyond current or dominant technologies; improve, innovate and invent (technologies) to achieve sustainability.
9. Actively engage communities and stakeholders in development of engineering solutions.

**There is a duty to inform society of the practice of green engineering.**