

The ChemE Connection

Lafayette College Chemical & Biomolecular Engineering News

Chemical and Biomolecular Engineering Department Highlights



the premier undergraduate experience that is the hallmark of Lafayette Chemical Engineering.

In due time, we will assemble together again as a community within the walls of Acopian. Until then, I hope we will continue to reach out and support one another through social media. ChBE is on Facebook, Twitter, and LinkedIn (see the back page for links). While the news of spending the remainder of the Spring semester off-campus is incredibly disappointing for all of us, I have been impressed with the resolve and selflessness of our students, especially the seniors. It is in times like these that we will appreciate those hours spent working together in the Fishbowl just a little more. Stay well, and I hope to see you all on campus again soon.

Thank you for your continued support of ChBE,

Lauren Anderson '04
Associate Professor and Head
andersol@lafayette.edu

Dear Alumni and Friends of Lafayette Chemical Engineering,

I hope the electronic version of this newsletter finds you well during this challenging time. In light of the COVID-19 virus, we were unable to gather together in person during our annual ChBE symposium. I wish to thank our alumni who graciously planned to return to campus to share their experiences with our current students and who continue to engage through virtual interviews and networking. I would also like to thank the students on the AIChE Executive Board, Andrew Frucht '20, Sarah Park '20, Cassandra Warrener '20, Kotoe Abe '21, Sidharth Vijay '21, Ryan Berry '22, and Maddie Carroll '22, under the leadership of Professor Michael Senra, for their tremendous

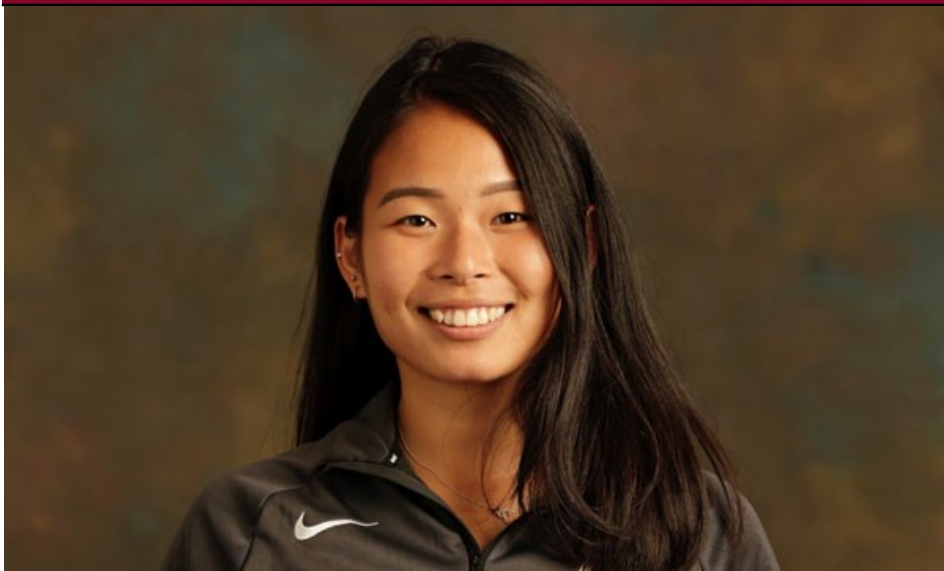
efforts in planning the symposium.

To ensure the health and safety of our community, the College moved to remote teaching and learning for the remainder of the Spring semester. Classes resumed virtually on Monday, March 23, after the Spring Break week. Most students have returned home and are adjusting to their new remote-work environments. Faculty have been working hard to redesign coursework to be taught effectively from a distance. Lab courses are using videos available on our LafayetteChBE YouTube channel and many faculty teaching lecture-based courses have been recording lectures for asynchronous teaching. ChBE faculty will continuously evaluate and edit their courses over the next several weeks in order to deliver

WE'RE IN THIS
together

LAFAYETTE

Student Spotlight — Sarah Park, Class of 2020



Cassandra Warrener, '20.

This year, the student focus corner revolves around one of AIChE's Co-Presidents, **Sarah Park '20**. Besides giving her time to AIChE and being a student, Sarah is also a D1 athlete, a peer mentor, and a researcher since her freshman year. While that is a lot, I can personally say, that somehow, Sarah is able to handle it all with grace and fortitude.

Sarah grew up about an hour outside of Easton and said that she selected Lafayette because "it's the perfect mix of academics and athletics." She continued, explaining, "I didn't come from a very big high school, so it was an immediate sense of being at home when I came to visit this campus." When I asked why Sarah chose chemical engineering specifically, she told me that while she loved chemistry, she also wanted to be challenged to think outside the box. She saw ChemE as the perfect opportunity to grow intellectually, as it would "force her to approach problems from several perspectives."

Sarah's desire to learn and problem solve is quite obvious from her long list of experience, in both research and industry. Starting the summer following her freshman year, Sarah worked with the Professor and

Lauren Anderson as a Clare Boothe Luce Scholar in the field of biomolecular engineering. The next summer, she was a research fellow at the National Institute of Health (NIH), where she "synthesized and purified a protein that is linked to autophagous diseases". This past summer, Sarah worked at M.Holland, a polymers and materials company, where she interacted with customers, ensuring products were on spec. She even had her own project, optimizing a product for the company. This year, Sarah returned to research, conducting her Honors Thesis with Professor Ryan van Horn on cell adhesion studies. Her next academic goal is to acquire her PhD in materials or biomedical engineering and then move into an R&D position at a pharmaceutical company.

Outside of academics, Sarah is the goalie for Lafayette's women's field hockey team. Showing that she thrives in both academics and athletics, Sarah humbly mentioned that she represented Lafayette the last three years on the US High Performance team for USA Field Hockey. After learning this, I asked Sarah what she likes to do in her free time, because she seems to really pack her life full of experiences. She told me that she enjoys long runs, drawing and art, listening to music, and "(of course) going

shopping for clothes even though I don't really need more."

By the end of this interview, I was in awe of everything Sarah has been able to complete, and her answer to my final question supported my view of her even more. I asked Sarah how she manages all of the things she does. This is what she told me:

"I think it was pretty difficult having to find a balance between athletics and majoring in chemical engineering. I would 100% be lying if I said that I was able to get through these last four years effortlessly. However, I think having had the opportunity to be on a time crunch almost all times of the year really taught me to 1. value work ethic and time management and 2. value the moments that I have for myself to do things I enjoy. I think it's easy to feel overwhelmed and feel sorry for yourself, but truly having had these two pieces of my life coincide has helped me become a more decisive and more proactive person, even beyond athletics or academics. It was a wild 4 years, without a doubt, but I genuinely think that field hockey helped me become a better ChemE and ChemE has made me a better hockey player."



New Electives in Chemical and Biomolecular Engineering

Maddie Carroll, '22.

The past year brought two new electives to the department: Chemical Engineering Computing and Atmospheric Science and Engineering. Chemical Engineering Computing is being offered by Assistant Professor Aseel Bala. She first taught the course in Spring 2019 and will likely teach it again in Spring 2021. Professor Bala has experience with multiple computing languages and her research involves using modeling programs such as Aspen, MATLAB, and VMD to improve thermodynamic models, so she is very interested and knowledgeable in how computing can be applied to engineering problems. Sophomores, juniors, and seniors alike take this course. Because of this, there is a wide range of not only coding knowledge, but also technical knowledge among students. The goal of Professor Bala's course is to intro-

duce Chemical Engineering students to the language of MATLAB, numerical methods, and how computing can be applied to engineering problems. Bala selected MATLAB as the language for the course because unlike many languages, it is not pure command line so it is less intimidating for students with no coding experience. With a simple language, the hope is that students will be able to quickly learn the syntax so more time can be invested in learning how a computer thinks to learn the concepts of coding.

The main structure of the course involves learning how to translate an engineering problem statement to mathematical models that can be solved using various numerical methods such as integrals, derivatives, and systems of equations. Students first practice solving problems using these methods by hand so they can understand what process or variables the

computer will need to use. After the numerical method is mastered, the students learn how to use MATLAB to solve the problems in a much more efficient manner.

Professor Bala is a proponent of hands on, group learning. Although this elective requires some aspects to be taught through lecture, students are given guided inquiry exercise handouts in class every day. The goal of such handouts is to work together in groups to learn concepts through doing, which leads to increased student interest and retention of material. These handouts are also used as opportunities for students to explore applications of computing to many branches of engineering. Problems that students work on include spring systems, predator-prey interactions, heat transfer, force balances, and rocket acceleration.

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Meet Brittany Clouser

Kotoe Abe, '21.

This year the Department of Chemical and Biomolecular Engineering welcomes Ms. Brittany Clouser as the new Coordinator of Chemical and Environmental labs.

Ms. Clouser received her B.S. in Biodiversity and Conservation Energy from Cedar Crest College in Allentown, PA. After graduating she started her career as a laboratory assistant at Mérieux NutriSciences. In this position Ms. Clouser received the necessary experience and training for her most recent position as the Quality and Operations Supervisor of Chemistry in Allentown for the last five years. In this role, she oversaw the day-to-day safety, quality, and observations in the laboratory.

The position at Lafayette initially interested Ms. Clouser because it

would allow her to diversify her career and achieve a sense of fulfillment in her professional life. The position appealed to her broader career interests related to creative problem solving and having the opportunity to truly make a difference.

In her free time, Ms. Clouser's hobbies include art and soccer. She enjoys painting, drawing, and print-making at her home studio and plays soccer in a women's league in the Lehigh Valley. She also spends time with her eight nephews and nieces, going to birthday parties, soccer practices, and hikes.

After her first semester at Lafayette, Ms. Clouser said Lafayette has been every bit as fulfilling as she had hoped it would be. Although a little daunting at first, Ms. Clouser said that everyone at Lafayette has been



incredibly welcoming and supportive. Her favorite part of the college so far has been the college's commitment to diversity and inclusion, something she holds personally valuable.

Alumni Focus — Kelly Flynn, Class of 2017



Sidharth Vijay, '21

Few Lafayette chemical engineering students sit in Kinetics daydreaming of their future at NASA. Kelly Flynn '17 was no different until she found an online application to be part of the NASA ETHOS flight control team. ETHOS, standing for the Environment and Thermal Operating Systems, is an integral part of the International Space Station, which just celebrated its 20th year. Operating within the Flight Operations Division (FOD), Kelly's work

in ETHOS focuses on human space flight in low earth orbit.

Over the last few years, Kelly has been a flight controller in training at the NASA bootcamp, having recently received her certification on the ETHOS Systems Trending Analysis and Resource (STAR) system and working her way to the Thermal Resources and Environmental Control (TREC) certification. As Kelly herself mentioned, NASA loves acronyms. Kelly mentioned how her training is

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AICHE Recognized by the College

Assistant Prof. Michael Senra

On May 8, 2019, Lafayette College held its annual Aaron O. Hoff Awards ceremony. The awards are presented to individuals and organizations that “highlight the achievements of Lafayette students, employees and student organizations for their inspiration, contributions, dedication and leadership to the Lafayette community”. The American Institute of Chemical Engineers (AIChE) chapter was the recipient of the Student Organization of the Year award at the ceremony. The award was accepted by the Presidents of AIChE during the 2018-2019 academic year: Ali Bord '19 (now at Pfizer) and Trent Eastman '19 (now at Merck). AIChE has earned this award on multiple occasions, most recently in 2014 before this award.

AIChE was recognized for the multitude of activities it conducts to enhance the experience of students in the major. This work starts when students first enter the major, with mentoring programs, one for first years and one for sophomores. In both programs, underclassmen are paired with upperclassmen to learn more about the major, opportunities available to student both at Lafayette and elsewhere and tips to navigate life as a

chemical engineering student at Lafayette. The organization also takes a lead role in developing programming for professional development, some as part of the required development lectures in ES101 and others aimed at upperclassmen such as brownbags on the Career Fair and internships/externships. AIChE has also been involved in helping out with campus-wide activities, such as supporting the mission of the Holiday Helpers program with Landis, which purchases Christmas gifts for less fortunate parents and their children.

More recently, AIChE has been working on increasing involvement from our loyal and accomplished alumni. Our major event is the Annual Symposium, typically held in the end of March. Distinguished alumni are invited back to campus to provide stories about their experiences and words of advice for our current students. This event also provides networking opportunities between our students and alumni. AIChE puts in significant effort to ensure a breadth of experiences, with alumni entering



traditional and non-traditional trajectories after graduation and alumni that chose to pursue further education, whether immediately after Lafayette or many years into their career. As many alumni that would like to participate live far away from Easton, we have developed video interviews with alumni to give them an opportunity to provide their experiences. These are available on the LafayetteChBE YouTube page. As we move forward, we would like to involve our alumni more in the activities of the department, whether through AIChE or other areas such as senior design. We would love to hear any ideas that you may have. Contact information is available at the end of this newsletter.

ChBE Faculty Win College Awards

Ryan Berry, '22.

This year Professors **Lindsay Soh** and **Chris Anderson** were recognized for their excellent teaching and scholarship by being granted tenure. They were also recognized at the annual end-of-year Trustees Dinner in May 2019.

Professor Soh was awarded the Thomas Roy and Laura Forrest Jone Faculty Lecture Award. This is a prestigious award given to only two faculty members a year. This award recognizes Professor Soh's superior teaching and scholarship in her discipline. Professor Soh is loved by her students and faculty for being an engaging teacher and wonderful research mentor.

Professor Anderson was awarded the Marquis Distinguished Teaching Award. This is given to only four faculty members a year and recognizes his or her exceptional teaching. Professor Anderson teaches Material and Ener-



Associate Professor Chris Anderson (center), being presented with the Marquis Distinguished Teaching Award by President Allison Byerly (left) and Provost Abu Rizvi (right).

gy Balances, Thermodynamics, and Biomaterials. His students appreciate his well-organized lectures, funny jokes, and his ability to connect with the students.

Let us congratulate Professor Lindsay Soh and Professor Chris Anderson for their exceptional teaching and hard work that they have provided to the students and engineering department.

Conference Corner — AIChE 2020

Andrew Frucht, '20.

This year Lafayette ChBE traveled to State College, Pennsylvania for the regional AIChE conference, and Orlando, Florida, for the national conference.

In Spring 2019, two cars of students drove to the home of Penn State for the regional conference. Here, students had an opportunity to present EXCEL and CBL research on a smaller scale than the national conference. In addition to the student research showcase, there was a small career fair with companies representing the industries of pharmaceuticals, chemicals, and petroleum. In all, five students presented research, while one student from the Lafayette College executive board attended the regional presidents meeting to discuss chapter developments. The regional

conference served as good practice for the much larger national AIChE conference, held in Orlando.

Thirteen students took flight to Orlando for the national student conference. This has been one of the largest contingents of Lafayette students to attend a national conference in recent years. In addition to taking advantage of the sunnier and warmer weather, student researchers had an opportunity to present their work, with four receiving awards. **Shiqing Ma '21**, studying with Assistant Professor Woo, won 1st place in a group in Environment & Sustainability. **Kristen Swaun '21**, researching with Associate Professor Lindsay Soh won 2nd place in a group in Separations. **Cameron Cranley '20**, working in Assistant Professor Melissa Gordon's group, and **Joanna White '20** working with Asso-

ciate Professor Ryan van Horn, both took 3rd place in the Materials section.

In addition to the research success, five members of the AIChE executive board were attended and took part in the Presidents Meeting and chapter workshops. The members shared the resounding success of the mentoring program spearheaded by the AIChE chapter where first years and sophomores in the Lafayette College ChBE program are paired with upperclassmen. Everyone was impressed with the overall involvement of both the students and the department in the Lafayette College AIChE chapter. The national students AIChE organization currently has an initiative to be involved in the local community, which in the future may find its way to Lafayette College.

Continued from FLYNN

surprisingly filled with classroom work necessary to familiarize flight controllers with NASA's history, its different programs, and the work she is being launched into. Naturally, this also includes simulation training, dealing with worst case scenarios, and several other ways of developing trainees' problem-solving skillset. Through these certifications, her ultimate destination is mission control at NASA's Johnston Space Center, providing real-time flight control support.

Kelly identified this job as a perfect fit for her and she has been proven nothing but right. Her love for working in an interdisciplinary team on a variety of complex problems on a daily basis has lent itself well to her role. Kelly noted her love of puzzles and there are few puzzles as high

stakes as this one. Furthermore, the work culture at NASA has been extremely conducive to her success. Her biggest surprise upon entering the workforce was seeing the "amount that other people want you to succeed", a sentiment that pushes flight controllers to realize the importance they play for the future.

This culture is no different from what so many of us, including Kelly, find at Lafayette, through our professors and their open doors. Furthermore, her Lafayette education showed her that there are multiple ways to solve a problem, such that she need not be a cookie cutter employee who just gets their work done. With the plethora of soft skills that the engineering-liberal arts mix gave her, Kelly transitioned easily into NASA's work

environment. Additionally, her time as a student athlete in Lafayette's volleyball team shaped the goal-driven personality she has today. In fact, her favorite memory at Lafayette is beating Lehigh in three sets at their home court.

Kelly, much like any chemical engineering student, had plenty of moments of uncertainty during her years at Lafayette. However, her greatest advice would be to not be afraid to fail. "If you constantly succeed, you will not know your weaknesses", and those realizations are what help you grow. It is important to know how to admit when you are wrong and need help, and there is no better environment to do this than at Lafayette.

Continued from ELECTIVES

Professor Bala believes that electives should be fun and not as demanding as the core engineering classes. Therefore, the class has no exams, but instead has small quizzes and projects for students to demonstrate their learning in a more creative way. The first main project allows students to explore models and computational applications at different levels of engineering - such as the molecular level, unit design, and plant analysis. The final project allows students to take a concept they have learned - optimization - and apply it to any engineering process of their choice. The hope of a student led project such as this is that they will be more invested in projects they find interesting and they can make it as technical or fun as they want. Last year's class excelled at these projects. One group optimized the amount of coffee to drink in a day to keep caffeine levels at a desired level. Another group went more technical, optimizing the velocity of a stream in the shell of a heat exchanger.

In future iterations of the course, Professor Bala would like to include even more in class coding activities,

such as designing a tic tac toe game, because that is where the students seem to excel in both learning and enjoying coding. She also hopes to integrate game development, not just numerical modeling, into the course to further illustrate to students how powerful coding can be.

Atmospheric Engineering and Science, the second new elective in the department, is taught by Assistant Professor Joseph Woo. Professor Woo's research focuses on atmospheric science - specifically the modeling of organic aerosols in the atmosphere. He has had several research students in the past, but teaching a course on his passion allows him to reach more students with the goal of demonstrating how chemical engineering skills can be applied to atmospheric issues. As with all electives, sophomores, juniors, and seniors are all eligible to enroll in the course. The main objective of the course is to introduce students to the physics, chemistry, and thermodynamics that govern the dynamic atmosphere. Subjects discussed came from thermodynamics, organic chemistry, general chemistry, separations, and

kinetics and reactor design. These concepts can be applied to weather, air quality, and climate trends globally.

The course was set up as a survey, learning different concepts such as cloud formation, atmospheric energy balances, and meteorology in different units during the semester. A large component of the class focused on journal article presentation to allow students to delve into current research in atmospheric engineering and science.

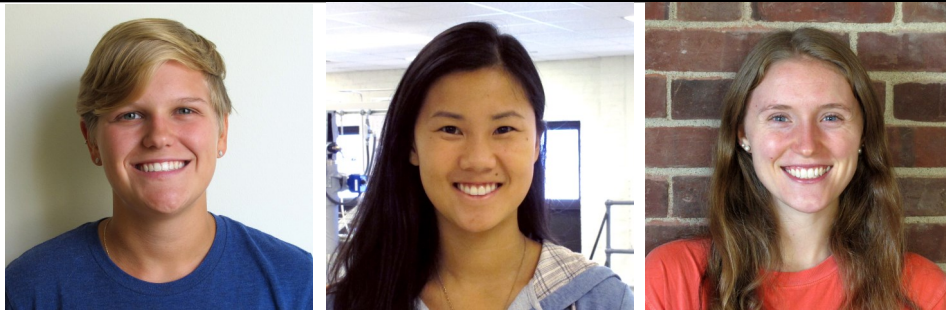
Besides the lectures and journal article presentations, students engaged in problem sets and mini quizzes throughout the semester. As an elective, the class did not include major exams or papers during the semester, only a final at the end. The final took concepts that were previously only applied to Earth and applying them to other systems. For example, one problem focused on atmospheric conditions on Mars while another asked students to analyze the aerosol emissions involved in cooking.

Multiple ChBE Faculty Collaborate in PNIPAM Study in PLOS One

Sarah Park, '20.

The Chemical and Biomolecular Engineering Department experienced yet another successful year with a collective effort from our very own faculty and students. Principal Investigator **Professor Lauren Anderson**, alongside Professors **Christopher Anderson**, **Melissa Gordon**, and **Ryan Van Horn** recently published their collaborative work on PNIPAM scaffolds. As two of the most recent additions to the department, Professor Van Horn and Professor Gordon provided a valuable perspective to the success of the publication with their expertise in polymers.

In this departmental collaboration, a thermoresponsive polymer, poly (N-isopropyl acrylamide) (PNIPAM), was researched by **Rachel Young, '18**, **Jodi Graf, '20**, and **Bella Miserocchi, '21**, in efforts to provide a basis for its application in tissue engineering. PNIPAM exhibits a unique property that allows the material to phase change based on solution temperature. This property is especially important for cell seeding because PNIPAM can either promulgate cell adhesion or cell detachment. As a result, a crucial component to the success of this journal was to be able to determine the parameters in which the scaffold could be optimized for cell interactions. Using the process of electrospinning, a synthetic scaffold was produced by co-blending PNIPAM and polycaprolactone together. By implementing electrospinning into the methodology of the research, the synthetic scaffold that was produced was able to mimic the extracellular matrix. Professor Christopher Anderson and Professor Lauren Anderson provided their expertise to conceptualize the research and analyze the cell viability of the scaffold, while Professor Van Horn's and Professor Gordon's mastery in polymers contributed to help develop a nano-



From left to right: Rachel Young '18, Jodi Graf '20, Bella Miserocchi '21.

fiber scaffold that is able to be utilized for tissue engineering purposes.

Although it is an impressive accomplishment to become published, Professor Van Horn, who specializes in the structure-property relationships of polymers, focusing on the thermodynamics and kinetics of self-assembly, believes the most significant aspect of this publication was helping undergraduate research students realize their goals and become successful. He emphasized that "anytime an undergraduate student is a co-author on a journal article...[it] is a significant achievement." In addition to this publication, Professor Van Horn has had two other publications with undergraduate authors and has published 38 peer-reviewed journal articles. Additionally, he thought this article provided an avenue to develop and foster collaborative relationships

with other members of the department.

In the upcoming academic year and future years to come, Professor Van Horn is excited to continue contributing his expertise in polymeric characterization and phase behavior. His current research projects are primarily focused on the biomaterial aspect of polymers as he has several research students characterizing the behavior of polycaprolactone for its diverse applications. His future interests are not limited to biomaterials as he anticipates pursuing research related to environmental issues and alternative energy as well. However, in light of this journal article, Professor Van Horn looks forward to continuing and starting new collaborations with his fellow colleagues at Lafayette.

Introducing Leona Soh-Yip

On May 10th, 2019 at 1:03AM, Associate Professor Lindsay Soh welcomed her daughter Leona Soh-Yip (樂安) into the world. She was born at a healthy 5 lbs, 11oz.

As her Chinese name suggests, Leona is quite a happy and peaceful child, and has been sleeping and eating well.

Congratulations to Professor Soh for the newest addition to her family. We wish both her and Leona lots of happiness and success for the future!



Renovating Acopian Engineering Center

Assistant Prof. Michael Senra

In December of 2018, Lafayette concluded its successful Live Connected, Lead Change capital campaign, raising \$425 million for a variety of objectives to maintain and improve the quality education provided at Lafayette. Part of this money was allotted to capital projects, most notably the creation of the new Rockwell Integrated Science Center (RISC) located in between Acopian Engineering Center and Watson Hall. Additionally, a number of buildings on campus have been or will be undergoing significant renovations, and Acopian is one of those buildings.

The renovation of Acopian will be a multiyear process and will include an addition to the 5th floor such that its footprint is similar to the 3rd and 4th year. The first sign of changes to Acopian occurred a few years ago with the creation of LeopardWorks, an interdisciplinary area where classes could schedule hands-on activities and additional space for senior design and/or interdisciplinary projects. Professor Polly Piergiovanni has taken advantage of this space moreso than any other faculty member, utilizing the space for both her Introduction to Engineering (ES 101) module and the junior level course Applied Fluid Mechanics & Heat Transfer (UO, CHE 321). This space was made available by the moving of Facilities to a new building down the hill near Kirby Sports Center.

The next sign of changes to Acopian came during the Winterim session in 2019 with the conversion of the former conference room for ChBE into a group workspace. The room contains three computers with large tables and big screens with additional outlets for personal laptops. This space has become very popular with our juniors and seniors, particularly for team projects in the lab and design sequence. In fact, this space is now being utilized for the weekly meetings between the senior teams and their faculty project manager in Design Synthesis (CHE 422).

More significant changes occurred during the Summer of 2019 with renovations occurring on multiple floors. The largest renovations occurred on the 2nd and 5th floors. The former large classroom in Acopian, AEC 200, was modified into a smaller computer lab with the additional space being used for a general lounge area. The formation of the general lounge area created a shift in the passageway location between the two sides of Acopian. Additionally, the computer labs were spruced up, including the Fishbowl. With the movement of Computer Science to RISC, the 5th floor will now be for the Engineering division. Therefore, initial renovations involved developing a larger computer lab and additional hands-on teaching space, an important aspect of the new Bachelor of Science in Engineering.



Future renovations will include the aforementioned additional space on the 5th floor and renovations to student spaces, faculty labs and restrooms to ensure a more appropriate gender balance on each floor. Most notably for ChBE, the research equipment and space devoted to our thriving biomolecular engineering cluster is slated to move to AEC 223B, the former large computer lab for engineering. If you are in the area, come visit your old stomping grounds in Acopian and see the changes... and check out our beautiful new neighbor, the Rockwell Integrated Science Center.

Connect with Us

We are always interested in connecting and reconnecting with alumni.

Please join our mailing list by e-mailing us for a link at aiche@lafayette.edu.

Lafayette Chemical Engineering website: che.lafayette.edu

Lafayette AIChE website: sites.lafayette.edu/aiche

Lafayette ChBE LinkedIn Group: <https://www.linkedin.com/groups/13604903/>

We're on Facebook and Twitter! 'Friend' Lafayette AIChE and 'Follow' @Laf_ChBE

AIChE Board 2019-2020: Professors Lauren Anderson and Michael Senra; Andrew Frucht '20, Sarah Park '20, Cassandra Warrenner '20, Kotoe Abe '21, Sidharth Vijay '21, Ryan Berry '22, Maddie Carroll '22