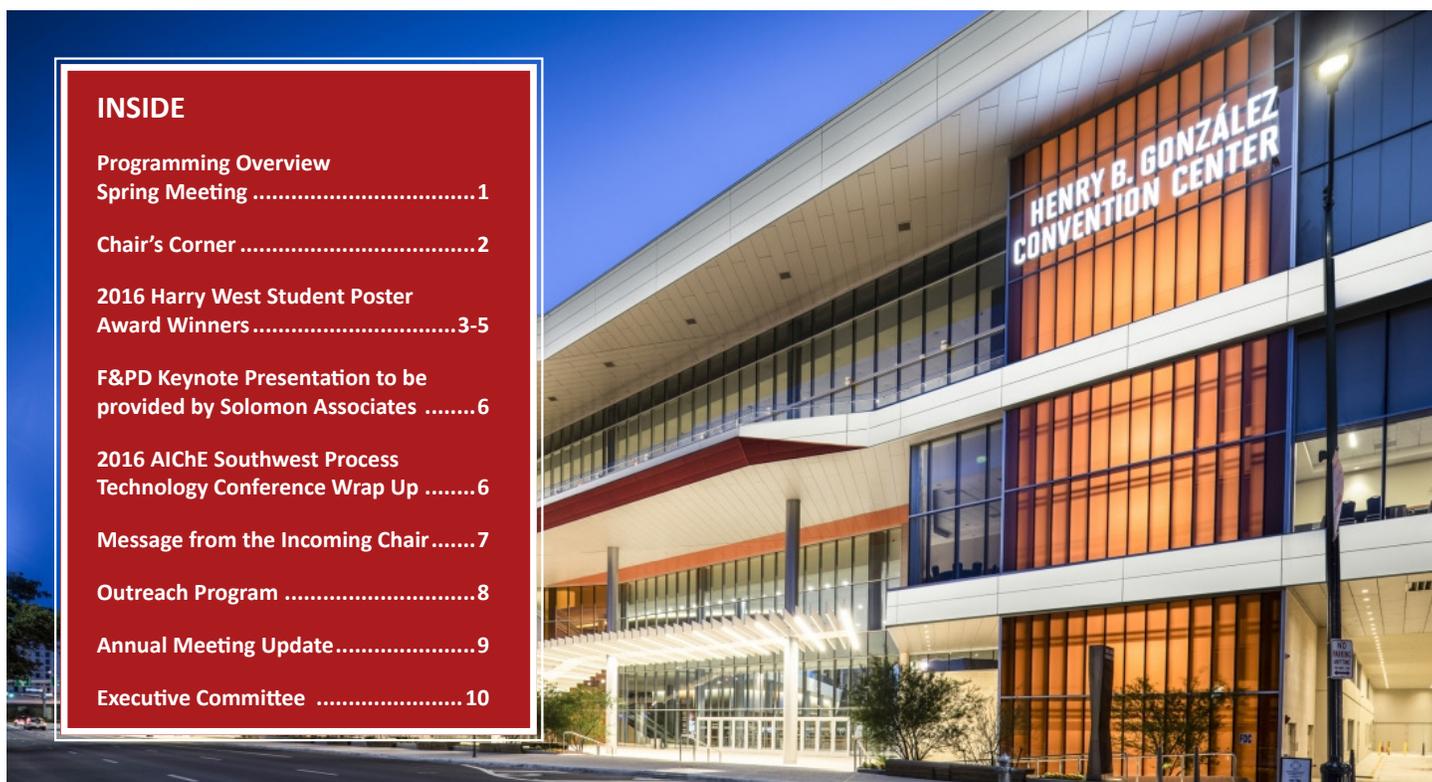


Programming Overview for the 2017 Spring Meeting in San Antonio

March 26-30, 2017, San Antonio, TX



by William (Bill) C. Rooney

AIChE and the Fuels and Petrochemicals Division are looking forward to another Spring Meeting with a wide variety of technical and industrial programming topics for members to attend and participate in.

While our Division's premier event is the F&PD Keynote address described elsewhere in this letter, F&PD also has two executive panel discussions planned for the San Antonio meetings. These panels are specifically designed to provide an interactive format to review and discuss major issues facing the chemical process industry. As usual, F&PD is also planning a full spectrum of technical topics in over 40 planned sessions covering refining, gas processing and utilization, and petrochemicals sectors. Several of these sessions are jointly sponsored with other parts of AIChE including the Environmental Division, the Process Development Division, the Global Congress on Process Safety, the Young Professionals Committee (YPC), the Kister Distillation Symposium, and the 3rd Big Data Analytics Topical event.

Immediately following the F&PD Keynote address on Monday morning, March 27th, the first executive panel, titled, "Resources for a Sustainable Future: The Energy, Water, and Food Nexus" will take place. This panel is intended for an in-depth and interactive discussion regarding the synergies across sustainability efforts to develop future supplies of energy, water, and food. The talk will cover both technical and policy issues impacting these areas. Dr. Joseph B. Powell, Chief Scientist, Shell, Dr. William Tumas, Associate Laboratory Director of Materials and Chemical Science and Technology, National Renewable Energy Laboratory, and Dr. Michael Webber, Professor at the University of Texas Austin, are the panel members. [continued on page 8]

Chair's Corner

by Rick Kolodziej



I hope all of you are having a good start to 2017!

As we all know, the Fuels and Petrochemicals Industries are still relatively slow. Upstream Oil & Gas Production industry seems to be showing some signs of recovery, which is good. The Refining and Petrochemicals industries correlate and should follow, but maybe lag a little bit. And natural gas is still a low cost fuels and petrochemicals processing feedstock and also keeps the energy costs to run process plants low. So, F&PD companies are no doubt a key part of our current economy and future!

The new US President, Donald Trump, is a strong supporter of our industry, not only for the United States, but also F&PD industries on a global basis. Our division has a long and established history of affecting and coordinating: industry, academia, and governmental involvement within the fuels and petrochemicals arena, and so we should be ready for the effects of the Trump administration.

AICHe Engage

As you may know, F&PD is the largest division/forum of AIChE. Within Fuels and Petrochemicals, we bridge academia and research with industry and government. We must stay current and connected. As AIChE members, we have the opportunity to keep engaged on daily basis with: AIChE Engage. See: <https://engage.aiche.org/home?ssopc=1> Maybe you are already participating? Maybe you have the mobile app? Every day, I receive an email with updated Discussion Central points and comments of interest to chemical engineers. Reading and replying are encouraged! So let's stay engaged, especially on topics that relate to F&PD.

Job Search within the F&PD Industries

As noted in my previous Chair's Corner, I'm sure we all know of chemical engineers affected by the slowdown and downturn. Employment remains a top subject priority for F&PD members.

F&PD remains a good networking venue. Our division and members should help us be the first in line for available job opportunities. So, if you have an opportunity or need an opportunity, let me know at: rkolodziej@gtctech.com. I will help get the word out through F&PD. And yes, for those that may have noticed, my email address did change! I myself made a job change since my last column. And yes, my networking within F&PD was part of reason for opening the discussion which afforded me a career opportunity which I eventually took.

Of course, AIChE already has CareerEngineer job board, and as I am writing this column, there are over 1000 postings on that job board! A number of these postings are from companies with strong F&PD involvement. So, check out: <http://careerengineer.aiche.org/jobseeker/search/results/> So, if some of you are seeking an F&PD related job and/or others of you may work for a company who has job posting on the board, we want to hear from you! Maybe we can help connect job demand and supply amongst F&PD members.

Consultants List

We are still working on establishing and growing a list of F&PD members willing to provide a small amount of consulting to other members at no charge. Dr. Mike Schultz has offered to lead this effort. His email contact information is:

MIKEASCHULTZ@GMAIL.COM.

Becoming More Involved in F&PD

If you're interested in becoming more involved in the division, there are plenty of volunteer opportunities. Please contact me or any of the F&PD ExCom to find out more information.

F&PD is also making a more concerted effort to coordinate/co-sponsor paper sessions and events with other AIChE Forums and Divisions. As you may interest in another AIChE Forums or Division and would like to be part of this coordination effort, please let our new incoming chair, Ian Glasgow here from you: iglasgow@triten.com.

2017 Spring Meeting + AFPM International Petrochemical Conference

Finally, the 2017 AIChE Spring Meeting and 13th Global Congress on Process Safety is upon us. As many of you know, this will be held March 26-30 at the Henry Gonzalez Convention Center in San Antonio, TX. F&PD's Lori McDowell is the MPC and is excited for this event. Please sign up if you haven't already. The one unique aspect this year is that the AFPM International Petrochemical Conference will be meeting in San Antonio at the same week and we are hoping that we get some Petrochemical folks coming to our F&PD sessions who may not normally attend the AIChE Spring Meeting.

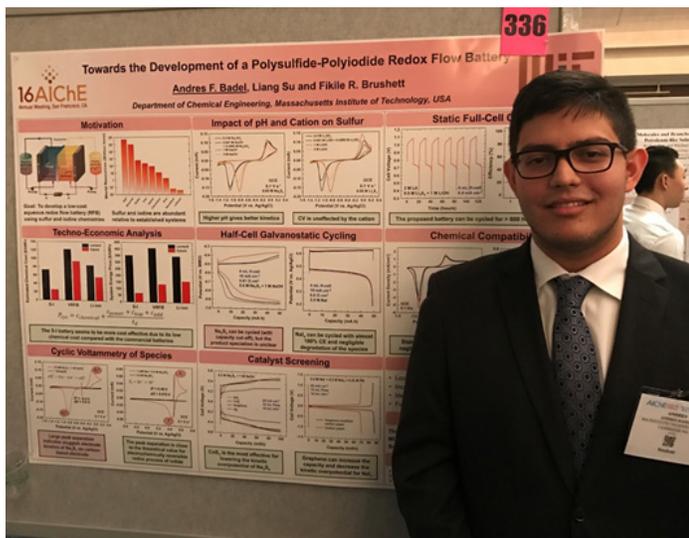
As you attend, please also come to our F&PD Planning Meeting on Tuesday where we already start looking at F&PD in 2018.

2016 Harry West Student Poster Award Winners

Harry H. West died suddenly at his residence in Houston at age 63. Dr. West was a very active member of AIChE with more than 35 years of experience in the areas of chemical process/safety analysis, environmental assessment, and regulatory compliance for the natural gas, petroleum, and chemical industries. He was founder and president of Shawnee Engineers and a faculty member at Texas A&M University, active there at the Mary Kay O'Connor Process Safety Center.

The Harry West Student Poster Award was developed by F&PD in honor of Dr. West's work and awards three winners every year as part of the AIChE Student Poster Competition during the AIChE Annual Student Conference.

The 2016 AIChE Student Poster Competition was held on November 14, 2016 at the Hilton San Francisco Union Square. F&PD helps in the judging of the student posters in the Fuels, Petrochemicals, and Energy areas and thanks all the students who presented their fine work, but wants to especially congratulate the Harry West Student Poster Award winners for 2016:



The 1st Place Harry West Poster Award certificate and \$500 monetary award went to Andres Badel of MIT for his work and poster entitled:

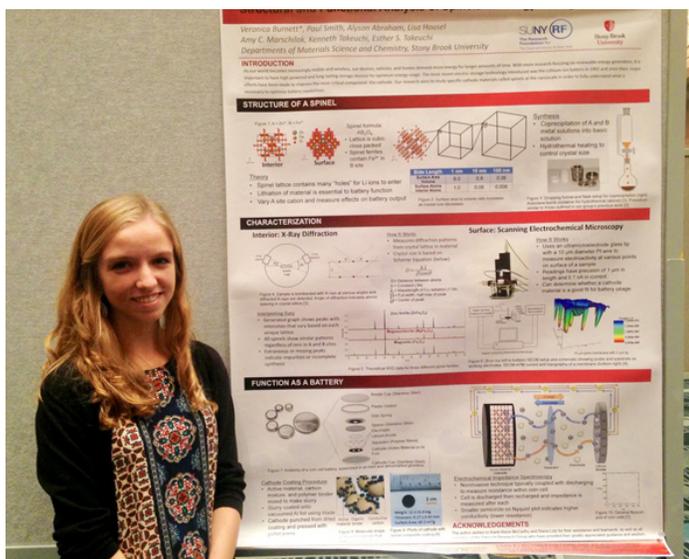
Towards the Development of a Polysulfide-Polyiodide Redox Flow Battery

As we move towards a reliance on renewable energy, low-cost, large-scale energy storage systems will play a pertinent role in their integration into the existing power grid to smooth out

the intermittency of the renewables. Among different energy storage strategies, redox flow batteries (RFBs) have recently received increased attention due to their separated energy and power units, which enables flexible system design for different power and/or energy requirements. With current commercial RFBs having high chemical costs, efforts have gone into looking for more cost-effective redox active species. In this work, we demonstrated preliminary steps in developing a polysulfide-polyiodide (S-I) redox flow battery. According to our techno-economic analysis, the proposed S-I battery is more cost-competitive than vanadium RFBs or lithium-ion batteries. The S-I battery has a theoretical energy density as high as 50 Wh/L with an open circuit voltage (OCV) of 0.95 V. Cyclic voltammetry (CV) shows that polyiodide species has a peak separation close to the theoretical value for an electrochemically reversible reaction with 2/3 electron transfer, suggesting good kinetics for the reaction; the polysulfide species, on the other hand, has large peak separation implying a sluggish reaction on the carbon-based electrode surface. The performance as a function of pH was tested for the polysulfide species and indicated improved kinetics with increasing pH. The implications of a change in cation were also tested, finding no noticeable difference between species. Static half-cell studies were conducted on each species to verify their cyclability. Consistent with the CV results, polyiodide shows good cycling performance with small kinetic polarization whereas polysulfide seems to be more kinetically sluggish, which necessitates more effective catalyst. Along this line, we also found that cobalt polysulfide is able to lower overpotential, and will be used in future flow-configuration testing. Additionally, graphene is tested as a catalyst for the polyiodine, showing 25% increase in capacity. Static full-cell cycling was then conducted using lithium chemistries to take advantage of a highly selective LiSICON separator, demonstrating over 600 hours of cycling with ~100% coulombic efficiency and ~90% iR-corrected voltaic efficiency. The species were shown to not react upon mixing, such that we will have a full cell without significant concern for crossover of the species. Future work includes determining the sulfur speciation through spectroscopy, increasing of NaI₃ solubility, identifying of a selective yet conductive separator, and demonstrating full-cell cycling under flow configuration.

[continued on page 4]

2016 Harry West Student Poster Award Winners cont.



The 2nd Place Harry West Poster Award certificate and \$300 monetary award went to Veronica Burnett of Stony Brook University for her work and poster entitled:

Structural and Functional Analysis of Spinel of Energy Storage Devices

As our world becomes increasingly mobile and wireless, our devices, vehicles, and homes demand more energy for longer amounts of time. With more research focusing on renewable energy generation, it is important to have high-powered and long lasting storage devices for optimum energy usage.

The most recent electric storage technology introduced was the Lithium-ion battery in 1992 and since then, major efforts have been made to improve the most critical component: the cathode. Our research aims to study specific cathode materials called spinels at the nanoscale in order to fully understand what is necessary to optimize battery capabilities. Several spinels were synthesized with various elements in the crystal A site. The synthesis of the spinel cathode material was conducted via co-precipitation and then hydrothermal heating. The product was characterized by X-Ray Diffraction to confirm accurate crystallinity. The cathode was then made by creating a slurry of the spinel active material, carbon mixture, and a polymer binder. The slurry was coated onto Aluminum foil and dried in a vacuum oven. 1 cm diameter cathodes were punched from the coated foil and assembled into battery coin cells under inert gas in a glovebox, which were then discharged and recharged. Impedance testing was done to measure resistance within the batteries before and after each charge cycle. Our research also involved studying a new technique called Scanning Electrochemical Microscopy, which can be used for determining electrical conductivity of surface materials. SECM was found to be promising for measuring the conductivity of our various cathode materials while in electrolyte solution, which better simulates actual battery conditions. The results of this study found a promising cathode material for high-powered and long-lasting Lithium-ion battery applications. The methods used for synthesis proved efficient for making battery coin cells and the techniques used for characterization proved effective in forecasting battery performance.

[continued on page 5]

New Fuel and Petrochemicals Division Programming Opportunities

by Kirtan Trivedi & Ian Glasgow

To continue to further expand the programming impact that Fuels & Petrochemical Division (F&PD) can make on all of AIChE programming, the division is now sponsoring and organizing sessions at other conferences, starting this 2017 calendar year.

In particular, we are organizing one session at the 2017 Process Development Symposium (with the Process Development Division) to be held in Toronto (June 6-8, 2017). The session title is Addressing Common Development Issues across Industry: Economic Perspective and Evaluation. Details can be found at the AIChE website. Please submit your abstract to this session at the conference website.

The second conference is the Carbon Management Technology Conference (with Center for Energy Initiatives Forum) that will

be on July 17-20 in Houston, TX. We will be continuing our discussion from the Spring Meeting Executive Panel on the very important topic of Energy-Water Nexus. Details can be found at the AIChE website. Please submit your abstracts to this session at the conference website.

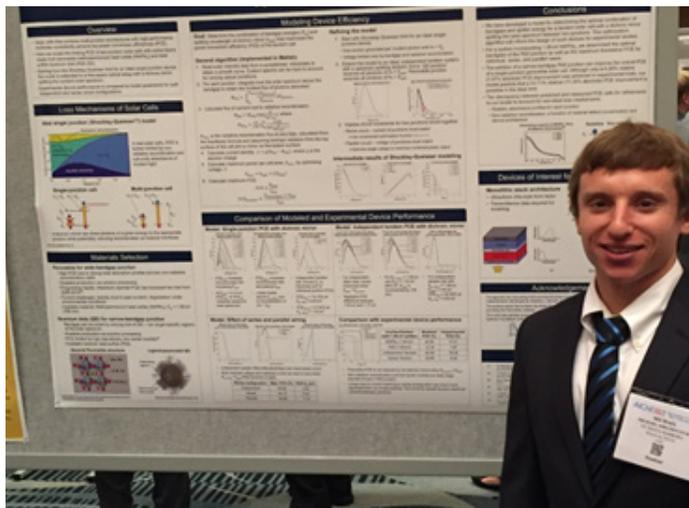
If you are interested in supporting the division efforts in these and other conference, please feel free to contact either Programming Chair or the Division Chair or 1st Vice Chair.

Kirtan Trivedi – Kirtan.k.Trivedi@exxonmobil.com

Ian Glasgow – iglasgow@triten.com

Bill Rooney – William.rooney@honeywell.com

2016 Harry West Student Poster Award Winners cont.



The 3rd Place Harry West Poster Award certificate and monetary award of \$200 went to Michael Abramovitch of the University of California, Santa Barbara while he was doing work for the Department of Materials at the University of Oxford. Michael's work and poster are entitled:

Modeling the Limiting Efficiency of perovskite/PbS Tandem Solar Cells

Multi-junction ("tandem") solar cells have consistently achieved the top power-conversion efficiencies in the world for nearly three decades. In combination with solar concentrators and high-performance materials like GaAs, these devices routinely break the thermodynamic efficiency limit derived by Shockley and Queisser for single-junction devices. At the same time, quantum dots (QD) and perovskites have become highly attractive as low-cost active materials, the former for their wide tunable band gap range and the latter for their high power-conversion efficiencies (PCE).

Here we model the limiting efficiency of a two-junction tandem solar cell with active layers of perovskite material $\text{CH}_3\text{NH}_3\text{PbI}_3$

(MAPbI_3) and lead sulfide quantum dots (PbS QD). Starting from the ideal single-cell case (33.64% maximum PCE), we then consider a version of the PVMirror system proposed by Yu et al., with a long-pass dichroic mirror directing short and long-wavelength light onto the wide and narrow-band gap junctions, respectively. An idealized thermodynamic model was used to optimize the band gap of each junction and the splitting wavelength of the dichroic mirror. When the two junctions are wired independently, PCE is maximized with a splitting wavelength of 700 nm and band gaps of 1.77 eV and 0.94 eV for the perovskite and QD junctions, respectively. This optimal system achieved a theoretical maximum PCE of 46.12%, with the perovskite and QD junctions converting 27.80% and 18.32% of the AM1.5 spectrum, respectively. The predictive accuracy of the model was tested by comparing the theoretical and experimental performance of a tandem solar cell comprising 1.59 eV MAPbI_3 , 1.08 eV PbS QD, and dichroic mirror with splitting wavelength 800 nm in both independent and series wiring configurations. In the independent configuration, the tandem cell achieved a maximum experimental PCE of 18.08%, an improvement of 1.07% (absolute) over the perovskite alone. In the series configuration, tandem PCE was in fact reduced to 6.45%, indicating significant losses due to current matching. Both of these findings suggest that real device performance is limited by poor carrier transport within the PbS junction; reducing these losses is key to realizing the theoretical efficiency gains of the tandem system. The discrepancy between predicted and measured PCE also calls for further refinements to our model to account for losses due to realistic absorbance profiles and non-radiative recombination within each junction.

If you would like to know more about any of these posters, please let me know at rkolodziej@gtctech.com and F&PD will be glad to connect you with these students and their work.

And if you are student considering or already conducting work in the Fuels, Petrochemicals, or Energy related areas, F&PD looks forward to seeing your posters at future AIChE Student Conference at the AIChE Annual Meetings.

F&PD Keynote Presentation to be provided by Solomon Associates

by Ian M. Glasgow, PE



The F&PD Welcome Session Keynote speaker for this year National Spring Meeting will be Claire L. Cagnolatti who is Vice President of Chemicals Studies for Solomon Associates, where she has worked for 15 years. The title of her presentation will be “Energy-Industry Trends and Insights from the Wellhead to Downstream Products”. It will provide information that Solomon Associates LLC

(Solomon) has conducted in Comparative Performance Analyses™ (CPA™), also known as the Solomon studies, for over 35 years. These studies benchmark the Refining, Petrochemicals, Midstream, Upstream, and Electric Power industries. Key Performance Areas include yields and losses, energy consumption, reliability and maintenance, personnel, efficiency, and financial performance. These benchmarking studies provided valuable insights into the key performance areas of their facilities as well as the overall

industry trends. The studies have documented all of the ups and downs of the oil-and-gas-related industry as it reacted to changes in prices, markets, technology, and government regulations. In Claire’s keynote, she and her team have examined the trends and shared insights learned from their data-driven CPA on all energy-related industries from the wellhead to the downstream derivative chemical manufacturing, and all stages in-between.

In addition to working at Solomon for 15 years, Claire has 14 years of hands-on manufacturing experience and four years working in economic optimization at plant and corporate levels in the chemical and petrochemical manufacturing industries. She holds a Bachelor of Science degree in Chemical Engineering and a Master’s degree in Business Administration, both from Louisiana State University in Baton Rouge.

2016 AIChE Southwest Process Technology Conference Wrap Up

by Jayce Mathews

South Texas Section (STS) of AIChE in partnership with AIChE HQ conducted it’s 8th Southwest Process Technology Conference (SPTC) in Galveston, TX from October 6-7, 2016. The technical program was packed with highly topical presentations on topics that included Process Safety, Energy Efficiency, Thermodynamics & Process Simulation, Distillation & Separation, Catalysis and Reaction Engineering, Process Control & Optimization, Chemical Process Technology and Petroleum Refining Technology. There were also special sessions for Students and Young Professionals, and an Ethics presentation delivered by Robert Opiela, Director Licensing at Texas Board of Professional Engineers. The opening keynote address, on Capital Efficiency in the Downstream Market, was presented by James Turner, Executive Director at Fluor.

This year we added a luncheon keynote on Friday which was presented by Andre Boyd on “In Search of the Limits of Human Creativity”. Another highlight of this year’s conference was the dinner meeting, where Frank Souto gave a compelling talk on Industrial Cyber Security.

The winner of this year’s Best Presentation Competition was Alexis Shackelford of BASF, for her presentation “An Innovative Solution from Boron-Based Technology Platform for FCC Unit Performance Improvement.” We would like to thank all the Session Chairs and Co-Chairs for tracking down the excellent technical presentations that provided great value to all attendees.

This year we had 23 exhibitors in the main exhibition hall. The exhibition provided a wealth of technical information and great networking opportunities. In addition, we had 2 career fair exhibitors, providing career development opportunities both for new graduates and seasoned engineers.

The conference would not have been possible financially without the generous financial support of our many sponsors and the tireless efforts of conference leadership team. Next year’s SPTC is scheduled for October 12 & 13, 2017. Save the date, and don’t miss it!

Message from the Incoming Chair

Ian Glasgow - IAG

As the incoming Chair to Fuels & Petrochemical Division (F&PD), I am looking forward to the opportunity to serve the membership of this outstanding division that I believe is one of the key leadership groups of AIChE. This is really an exciting time in AIChE as the institute is currently looking to make changes that will improve the services provided to the membership. Some of the key items that have been identified in past year are:

- Work to bring the technical and innovation “Thought Leaders” (academia and industry) back to AIChE.
- Taking a refresh look at the Annual Meeting so that is attractive to all members of Chemical Engineering (graduate students, professors, and industry professionals).
- Taking a renewed focus to programming quality to ensure it meets the expectations of our membership.

All of these items are in-line with what F&PD has always believed to be true. As a result, F&PD will have opportunities to help provide leadership so AIChE is able to achieve these objectives. Items that F&PD is already doing and/or planning to demonstrate this leadership include the following:

- Having a session of invited Keynote Speakers at the 2017 Annual Meeting.
- Putting conference proceeding submission requirements to all F&PD sessions at the Spring Meeting.
- Working with AIChE to make it easier to get access to all F&PD Conference Programming proceedings in the Members Only section of the website.
- Collaborating with other divisions and forums to help organize programming at AIChE conferences outside of the Spring and Annual Meeting.

As the incoming Chair, I look forward to the opportunity to lead this great division through this time of transition so that we are able to better serving the F&PD membership. We will accomplish this by continuing to improve our programming and outreach activities, and seek to identify ways we can increase our membership. In order to be successful, F&PD will need to continue to provide quality technical information, as well as networking and professional growth opportunities.

If you would like to get more active within F&PD, now is a great time; please feel free to contact me via e-mail me at iglasgow@triten.com, and I will be more than happy to make the appropriate introductions for you.

Many thanks, and I look forward to the honor of serving the F&PD membership throughout the 2017-2018 year.



AICHE 2017 Spring Meeting OutReach Program

The AIChE Spring High School OutReach Program has returned to San Antonio where the first OutReach event at the Spring Meeting took place in 2012. This year the event is being held on Tuesday March 28, at the University of Texas at San Antonio (UTSA) and is being co-sponsored by the Fuels & Petrochemical Division, the Environmental Division, and the Management Division.

The OutReach Program is free and is intended to expose students to the profession of chemical engineering and engineering in general, and to give students the opportunity to interact with professional engineers. Students will come away from the program with an understanding of what engineers in general and chemical engineers in particular do, how they touch our lives, and how to pursue a career in engineering.

This year's event is titled "Being an Engineer—Creating a World that Works", will introduced local area high school students to the industry and how engineers help change the world. The students will learn what different types of engineers actually do and also learn about green fuels and how engineers help to protect the environment. The students will also have an opportunity to ask questions and to interact with professional engineers during a panel discussion and networking lunch. UTSA will provide a tour of their campus, which will be led by UTSA engineering students.

The AIChE supports and sponsors a number of OutReach events every year all around the country, that are focused on kids in middle school and high school aged 11 to 18. The importance of educating kids early about pursuing a career in science and engineering is crucial to ensure that there are enough engineers to address the world's problems.



Programming Overview for the San Antonio 2017 Spring Meeting cont.

F&PD is sponsoring a second panel session included in the 20th Topical Conference on Refinery Processing, titled "The Future of APC". This event is co-sponsored with YPC. Five panelists will provide an overview of the current state of advanced process control and ideas and further touch on how to address coming work force challenges to develop the next generation of advanced process control engineers. The panel members for this event are Joseph Zimny, Process Control Engineer, Lyondell Chemical Company, Brian Ashcraft, Senior Process Automation Manager, The Dow Chemical Company, Vikash Sanghani, Senior Process Control Engineer, Chevron, Greg McMillan, Retired Senior Fellow, Solutia/Monsanto, and Gina Garcia, Regional Advanced Applications and Process Control Discipline Technology Lead, ExxonMobil.

As part of the 17th Topical Conference on Gas Utilization, the annual Gas Utilization Keynote address continues. A complimentary reception courtesy of AIChE opens the session, followed by an extended presentation. Mr. Mahdi Nouri, Global Technology Leader – Midstream, Ch2M, will present a talk entitled "Challenges in the Application of Adsorbent Technologies for Midstream Contaminants Control" describing current state-of-the-art technology for contaminants control and removal using adsorbent technology.

Rounding out F&PD's programming for San Antonio in 2017 are a variety of technical sessions in the refining, petrochemicals, and gas process sectors, spread over 40 technical sessions.

Finally, preparations for the Spring 2018 meeting set for Orlando, Florida begin at the San Antonio event. F&PD will host an open Programming Planning meeting on Tuesday afternoon of the conference. All F&PD members and guests from other divisions are welcome to attend. At this meeting, an initial outline of the 2018 technical sessions will be presented. This is a great opportunity for F&PD members to provide their input on potential programming topics for next year and to sign up to volunteer as session chairs



and co-chairs. Many people begin their involvement in the F&PD division by volunteering to assist with the technical programming sessions for the Spring AIChE meeting. Please check the final conference schedule and "Ancillary Meetings" list for the confirmed time and location of the F&PD Programming Meeting, tentatively scheduled though for Tuesday, March 28th at 5 p.m.

Respectfully,
 William C. Rooney
 F&PD Area Chair- Topical Conference on Gas Utilization
 2nd Vice Chair, F&PD
william.rooney@honeywell.com

Annual Meeting Update

By Saadet Ulas Acikgoz

The AIChE Annual Meeting is a great educational forum for chemical engineers interested in innovation and professional growth. Fuels and Petrochemicals Division organizes sessions at the AIChE Annual meeting that cover a range of topics like unconventional and alternative fuels and emerging technologies as well as biofuels. As one of the initiatives to increase the quality of programming and paper submissions, we are organizing a Best Paper Competition with the goal to find paper submissions that we could nominate into a special edition of the AIChE Journal. This special edition will be put together partnering with other divisions.



F&PD is also planning to organize a Keynote session on Monday morning at the AIChE Annual Meeting similar to a F&PD Welcome Keynote session at the Spring Meeting. The plan is to invite four speakers to this Keynote session and organize a coffee break in the middle of the session.

Please contact Saadet.Acikgoz@Honeywell.com for more information. Any ideas or volunteers who would like to contribute to Annual Meeting Programming are welcome.

EXECUTIVE COMMITTEE

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