



James R. Fair

Process Science and Technology Center

Fall/Winter 2017 Newsletter

<https://sites.utexas.edu/pstc/>



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Note from the Program Head

Winter greetings from Austin—we did have a Central Texas blizzard earlier in December so it is officially winter. It continues to be a time of transition for both the PSTC and SRP. We very successfully filled the three technical positions and we are very pleased to have Lauren Murrah, Jaime Church, and Juan Campos as part of the team. Lauren, the PSTC Executive Assistant who is profiled in this newsletter, continues to expand her role most recently totally revising the PSTC / SRP websites to give them better functionality and a more polished look. Frank's contract research program continues to flourish and I am pleased with the number of undergraduate and graduate students interested in conducting traditional process technology research. Speaking of students, we profile Matt Beaudry in this newsletter. Matt had a successful graduate experience, received his PhD and finding a fiancée all within the confines of the PSTC. The best part of my job is watching students move through an exciting phase of their lives. As I will continue to say, we are very thankful to our research sponsors for making this journey a possibility for so many students.

A business meeting was included as part of the Fall PSTC meeting activities. We discussed two main topics, a sponsorship fee increase and a European Meeting. The consensus opinion was that a small fee increase would be acceptable if ade-

quate notification was given to the sponsors to allow appropriate budgeting. Therefore, my plan will be to raise the Tier I fee from the current \$ 15,000 to \$ 20,000 starting in January of 2019.

This increase is needed to cover rising costs associated with student support and the Center's administration. We will also continue to pursue additional sponsors to leverage our existing funding. The European meeting was not adequately endorsed by our sponsors and we will not pursue the idea. In my tenure at UT, we have had three very successful European meetings. In all cases, multiple sponsors financially supported and hosted the event. Without this level of external support and engagement, we cannot financially justify the event.

The Spring PSTC meeting is Tuesday, April 3rd and Wednesday, April 4th, we look forward to seeing you in Austin. I will add that the Spring AIChE meeting will include multiple presentations given by our students so also look for those.

Best wishes for a happy and safe start to 2018.

Bruce



SRP Update: Frank Seibert



The pilot plant activity continued during the summer with the successful completion of a carbon dioxide capture study which utilized enhanced instrumentation, pumps, and control capabilities associated with Professor Rochelle's Advanced Flash Stripping System. Plans for installing the new and more powerful process control computers and monitors are underway. The \$150K donation is being provided by Emerson Process Management. Installation of the new computer system is anticipated in January 2018. An LED lighting subsidiary is looking to enhance the lighting associated with the SRP Pilot Plant and Highbay labs.

As mentioned in the previous newsletter, an interesting distributor performance study was performed during the summer. A fractal distributor, provided by Amalgamated Research, Inc. (ARI), was compared with a standard trough drip distributor using the cyclohexane/n-heptane system and a metal structured packing with 500 m²/m³ of surface area. The fractal distributor provided improved performance and obtained an SRP record low HETP of 4.8 inches. Future studies of the fractal distributor in distillation service are planned in 2018.

The SRP is currently carrying out an interesting study of an unconventional random packing material. The first part of the study focusses in its hydraulic characterization, and the second part will address its mass transfer performance under distillation conditions. The hydraulic studies will continue in the 1Q2018. The distillation tests are expected to be conducted at the end of the 2Q2018.

Future SRP pilot plant and lab scale operations will include:

- ◆ Pilot Plant Demonstration of the Advanced Flash Stripper and a Membrane Contactor for Carbon Dioxide Capture
- ◆ Effect of a Fractal Distributor on Distillation packing performance



Stainless Steel Fractal Liquid Distributor and Chimney Tray Used in the Distillation Study

- ◆ Distillation Packing Characterization
- ◆ Gas Film Mass Transfer in Co-Current Spray Contactor
- ◆ Pilot Scale Dividing Wall Distillation
- ◆ Effect of Interfacial Tension on the Oil/Water Separation using a Novel Membrane Process
- ◆ Effect of Plastic Random Packing as a Coalescer in Liquid Extraction
- ◆ Application of Air/Water Derived Mass Transfer Models to Distillation Packing Performance

—Frank

In the News



Melanie Merrick, a member of the Freeman group, has been awarded a \$2,500 [Gulf Coast Power Association \(GCPA\) em-POWERing Students Fellowship](#). The Gulf Coast Power Association Scholarship Program was initiated in 2007 to pro-

vide assistance to students with expressed interest in pursuing a career in the electric power industry.



Alon Kirschner, also from the Freeman group, has been awarded the [Texas Desalination Association Ed Archuleta Desalter Scholarship Fund](#) prize based on his research in water purification. The award is named for Ed Archuleta, a pio-

neer in desalination in Texas.

Student Spotlight: Matthew Beaudry

In this issue, we shine our student spotlight on Matthew Beaudry, a Rochelle Group member nearing graduation. Matt grew up in Pasadena, Texas, just outside Houston. Although neither of his parents pursued science or engineering, they both had a significant influence on Matt's academic path. His father, a woodshop teacher, worked with him on projects in their own home woodshop, instilling in Matt a joy in planning and building. His mother, a high school cooking instructor, shared with Matt her craft of baking and cooking—he likens it to the same kind of process in the chemistry lab, just with tastier results.

Excellent high school science and math teachers fostered an interest in engineering, especially his favorite subject chemistry, and Matt decided to pursue Chemical Engineering. He appreciates the flexibility associated with chemical engineering, which incorporates the fields of mechanical, civil, electrical, and industrial engineering.

Living near the petrochemical plants in Pasadena certainly had an influence as well—Matt thought the columns, flares, and pipelines were amazing engineering feats.

After earning a B. S. in Chemical Engineering (ChE) from Lamar University in Beaumont, Texas,

Matt arrived at the University of Texas at Austin to pursue his Ph. D. The highly regarded ChE department offered a broad range of research topics within the field and was effective in placing graduates in industry and academia.



Matt spent his first two and half years conducting research on lithium-ion batteries but found himself drawn to process engineering and, after switching his research focus and joining Dr. Rochelle's group, he landed in the Process Science and Technology Center (PSTC). Matt is deeply satisfied with this move, finding a thrill in working on large-scale projects and their inherent challenges in scaling up operations. Matt focuses his research on developing emissions analyzers for amine-scrubbing CO₂ capture processes.

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Through these analyzers, he can quantify amine aerosol emissions from the process and, by altering parameters in the capture process, work on reducing the amine emissions. The added benefit of working these kinds of projects is that the captured CO₂ is a valuable commodity that can be used in a variety of ways. Matt enjoys working on projects that involve reclaiming a valuable product from a waste stream; this fall he even interviewed for a role in studying how to collect precious metals from coal combustion waste.

Participating in research outside of school has given Matt plenty of field experience. As an undergraduate student, he had co-ops with LyondellBasell Industries in which he learned, beyond conventional chemical engineering, how to handle emergency situations after Hurricane Ike flooded the plant with eight feet of water during his second week on the job. He also did a research experience at the Colorado School of Mines, working on characterizing reactor flow properties for solid oxide fuel cells. In between dodging rattlesnakes and elk on his way to and from the lab, he spent plenty of time in the great outdoors, loving his backpacking and camping trips.

As a graduate student, Matt's research has taken him out into the field many times, collaborating with the University of Kentucky, Kentucky Utilities, and Louisville Gas and Electric at a pilot plant outside Lexington. He performed emissions sampling, even once where, during a deep freeze in which the site kept losing power, he frantically reset breakers for his analyzers. The intense cold caused a crack in the one of the analyzer's windows to expand, rendering it inoperable. Despite the stress and exhaustion, Matt found this a great learning experience which greatly enhanced understanding of analyzer capabilities.

Matt also got to perform field sampling in collabora-

tion with the National Carbon Capture Center near Birmingham, Alabama. He got to flex his creative muscles on one trip when the calibrator for his PDI aerosol sizing analyzer broke, and he used the spray from a Windex bottle to align the lasers of the device—and, to his surprise, it actually worked!

Noting that aerosol problems are a prevalent issue across the board in chemical production processes, Matt believes his research is applicable across a variety of processes. The analyzer technology he has helped to test in the field has great potential, but says improvements need to be made to enhance the robustness of the equipment.

When not in the lab, Matt enjoys many physical and outdoor activities to help clear his mind. During the week he lifts weights, which has the added benefit of helping him at work with lifting and carrying heavy equipment at the pilot plant. On weekends, he's outside fishing, hiking, and kayaking, and enjoying the beauty of fall in central Texas.

He likes to exercise his mind as well, enjoying books such as *For Love the Game* and *The Martian*. The former inspired him when he felt discouraged with his graduate career, helping him re-focus on accomplishing the goals he had set for himself. Matt found the latter, *The Martian*, hilariously related to his field research—spending a lot of time alone at far-away sites in which everything that could possibly go wrong can and does happen. In the end, he says, we find a way to make it all work. Matt has certainly done that successfully and we wish him the best in his post-academic career!

—Lauren Murrah

Staff Spotlight: Lauren Murrah

This month we meet one of our staff members, PSTC's admin Lauren Murrah. Born in Houston, Texas, her family lived in several Texas cities before landing in Cedar Rapids, Iowa where her father moved the family for work. Lauren likes to joke that she understands engineers and scientists after having been around them her whole life—her father, a UT

Austin graduate in electrical engineering and law, headed up the intellectual property office for Rockwell Collins (a division of Rockwell International); her mother, after earning undergraduate and graduate degrees in nursing and health administration, was a cardiologist nurse, and later a director, for a local hospital.

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In high school, Lauren pursued a dream of becoming a marine biologist while indulging her love of the arts, balancing advanced math and science classes with advanced English classes and music performance in piano and French horn.

While she initially studied Latin to help with her science career goals, Lauren discovered a fascination for the languages and history of ancient Greece and Rome, earning an undergraduate honors degree in Classics from Emory University in Atlanta.

Looking for related, yet gainful, employment after graduation, Lauren decided to give teaching school a shot for year or two before heading to graduate school; she ended up embarking on an eleven-year career, teaching Latin and English at the middle school and high school levels. Feeling the creative pull again, Lauren picked up a graduate degree in writing from Kennesaw State University in Atlanta and added to her teaching load undergraduate online courses in research writing.

After moving back to Austin to be closer to her family, Lauren decided to leave the high-stress, time-consuming world of teaching in order to have more time to devote to her creative endeavors. She moved into administration, managing the large research group of a UT Austin professor in materials science and engineering for five years. She made the move north to the Pickle Research Campus in order to cut down on her daily commute time and has enjoyed working with the folks in Chemical Engineering and the PSTC.

When she's not managing newsletters, websites, accounting, or annual meetings, Lauren freelances as a technical editor's assistant for an engineering journal and as a writer, penning pieces for *TexasLiving* and other Texas-based websites. However, the great love of her life is dance, in particular dances from around the world. For the last fifteen years she has studied, taught, and performed Middle Eastern dance (classical, folkloric, and modern fusion styles) and

has pursued additional studies in styles of Indian (Bharatanatyam, Odissi, Kathak, Bhangra, and Kallibeliya) and Polynesian (hula and Tahitian) dance. She has enjoyed teaching workshops and performing in various festivals throughout the southern U. S.

This summer and fall, Lauren got the thrill of a lifetime, embarking on short tours with an internationally touring dance company, performing Middle Eastern dance in several cities along the east coast and in Europe (she is inordinately grateful for the vacation days earned at UT as well as her two incredibly supportive bosses!).

In the little free time she has left, Lauren is a voracious bibliophile, consuming one or two (sometimes three) books per week, reading a wide range from history, science, psychology, travel narrative, and, her guilty pleasure, murder mysteries. She is concurrently plowing her way through three books: *The Demon Crown* (James Rollins), *Between the World and Me* (Ta-Nehisi Coates), and *What If?: Serious Scientific Answers to Absurd Hypothetical Questions* (Randall Munroe).

While pondering the bizarre scenarios in the last title (How long could you live swimming in a pool of spent nuclear fuel rods? What would happen if you tried to hit a baseball pitched at the speed of light?), Lauren is grateful for her years spent around great science and engineering minds. As a result, she feels she can better understand and appreciate things like "What would happen if you physically built an actual periodic table of elements?" (spoilers: lots of explosions and radiation, apparently), making her feel right at home in the PSTC.



Articles We've Published

Full citations and abstracts are available on the [PSTC website](https://sites.utexas.edu/pstc/).

Eldridge Group

- ◆ Weinfeld, J. A.; Owens, S. A.; Eldridge, R. B. "Reactive Dividing Wall Columns: A Comprehensive Review," *Chemical Engineering and Processing: Process Intensification* **2018**, 123, 20-33.

Freeman Group

- ◆ Shaver, A.; Moon, J. D.; Savacool, D.; Zhang, W.; Narang, G.; Miller, G.; Vondrasek, B.; Lesko, J. J.; Freeman, B.D. "Poly(2,6-dimethyl-1,4-phenylene oxide) Blends with a Poly(arylene ether ketone) for Gas Separation Membranes," *Polymer* **2017**, 114, 135-143.
- ◆ Daryaei, A.; Jang, E.-S.; Choudhury, S. R.; Kazerooni, D.; Lesko, J. J.; Freeman, B. D.; Riffle, J. S.; McGrath, J. E. "Structure-property Relationships of Crosslinked Disulfonated Poly(arylene ether sulfone) Membranes for Desalination of Water," *Polymer* **2017**, 132, 286-293.
- ◆ Galizia, M.; Chi, W. S.; Smith, Z. P.; Merkel, T. C.; Baker, R. W.; Freeman, B.D. "50th Anniversary Perspective: Polymers and Mixed Matrix Membranes for Gas and Vapor Separation: A Review and Prospective Opportunities," *Macromolecules* **2017**, 50, 7809-7843. *An ACS Editor's Choice Article*.

Spring 2018 Meeting

Please join us for our annual PSTC Fall Meeting April 3rd—4th here at the University of Texas at Austin. Once again, we will be at the [Commons Learning Center](#) located on the Pickle Research Campus.

We have launched [a new website](#) and all [registration](#) and [accommodation](#) information is now available. Handouts of the presentations will be available for attendees; pdf copies will be posted on our website closer to meeting time.

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