The University of Iowa

EDITOR: Nathan Jarvey

AIChE Fall 2019

Advisor's Corner

By: Prof. David Murhammer, Professor and AIChE Student Chapter Advisor

Greetings to Hawkeye Chemical Engineers!! First, this Fall 2019 issue of our AIChE Student Chapter Newsletter contains articles about our students' attendance at the AIChE National Student Conference in Orlando, Florida and at the SWE National Conference in Anaheim, California. Second, there are two articles about our student chapter activities, specifically about the Fall 2019 Kids Day Camp and our ChemE Car student organization. Third, there are four articles about individual student activities, including a summer internship at Fauske & Associates, a co-op experience at Tapemark, participation in the Iowa Startup Games, and research in a professor's laboratory. Fourth, there are two topical papers ("Developing Polysulfide Polymers to Protect the World's Greatest Resource" and "Temperature Swing Solvent Extraction – A Promising Method for Fresh Water Production") written by students in Professor Beth Rundlett's Process Calculations course.

A few comments about the AIChE National Student Conference at which the University of Iowa AIChE Student chapter received many awards. First, Michael Leyden received the Donald F. & Mildred Topp Othmer National Scholarship Award. There are only 15 of these scholarships awarded annually (awarded to students from approximately 8% of the student chapters in the United States). Michael is the 22nd University of Iowa student to receive this prestigious scholarship in the last 29 years. Second, Esmeralda Orozco won the Minority Affairs Committee's Minority Scholarship Award. Third, the University of Iowa won an Outstanding Student Chapter Award. This award is given to the top 10% of student chapters in the United States. This is the 15th consecutive year that the University of Iowa has won this award and the 26th time out of the last 27 years. Fourth, the University of Iowa team (Michael Lake, Michael Leyden, Esmeralda Orozco, and Jeremy Wallace) placed second to the University of Southern California (USC) and beat the Massachusetts Institute of Technology (MIT) in the national ChemE Jeopardy Competition Finals. In the preliminary and semi-final rounds the University of Iowa team beat teams from Notre Dame, Johns Hopkins and four other universities. This was the 9th year of the ChemE Jeopardy national competition during which the University of Iowa has placed first twice (2013 & 2014) and placed second three times (2012, 2015, and 2019). Not bad for such a small program!

Any comments about the newsletter contact can be sent to me at davidmurhammer@uiowa.edu.

University of Iowa American Institute of Chemical Engineers

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AIChE

The University of Iowa

AIChE National Conference in Orlando, FL— Nathan Jarvey

Over the weekend of November 8-11, more than 25 members of our student chapter of AIChE participated in the annual national conference, which this year was held in Orlando, Florida. The conference kicked off on Friday evening with a mixer for graduating seniors to interact with their fellow students and professionals. Saturday's lineup was filled with short workshops across various topics, from chemical process modeling and a discussion of ChemCAD to environmental consulting and working towards a more sustainable planet as chemical engineers to topics across the biological side of chemical engineering. The day was capped off with the Chem E Jeopardy competition, where our team (consisting of Michael Leyden, Esmeralda Orozco, Jeremy Wallace, and Michael Lake) managed to win second place overall. They managed to defeat the team from MIT in the final round, but could not better the team from USC, who won first place in the U.S. competition.

Sunday's major events began with the job and graduate school recruitment fair. Sunday also held the Chem E Car competition, which sadly we did not have a qualifying car based upon the regional results. A meeting of the board members of Omega Chi Epsilon chapters that were also members of AIChE was held, where an inter-chapter discussion of activities was led by a few of the national board members. Some chapters addressed the organizational issues of having OXE-led tutoring sessions, while our chapter mainly discussed initiation procedures and the biannual Nitrogen Ice Cream sale that we hold. Lastly, a student awards ceremony was held to recognize the winners of the various competitions and other deserving members of AIChE.

Monday began as planned, with many of our members taking part in the Undergraduate Student Poster Competition. The morning was spent exploring and presenting the various types of research undergraduate chemical engineering students were exploring through national labs, their home university, or other universities as part of various programs. However, due to issues with Chicago's airport and poor weather, our flight home on Monday afternoon ended up being cancelled. Thankfully, we were able to find additional accommodations until the next flight back to O'Hare, which ended up being very late on Wednesday night.

This 2020 national conference is taking place in the fall in San Francisco, CA. The next AIChE conference that students can attend is this year's Mid-American regional conference, which is to be held on the campus of the University of Nebraska-Lincoln on April 3rd and 4th. Students are highly encouraged to attend, as these conferences are a great opportunity to network with fellow students, companies, and graduate schools. Any questions regarding student conferences can directed to your fellow classmates or to Dr. Murhammer.

SWE National Conference— Katelyn Murhammer

This fall, 15 women in engineering at the University of Iowa, including 3 chemical engineering students, attended the 2019 Society of Women Engineers (SWE) National Conference in Anaheim, California. The conference took place from November 7th to 9th and was the world's largest conference for women in engineering and technology. There was a career fair, keynote speakers, breakout sessions, and several networking events that our SWE members had the opportunity to attend.

On Thursday, November 7th, we attended the opening presentation from a keynote speaker, Carol Malnati, who is an engineer at Medtronic. She serves as a vice president in Medtronic's research and development department, and was a critical team member in helping Medtronic develop their implantable defibrillator. She shared about her journey in becoming an engineer and provided valuable advice to SWE members. It was very beneficial for our members to hear Carol speak as she is an innovative and encouraging role model who advocates for women in engineering. (continued on next page)

SWE National Conference— Katelyn Murhammer (continued)

After the keynote speaker, SWE members attended smaller breakout sessions of their choice. Some of the sessions that we attended were focused on lifelong learning, cross-disciplinary collaborations, ethics and human rights, and obtaining professional degrees with an engineering background. Also on Thursday, we had the opportunity to attend the career fair with over 400 companies and graduate schools present. Some of our SWE members got invited for interviews with companies at the career fair. These interviews took place the next day at the conference and some members received internship offers. This career fair provided a great opportunity for us to network with companies who valued the diversity of women in engineering.

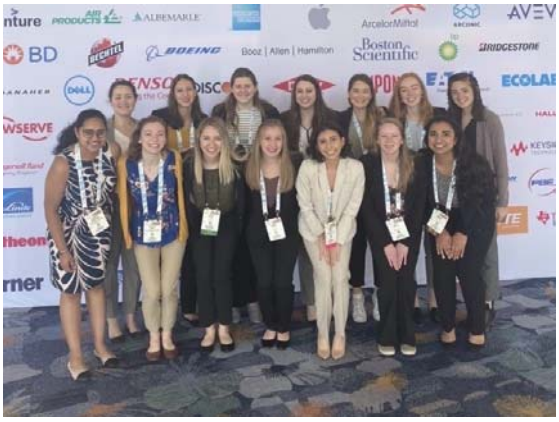
On Thursday night, we attended dinner at Fire and Ice, an interactive grill restaurant, with SWE alumni from the University of Iowa who work at Boston Scientific. It was a great chance to learn about the engineering industry from the perspective of recent graduates. After dinner, some of us took advantage the Disneyland Resort in Anaheim and attended Downtown Disney, an outdoor shopping center, where we got ice cream for dessert.

The next day, we listened to a second keynote speaker, Rachel Hutter, who is a senior vice president in health and engineering at Disney. Rachel spoke about her journey from being a young engineer to her leadership roles at Disney in facility operations and worldwide safety. Rachel had a very unique presentation and spoke about how we can use lessons from the women of Star Wars and apply it to our leadership roles within engineering. It was interesting to hear about Rachel's successes and failures during her career and provided beneficial insight to what a career in engineering can look like for an individual.

Similar to the events on Thursday, our members attended breakout sessions and had another opportunity to attend the career fair. Some of the breakout sessions that we attended were about embracing failures and how to make the best career decisions for ourselves. A few of us also took advantage of the free massages and manicures that were taking place throughout the day at the conference. That night we met up with a few members of SWE ECI, the professional Eastern and Central Iowa SWE section that periodically works with collegiate members at the University of Iowa. We had dinner at the Cheesecake Factory, and we networked with engineering professionals in SWE ECI and learned about their experiences.

On Saturday, we decided to spend time exploring Los Angeles. Half of our group relaxed at a beach for the day, and the other half visited the Hollywood Walk of Fame and the shops on Rodeo Drive in Beverly Hills. We had a great time exploring California and spending a day enjoying the warm weather. It was a very fun way to end our time in California before returning to the cold weather in Iowa.

Attending the SWE National Conference was very beneficial to all of our members. It was a great chance to spend time with hundreds of women in engineering and grow closer to the students from Iowa. The regional conference will be held this spring in Des Moines, Iowa, and there are already over 20 SWE members planning on attending. The next national conference will be held in New Orleans, Louisiana, in the fall of 2020. All women in engineering are welcome to join SWE and attend a conference alongside other Iowa students. If you have any questions, feel free to reach out to anyone on the SWE executive board or any members who have previously attended the national conference.



A group photo of the SWE conference attendees from the University of Iowa.

Fall 2019 Kids Day Camp— Elizabeth Occhi

The University of Iowa's chapter of the American Institute for Chemical Engineers (AIChE) hosts a community outreach event for children who are in kindergarten through fifth grade. The Kid's Day Camp occurs biannually, around Earth Day and Halloween. Those holidays are inspirational for the themes for the camps. The Kid's Day Camp consists of several different activities that include concepts from chemistry and engineering for the children to enjoy.

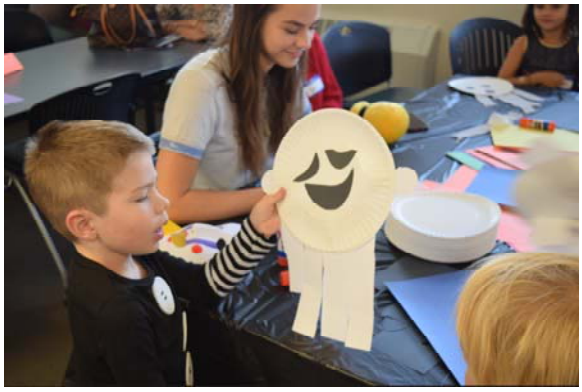
The latest Kid's Day Camp was scheduled for October 27th, 2019 and was Halloween themed. Since the event was only three days before Halloween, the kids and volunteers were encouraged to dress up in their costumes. Witches, lamps, princesses, Winnie the Pooh, and several others made an appearance at this event! While this made the event fun, there were several activities that the children were encouraged to participate in.

While the participants were arriving, the children and volunteers played a game of "heads up, seven up" and made paper airplanes to pass the time. After everyone arrived, the group went to an open area to play "duck, duck, goose" as an ice breaker. The first activities of the day consisted of painting pumpkins and making paper ghosts. While making ghosts, the kids decided to turn some of the volunteers into mummies. After making ghosts and painting pumpkins, the kids moved onto Halloween themed bingo to win prizes. After these events, the kids lined up to create dirt cups; using chocolate pudding, Oreos, and gummy worms.

The second half of the camp consisted of a few different chemical experiments, one of which was called a "bubbly brew". The bubbly brew involved mixing yeast, hydrogen peroxide, dish soap, and food coloring. The mixture gives off heat and produces a large amount of foam. The kids loved watching the formation of the foam and seeing the foam overflow the cups. The following experiment involved making slime. The slime was made from mixing glue, liquid starch, food coloring, and water. The kids could personalize their slime with different food coloring combinations and confetti. The slime was mixed with spoons or hands, making it a messy but fun activity.

The kids finished off their day by designing their own catapults. The catapults were constructed with popsicle sticks, rubber bands, and plastic spoons. Some kids decided to test them against the others, creating a contest out of the activity. The kids were able to catapult little candies, like dots or marshmallows, to test which catapult could fling the candies the best.

The Kid's Day Camp is an outreach program for the local community that focuses on activities that involve chemistry and engineering. One of the highlights from the event included seeing the different costumes that the volunteers and children wore. Other highlights from the event were playing "duck, duck, goose", creating slime, producing a bubbly brew, and building the catapults. All in all, this event was successful. Everyone had a great time meeting new people and participating in the different activities. The Earth Day camp will soon be planned, with hopes that there will be even more participants.



One of the participant's paper ghosts.

ChemE Car— Michael Leyden

ChemE Car is a student organization dedicated to constructing a moving car powered by a chemical reaction. It is comprised of sophomores, juniors and seniors majoring in chemical engineering. The goal for this year is to produce a functioning car to compete at the regional AIChE conference at the University of Nebraska. At the competition, each car is allowed two attempts to travel a specified distance while carrying a required amount of water. This year's car will be powered by a lead acid battery and utilize a luminol reaction as the timing mechanism.

Like standard car batteries, electricity will be generated by submersing a lead and a lead oxide electrode in a dilute sulfuric acid solution. An oxidation reaction occurs at the lead electrode forming lead (II) sulfate. The electrons travel towards the lead oxide plate. This powers the motor and leads to the reduction of lead (IV) oxide to lead sulfate.

$PbO_2 + H_2SO_4 \quad PbSO_4 + H_2O + O_2$ (1)

$Pb + H_2SO_4 \quad PbSO_4 + H_2$ (2)

The goal is to create enough functioning cells to achieve the voltage required by the motor and to produce power for at least 2 minutes.

The purpose of the luminol reaction is to make the car stop at the specified distance. In the luminol reaction, an aqueous solution of luminol and sodium hydroxide is mixed with a solution of hydrogen peroxide and iron ferricyanide. Upon mixing, the mixture begins to glow. This is referred to as chemiluminescence. The light produced will hit a photoresistor. This completes a circuit allowing the motor to operate. When the glow becomes dim and ceases, the car will stop. By altering the quantities of each solution and their concentrations, the time can be altered.

There are many opportunities to get involved in ChemE car. People can work on building the main chassis, the luminol reaction, battery and circuitry. If you would like to join ChemE car, feel free to contact Michael Leyden or Esmeralda Orozco.

Interning with Fauske & Associates—Alex Kaffka

I have had the privilege of working at Fauske & Associates during my summer and winter breaks. My assignments as an intern have been assisting with the many aspects of the company wherever I might be needed. This has also been a great opportunity to experience the many aspects of what I can apply my Chemical Engineering degree to.

Fauske is a chemical and nuclear process safety company. They work with clients to run chemical tests, construct equipment for lab usage, and code computer models of their systems. All of these are done to ensure that their processes are being handled appropriately and determine where safety measures should be taken. My manager wanted to make sure that I had gained experience in each of the divisions at Fauske. I greatly appreciated this, as I was always kept busy and I always felt useful to the company during my time there. I have had the opportunity to work in their flammability lab with their MIE testing. Here, we tested differing compositions of fuel mixtures to determine the lowest energy required to combust the mixtures. Other work included working in their thermodynamics lab with their ARSST, where I was able to get hands-on experience with their calorimeters. Here, the company can study the characteristics of runaway reactions. I had a great experience in their dust lab, where we performed Hartmann Tube tests on fine particles, sieve tests, and identification procedures for the substances that arrived for testing. Some of my job required me to work on coding and computer programs to translate work from Mathcad to C++, as well as designing computer models to replicate scenarios occurring at a client's plant.

It was an experience that I am very thankful to have had. The people there were very willing to answer my questions and get me on track for my future as a Chemical Engineer.

Developing Polysulfide Polymers to Protect the World's Greatest Resource— Jack Lynn

Water sustains all life on earth, and life's survival depends on the cleanliness and accessibility of water. Unfortunately, industry discards—intentionally or unintentionally—harmful byproducts into precious water resources. Two notable pollutants are hard metals and oil, which not only hurt the aquatic biosphere but also threaten human health. Luckily two new polymers, sulfur-limonene polysulfide and unnamed polysulfide copolymer, potentially address both issues in a costly, sustainable, and effective manner.

Heavy metals serve as fundamental components in industrial practices but also pose serious deleterious effects on human health. For decades, various industrial and medical processes have involved heavy metals, increasing their presence in water and the environment. In particular, mercury can have severe negative effects on both human and animal health. Although also found naturally, mercury is often sourced from electrical and dental industries, among others, and often feeds into waterways. Much of the human consumption of mercury comes from the consumption of fish, who consume mercury from their aquatic habitats. Mercury is a carcinogen and toxic in all forms, notable for doing significant liver, kidney, and neurological damage [1]. Clearly such a harmful heavy metal necessitates an effective manner of removal from aquatic resources.

Researchers from the Flinders University have developed sulfur-limonene polysulfide in order to remove mercury from water sources [2]. As the name suggests, sulfur-limonene polysulfide combines sulfur, which attracts the heavy metals, and limonene, which repels water and gives a waxy texture [3]; the resultant structure is a thermoplastic polymer that is ideal for cleaning water systems [2]. In laboratory testing, the sulfur-limonene polysulfide was found to form a bright yellow deposit with mercury. The deposit can be used as an indicator of mercury and a vehicle for mercury removal. The polymer is so effective that even trace amounts of mercury can be removed easily. In laboratorial trials, it was able to reduce the count of mercury from 2000 ppb to 910 ppb in just 24 hours. Its efficacy has made sulfur-limonene polysulfide attractive to industry. In particular, its components are cheap: 60 million tons of sulfur are produced as a biproduct of petroleum refinement, and 70 thousand tons of limonene are isolated from citrus rinds every year. Due to the abundant access of the reagents, the production process is both cost-effective and sustainable. Other attractive features include the ability to mass produce and the ability to be molded [3]. While sulfur-limonene polysulfide seems like an attractive solution to mercury water pollution, research is still relatively limited, and continued and holistic testing of the polymer is necessary.

Another major contaminant of the world's water supply comes from oil spills; furthermore, it is well-established that spilled oil can have serious deleterious effects on aquatic ecosystems. Fortunately, unlike the case of heavy metals, the amount of oil spilled into the ocean has decreased dramatically since the 1970s. From 1975 to 2018, the annual number of major oil spills (more than 7 tons released into the ocean) decreased from 116 to only 6. One of the biggest reasons for this drop is simply that manufacturers have improved their systems of extraction. Markedly, the percentage of oil spills caused by accidents (collisions, explosions, among others) has increased, while spills from bad equipment have decreased. For example, in the 1990s, the percentage of spills caused by hull failure approached nearly 18 percent; by the 2010s, hull failure decreased to less than 5 percent [4]. That being said, most studies do not account for small-scale breaches and lack of resources for cleaning in developing countries [5]. While the amount of oil spilled is far from where it used to be, there is still a need to develop cheap and effective cleaning methods.

Up until this point, the most common method of removing oil involved passing affected areas through a filter, which is both expensive and wasteful [6]. Researchers from Flinders University have developed a new polysulfide copolymer, which boasts both cheap, resourceful, and effective ways of removing oil from water. (continued on next page)

Developing Polysulfide Polymers to Protect the World's Greatest Resource— Jack Lynn (continued)

They synthesized the copolymer using equal parts sulfur and canola oil, both of which are cheap reagents. Like the limonene polysulfide, the sulfur can be sourced from within the oil industry, supporting sustainable development. The structure of the polysulfide copolymer is sponge-like, using sodium chloride in the synthesis to create pores. When the polymer is submerged, the polymer's hydrophobia minimizes water absorption (only about 56 mg of water per gram of polymer) while its nonpolar structure attracts and traps oil in its pores. The polymer can be wrung out in a waste container and used again. This characteristic is attractive considering that the same polymer can be used several times to maximize its efficacy [5]. The main drawback to this polymer is that it has not yet been tested holistically, especially in relation to its own effects on aquatic ecosystems [6]. Nonetheless, the prospect of using this sustainable and effective method could revolutionize the way oil is removed from water.

With the increasingly industrial world and importance of preservation, maintaining the health of water systems are essential for survival. Polysulfide polymers could play a central role in cleaning water system as they present cheap, effective, and sustainable alternatives. The increasing number of heavy metals, like mercury, in waterways pose serious health risks; sulfur-limonene polysulfide could extract harmful levels of mercury. Despite recent advancements, oil spills remain a real threat to aquatic ecosystems, but polysulfide copolymers could present the cheapest method of removal yet. Nature and development will always compete with one another for dominance; however, innovative engineering creates harmony between man and mother nature.

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Temperature Swing Solvent Extraction – A Promising Method for Freshwater Production— Juan Tello

Global water consumption is becoming an increasingly terrifying concern. According to UNESCO, the United Nations Educational, Scientific, and Cultural Organization, global water consumption has been increasing by around 1% per year since the 1980s and will continue to into the 2050s (1). Increased consumption has taken a huge toll on populations across the world. UNESCO estimates over two billion people live in water-scarce countries, and four billion people experience water-scarcity at least one month of the year (1). Natural freshwater is also a limited source. Although our blue planet is abundant in water, only 2.5% of water on Earth is considered freshwater and safe for consumption, and only about half of that is readily accessible (2).

Amazingly, there is an untapped water resource that has been left mostly untouched up until this point: industrial water. Several industrial processes, such as oil and gas refining, produce large quantities of water as a byproduct (3). In the oil and gas industry, water is extracted from oil wells along with the hydrocarbons. (continued on next page)

Temperature Swing Solvent Extraction – A Promising Method for Freshwater Production— Juan Tello (continued)

This water, called produced water, is usually highly contaminated with oil, organic compounds, suspended and dissolved solids, and various other chemicals that are used during the extraction process (3). Currently, the purification process is highly complicated, as it requires different treatment technologies to remove different classes of pollutants.

Adding to the problem, much of the water produced is heavily polluted with salts that are hard to separate in an effective and cost-efficient method. These high-salinity waters, called hypersaline brines, are currently through two processes: evaporative distillation and reverse osmosis. Evaporative distillation processes, which is the separation of water its pollutants by evaporation, effectively separate water from solutions by phase change from liquid to gas but require high energy inputs that make them very cost inefficient. Reverse osmosis processes, which work by overcoming osmotic pressure, are much more energy-efficient, but cannot separate water from hypersaline brines due to osmotic pressure barriers. Unfortunately, there exists no standard reliable method for removing water from hypersaline brines with low energy costs. The future of freshwater production therefore depends on new water purification technology that can effective and efficiently produce potable water from hypersaline wastewaters and seawater.

Currently, there is extensive research being done on several new separation methods. One promising method comes from Dr. Ngai Yin Yip's lab at Columbia University. Dr. Yip is currently researching a method called temperature-swing solvent extraction (TSSE), which aims to effectively extract water from hypersaline brines up to six times saltier than seawater. TSSE employs secondary and tertiary amine solvents, which possess low polarities with temperature-dependent water solubilities (4). The importantly unique characteristic of these solvents is that they absorb water according to the temperature of the solvent. In this process, one of these solvents are added to the brine. At the process low temperature (20 °C), the solvent extracts water out of the brine solution and salts out a dewatered concentrate, which is removed. The solvent-water mixture is then heated (60 °C), which causes the solvent to separate out from the water. The water is then removed from the mixture and the solvent is recycled back into more brine to continue the process (4).

In Dr. Yip's recent study, "Membrane-less and Non-Evaporative Desalination of Hypersaline Brines by Temperature Swing Solvent Extraction", his lab tested water extraction abilities of three amine solvents using 1.0 M and 4.0 M NaCl solutions. The results concluded that TSSE using these amine solvents was very effective in removing water (the lower concentration, the more water removed), very effective in removing salts (the higher the salt concentration, the more salt removed), and very effective in lowering osmotic pressure when in solution with hypersaline brines (4).

TSSE provides a promising future method for processing unused, high-salinity industrial water and seawater into potable freshwater. TSSE is more energy-efficient than evaporative distillation, as it only requires temperatures at around 60 °C. Unlike reverse osmosis processes, TSSE can overcome osmotic pressures and extract water from hypersaline brines. With future research and development, TSSE could provide a unique and lifesaving method for producing freshwater.

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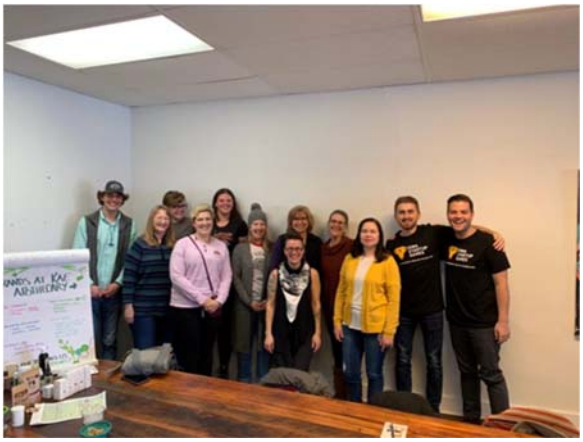
My Experience at the Iowa Startup Games— Paul Flanders

In the spring of 2019, I participated in a competition called the Iowa Startup Games. It is a three-day event where students, from all areas of study, pitch their business ideas. After the ideas were pitched on Friday night, teams were formed to bring the best ideas to life. While my idea didn't move forward, I was able to join a team that pitched a CBD-infused honey product. My other teammates were both business majors, so my perspective as an engineering major was valuable to the team to make sure our ideas were practical.

On the second day of the competition we spent the day doing "customer discovery". We found a CBD information session that was hosted at a local health shop and made sure to attend to meet our potential customers and learn more about their needs and wants. The picture given below shows my team with the attendees of the information session and the business owner.



My favorite part of the day was after the information session when the owner of the shop sat down with us and made us tea. She shared amazing insight about how products end up on her shelf and loved meeting us. The meeting ended with her offering to sell our product on her shelves and promoting us on social media. We also witnessed a customer buying CBD and honey separately, who loved hearing our idea and told us she would buy it in a heartbeat. We then spent the rest of our day developing our business more by creating marketing material and formulating our value proposition.

On the third day, we finalized our pitch and presented it to a group of panelists. In the end, we were awarded the Judges Choice award as well as awards for Marketing and Customer Discovery. I learned so much about myself and about building a business through this experience. I would never have thought that in 48 hours we could put together a team and build a business where real people express interest in buying our product. While my team decided not to pursue our business idea further, it was truly an experience I will cherish for a lifetime.

Research in Dr. Stanier's Lab—Austin Doak

I have been working as an undergraduate research assistant under Dr. Charles Stainer since my third semester at the University of Iowa. My research is concerned with air quality and atmospheric pollution which has become a growing concern in today's society due to its links to climate change and negative health effects. It is important that the interactions and distribution of pollutants are researched to develop options to reduce this pollution.

My research is focused on using computer programs and models to determine the influence of atmospheric emission sources on air quality measurements taken during the 2017 Lake Michigan Ozone Study (LMOS). LMOS was a month-long collaborative campaign in the summer of 2017 between federal organizations and a few universities, including the University of Iowa. (continued on next page)

Research in Dr. Stanier's Lab—Austin Doak (continued)

The study's objective was to better understand ozone formation and transport around Lake Michigan and more specifically examine why ozone concentration are generally highest along the lake shore in rural areas. During the month long LMOS campaign measurements were taken of various volatile organic compounds (VOCs) and airborne particulate size distributions at the ground site located in Zion, IL.

Using these measurements along with local meteorological data multiple plots were created in MATLAB to visualize the direction pollutants originated from. These plots include wind roses, pollution roses, conditional probability function plots, and bivariate polar plots.

Additionally, we wanted to investigate what power plants in the area could be influencing measurements. To complete this, the continuous emission monitoring system (CEMS) data for all powerplants in Illinois, Wisconsin, and Indiana were collected. Emission time series from all the powerplants were mapped into an interactive google earth map. Using meteorological, ground-based measurement, and CEMS data the influence of power plants was investigated by plotting the diel pattern of emission and by comparing the measured time series with the time series of emissions from local power plants.

Ground based measurement data was also analyzed using the U.S. Environmental Protection Agency (EPA) positive matrix factorization (PMF) receptor model. PMF is a model that quantifies the contribution of compounds to sources that are determined by comparing the rate of change in concentration of species. PMF results were used to determine what possible common emission sources, such as those associated with automobiles or coal-fired powerplants, could have been influencing measurements.

My current research work has been summarizing the results of all work associated with LMOS and writing a paper to characterize how good of a site Zion was for a regional air quality study.

Co–op at Tapemark—Sarah Hoadley

From January to August this past year, I had no exams, homework, lab reports, and projects. Instead, my days were filled with the 8-5 grind that is the working world. And I loved every second of it. Tapemark is a pharmaceutical contract development and manufacturing organization (CDMO) in West Saint Paul, Minnesota. They recruit chemical engineers from University of Iowa and biomedical engineers from Marquette University for cooperative experiences (co-ops) that allow the students to get a taste of life after graduation. This co-op helped me figure out my path. With the new curriculum change, fall of the 3rd year is rough for chemEs. It hit me pretty hard. I started having doubts about what I wanted to do in the future and even if this is the right major for me. The co-op at Tapemark gave me the break I desperately needed from school.

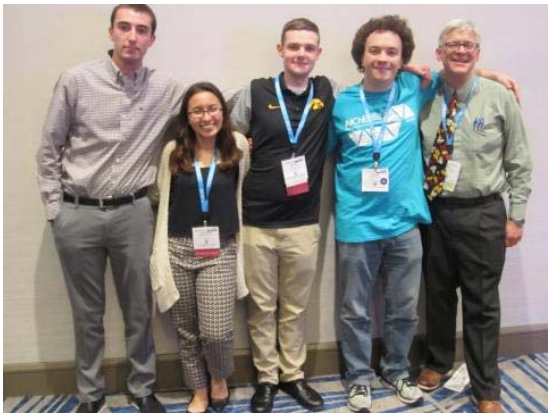
The first couple days was a lot of training and shadowing the other engineers. It was not very exciting, but once that first hurdle fell of getting to know my co-workers, the fun began. There were days when I would get to the co-op cube in the morning and before I even had my coat off one of the engineers would grab me and bring me down to the manufacturing floor to show me a set-up diagram that needed to be updated. Other days would be filled with customer calls or internal project meetings. For me, the best part about this co-op was that if you wanted to see a different part of the company, you could. I asked my boss if I could get time in the analytical lab, and within a week, I had a meeting with the head of the lab and began training. When I wanted to learn more about industry quality engineers, I would walk over to their area and spend the day with one of them. Co-ops get to work with the buyers, the salespeople, plant managers, research and development (R&D) engineers, and the operators. We even go to the meetings when customers visit for the projects we are working on. (continued on next page)

Co–op at Tapemark—Sarah Hoadley (continued)

My days were mostly filled with tailing one of the R&D engineers and learning everything I could about the mixing and coating process for transdermal and buccal films. I was also the lead engineer for a few projects. When questions arose, the project manager and other team members would come to me for answers. Not everything is just a single co-op's job. There is always one or two other co-ops with you to share the work. We would tag along on each other's meetings to sit in and learn about the projects, share advice, and crack jokes.

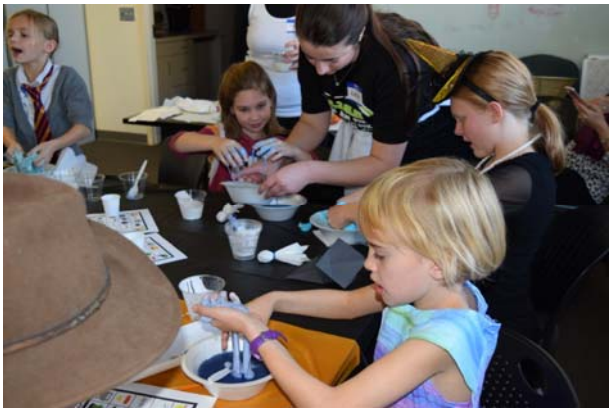
Industry is a whole new world. Without experiencing it yourself, it is difficult to know whether or not you enjoy it. During those eight months, I learned that I love the R&D side of pharmaceutical production. I completely rewrote my EFA to fit what I want to do. I left Tapemark and immediately began looking for summer internships. It set my graduation back but helped me recharge and figure out a path for the future. I still stay in touch with the people I was working with. It is not for everyone, but when they open up the application for the next co-op opportunity, I highly recommend looking into it. It opened up a whole world me. And a semester with a solid sleep schedule is amazing.

Fall 2019 Events in Photos

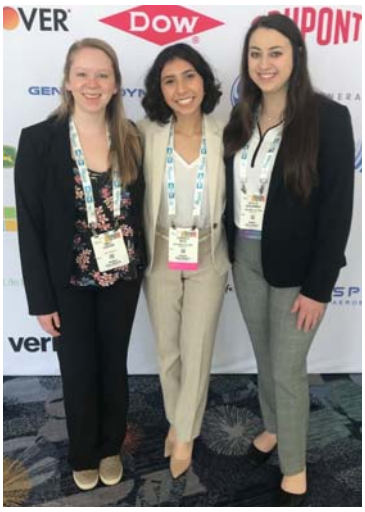


Our ChemE Jeopardy team which won second place at nationals (from left to right: Mike Lake, Esmeralda Orozco, Michael Leyden, Jeremy Wallace, Dr. Murhammer).

A group photo of all the attendees of the AIChE National Conference.



Slime-making in progress at Kids' Day Camp.

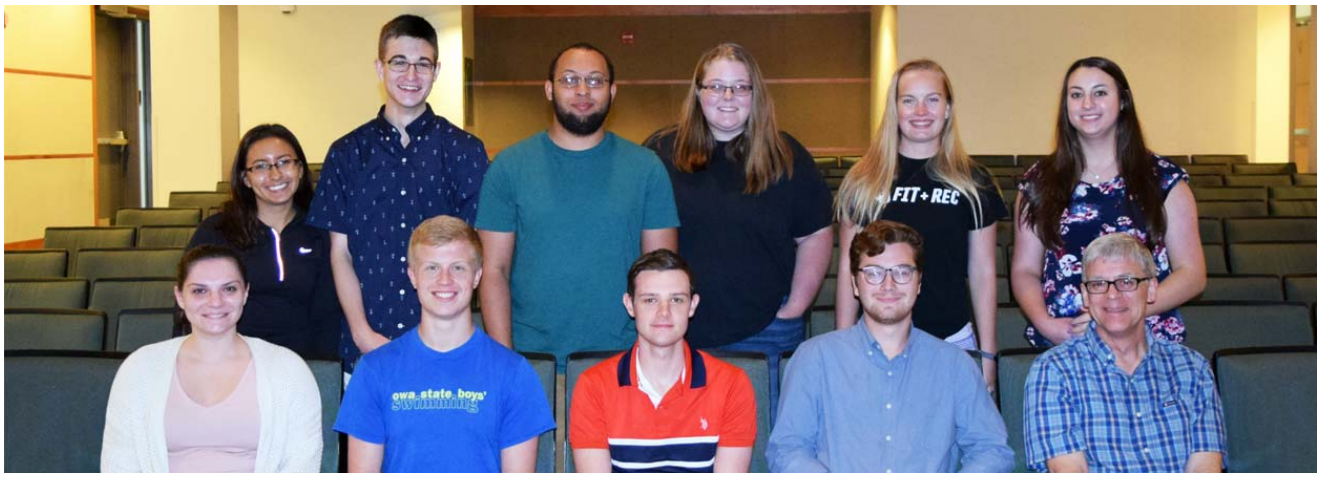


Chemical engineering students at the SWE conference (from left to right: Emily Fortier, Gabriela Moya, Katelyn Murhammer).

Acknowledgements

Thank you to the AIChE Officers for their hard work and contributing efforts to make our AIChE Student Chapter a successful organization.

Fall 2019 Officers:



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Kid's Day Camp Coordinators:

Maggie Norland, Katelyn Murhammer, Elizabeth Occhi

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Faculty Advisor: Professor David Murhammer

Contributors: Katelyn Murhammer, Elizabeth Occhi, Michael Leyden, Alex Kaffka, Jack Lynn, Juan Tello, Paul Flanders, Austin Doak, Sarah Hoadley, and Nathan Jarvey

Your help is much appreciated!

Interested in speaking at professional seminar? If so, then contact our Spring 2020 AIChE Student Chapter Vice President Katelyn Murhammer at katelyn-murhammer@uiowa.edu or Student Chapter Advisor Prof. David Murhammer at david-murhammer@uiowa.edu for details and availability!

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