

Research Spotlight — Fueling Up!

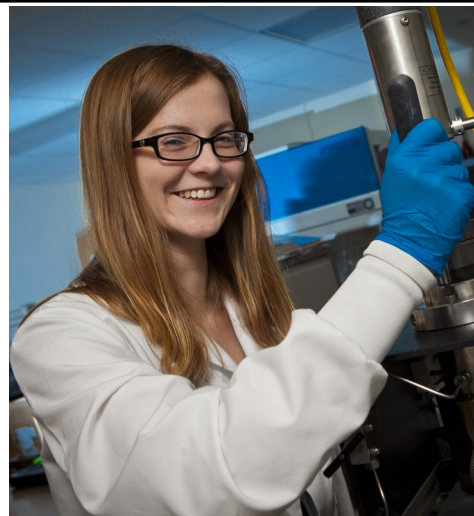
Cassandra Warrener, '20.

Diminishing fossil fuel resources as well as their negative environmental and safety impact emboldened Lafayette professors to search for an alternative. Although each professor focuses on different aspects of biofuels, both sides are vital in creating a long lasting solution. Assistant Professor of Chemical Engineering, Michael Senra, concentrates on the cold flow properties of fuels, and Assistant Professor Lindsay Soh (Kate and Walter A. Scott Research Scholar in Engineering) investigates how to incorporate Green Engineering Principles into biofuels especially the process of making biofuels. So, from beginning to end, these two professors are doing their best to understand and explore many types of biofuels.

In Professor Soh's lab, one set of students, Kristin Swaun, '21, and Cassandra Warrener, '20, tests a variety of chemicals, focusing on green solvents, which have promising environmental, health, and safety scores, and biofeedstocks, or feedstocks coming from nature.

For example, they have analyzed soy lecithin, a soy bean processing trash product, soy bean flour, and soon sunflower flower. In the end, they hope to find the best combination of solvent and biofeedstock to create a green process that produces the desired amount of triglycerides, a main substance used to make diesel.

A different set of Soh's researchers, Annika Fisk, '19, and Sasha Neefe, '21, works on "optimizing biodiesel conversion reactions with a solid catalyst in green solvent," she explains. Another problem with diesel at the moment, is the exorbitant amount of glycerol produced as a byproduct of converting fuel using the traditional method. Glycerol can be incorporated into many products, but there remains an overabundance of it. To rectify this, students have been exploring other conversion methods, tweaking small details along the way like type of catalyst, addition of water, and amount of carbon dioxide used. Their goal is to enhance the alternative process to the point where the conversion



rate, the largest hindrance at the moment, matches or exceeds that of the traditional method, and they are getting pretty close!

One of Professor Soh's student's, Eddalee Hochwalt-Naumann, '19, research actually aligns with that of Professor Senra. Eddalee has moved from the first aforementioned project to "establishing appropriate biodiesel blends for enhanced cold flow properties," Professor Soh states. Eddalee even recently won first place at the AIChE National Conference in the environment and

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Connect with Us

We are always interested in connecting and reconnecting with alumni. We are grateful to alumni that have given their time by speaking at AIChE and ChBE events and/or opening their workplace to us to host a plant tour or workshop. For more about Lafayette ChBE, 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

We're on Facebook! 'Friend' Lafayette AIChE

AIChE Board 2018-2019: Professors Lauren Anderson, Polly Piergiovanni, and Michael Senra; Alexandra Bord '19, Trent Eastman '19, Andrew Frucht '20, Sarah Park '20, Cassandra Warrener '20, Kotoe Abe '21, Sidharth Vijay '21

The ChemE Connection

Lafayette College Chemical & Biomolecular Engineering News

Chemical and Biomolecular Engineering Department Highlights



After 37 years of service to the department, Mr. Tom DeFazio will be retiring in 2019.

During Academic Year 2017-18, the Department of Chemical and Biomolecular Engineering graduated 39 majors, 10 with departmental honors, and welcomed 40 sophomores into the program. The Department continues to offer a premier undergraduate experience in chemical engineering through a combination of courses rich in experiential learning and research opportunities in cutting edge areas like sustainable energy sources, smart materials, atmospheric chemistry, and bioengineering. Department faculty mentored 10 honors thesis projects and an additional 24 students in independent research projects through either Independent Research, Independent Study, EXCEL, or Clare Booth Luce Summer Research Fellowships.

In the 2018 NSF GRFP Competition, there were 7 Awards or Honorable Mentions granted to Lafayette students or alumni. We are very proud that 5 of these 7 awards went to chemical engineers! As you will read about on page 3, Rachel Young '18 received the NSF GRFP for graduate study in bioengineering at the University of Pennsylvania. Patrick Leggieri '18 and Katarina DiLillo '18 received Honorable Mentions and will pursue graduate studies at UCSB and Michigan, respectively. Rachel Elias '17 (Michigan) and Isaac Levine '14 (Duke) also received Honorable Mentions. Zvikomborero Machikiti '19 was one of 19 undergraduates nationwide selected for the Future Leaders in Chemical Engineering Symposium held at NC State University, where he presented his

research on the green production of biopolymers.

In Fall 2018, 8 students attended the AIChE conference in Minneapolis. Rachel Tenney '18 and Junwei Xiang '18 won first place in their respective research divisions in the student poster competition. Two female students also attended the BMES conference in Phoenix and networked at a "Women in BME" Lunch as part of the Clare Booth Scholars program. In Fall 2019, 8 students attended the AIChE conference in Pittsburgh. Eddalee Hochwalt-Naumann '19 won first place in the environment and sustainability division poster competition for her research described on page 8. Joanna White '20 finished first place for materials research she conducted in the summer at Penn St and Jodi Graf '20 and Bella Miserocchi '21 brought home a second place finish for their research on electrospun smart biomaterials in the materials engineering and science division. Overall, this level of student engagement and success is a direct reflection of the department's strong commitment to providing high quality research experiences and mentorship to our students.

As you will read about on page 2, Professor Polly Piergiovanni received the William H. Corcoran Award for the best paper in Chemical Engineering Education for her work "Students Learn Without Lectures", published in 2017. She received the award at a dinner during the ASEE Annual Meeting in Salt Lake City. In

February 2018, Polly was also one of thirteen representatives to attend ASEE's Delegation to Cuba.

The AIChE Mentoring program continues to successfully welcome and transition new students to the college, the division, and the major. Last year marked the first year of the Sophomore Mentoring program, which had a relatively high participation rate. Programming focused on study abroad and research/internship opportunities.

The department was very excited to welcome two new faculty members last summer: Aseel Bala with expertise in thermodynamics and CHE computational software, and Ryan Van Horn '04 with expertise in polymer and surface science. You can read more about them on page 5.

Lastly, it is with immense gratitude that we accept the retirement of Mr. Tom DeFazio. Tom has been the Coordinator of Chemical and Environmental Labs for the past 37 years. Every current student and alumnus has a story of how Tom helped them at one point during their time in the chemical engineering department. Tom is a master of his craft. He can run every piece of equipment in any lab, he can troubleshoot and fix most everything that breaks, and he can creatively whip up any type of lab widget in hours. He cares deeply about student learning and has enhanced the department and its culture in countless ways. Tom, we all wish you the best in your next adventures. From the bottom of our hearts, THANK YOU. You will be greatly missed.

If you'd like to send Tom a note of thanks for his retirement, please send it to his attention:

Mr. Tom DeFazio
Department of Chemical and Biomolecular Engineering
AEC 319
Lafayette College
Easton, PA 18042

Thank you for your continued support of ChBE,

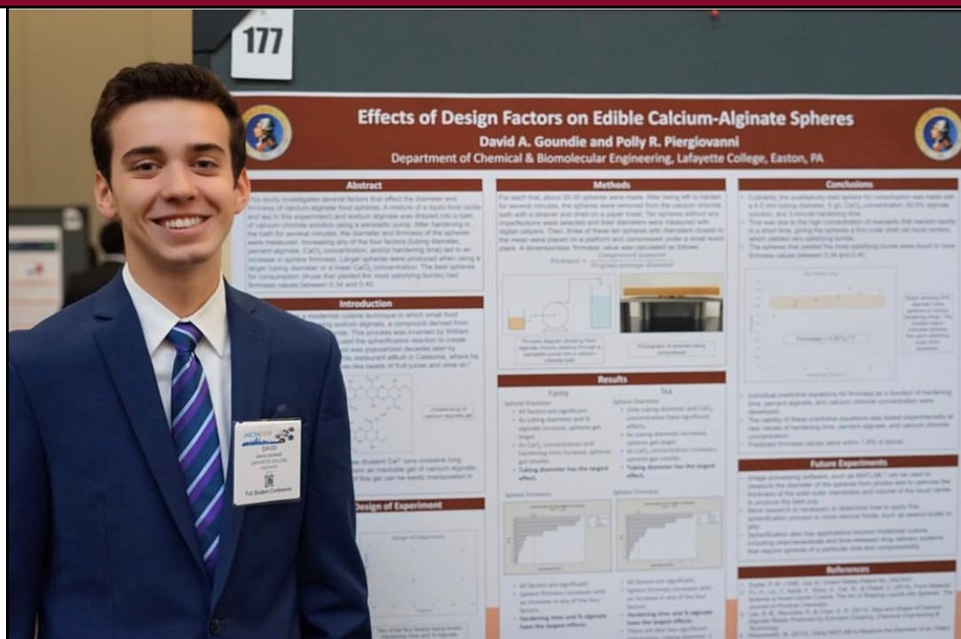
Lauren Anderson '04
Associate Professor and Department Head
andersol@lafayette.edu

Student Spotlight — David Goundie, Class of 2020

Cassandra Warrener, '20.

While David Goundie, '20, has traveled around the world, studying abroad in Spain, visiting Morocco, Lithuania, and Portugal along the way, Lafayette sits only a 30 minute drive away from his hometown of Whitehall, PA. In fact, David cites the Engineering Study Abroad Program as one of the many reasons he chose Lafayette. The amazing experience came to a close last May, but that didn't stop David from diving back into Chemical Engineering over the summer.

David worked with Professor Polly Piergiovanni this summer as an EXCEL Scholar completing research in the food engineering field. Not only did David work with Doctor Piergiovanni to develop experiments for a food-based Introduction to Engineering course, which the *Journal of Chemical Engineering Education* recently accepted with minor revisions, but he also investigated the optimization of producing edible calcium-alginate spheres. Spherification, the process of creating these spheres, has applications in modernist cuisine, pharmaceuticals, and time-released drug delivery



systems that require spheres of a particular size and compressibility. David hopes to submit another paper, this time to the *Journal of Food Engineering*, based on his work during the summer and the past winter interim.

Although, David's research focuses on food engineering, he is pursuing a minor in Environmental Science, as well. In the future, he'd "be very interested in doing something in the alternative energy field ... (or) pharmaceuticals and process engineering." Although, he'd rather go straight into an industry

job after graduation, he's open to returning to school in a few years to obtain a Master's Degree.

Besides traveling, homework, and research, David participates in Running Club, is a member of Tau Beta Pi Engineering Honor Society, and acts as a mentor for a group of first-year Chemical Engineering students. Outside of academics, he enjoys hiking, running, and hanging out with his friends. In short, David has a lot on his plate, but successfully balances school work, research, and friends.

Professors Lauren Anderson and Polly Piergiovanni Receive Accolades

Ali Bord, '20.

The 2017-2018 academic year was a year of success and recognition for the Chemical Engineering Department. Two professors won awards for their outstanding teaching and research.

Professor Lauren Anderson was awarded the B. Vincent Viscomi Engineering Prize for Excellence in Mentoring and Teaching. She is a co-director with Scott Hummel of the Clare Boothe Luce Research Scholars in Engineering Program, "to provide a richly supportive con-

text for women engineering students of high academic promise to thrive, while giving them the best possible preparation to pursue graduate education and careers in research."

Since 2010, she has served on the Provost-appointed Scholar-

Continued in AWARDS

Continued from AWARDS



Professor Lauren Anderson (center), being presented with the Viscomi Prize by President Allison Byerly (left) and Provost Abu Rizvi (right).

ships and Fellowships Advisory Committee to raise student awareness of the myriad of scholarship and fellowship offerings. She has mentored numerous undergraduate research students, many of whom have recently received awards for their research at international student conferences or national graduate fellowships and are continuing their careers at top-ranking chemical or biomedical engineering graduate programs.

She feels grateful to have received this award and recognition. The most gratification though comes from sharing in the successes of the students "nothing beats that forwarded email of an anticipated fellowship, grad school acceptance, or job".

In June, Professor Polly Piergiovanni won the William H. Corcoran Award from the American Society for Engineering Education (ASEE), which is "presented each year to

the author of the most outstanding article published in *Chemical Engineering Education*". *Chemical Engineering Education* is a quarterly journal that publishes articles of interest to Chemical Engineering faculty. Every year a committee reads every article and ranks the top five. The editor looks at the ranking and chooses the most highly ranked. Professor P. won in the 2017 year of the publication.

The article describes a "Unit Operations in Food Engineering" course that she taught a couple of years ago. In her article, "Students Learn Without Lectures" she describes her technique using problem-based learning. Students would ask her questions and then she would give an engaging mini-lecture based on the topic. She worked with A-Treat Bottling Co. in Allentown, PA and Klein Farms Dairy and Creamery near Lafayette. Through these experiences, students were able to design heat exchangers and unit operations.

Professor Piergiovanni feels very proud and honored to receive recognition from her peers and she hopes to teach the course again someday.

ChBE Seniors Demonstrate Chemical Kinetics at Cheston Elementary

Stephen Wilson, Lafayette Communications Division.

Cheston Elementary third-graders joined chemical engineering students Assistant Professor Michael Senra, for a day of bonding, both literally and figuratively.

The lessons are part of the Aspirations program from Landis Center for Community Engagement where Lafayette faculty,

Cheston teachers, and both Lafayette and Cheston students work together through cooperatively developed classroom-oriented learning.

"My students loved doing this," says Senra. "As seniors, they are taking classes, conducting research, looking for jobs, and applying to graduate school. Today helped calm that storm and boost morale in a hectic time."



Continued from AKRAM

ties in the world and create the story you want for your life”, which is exactly what he has done.

He adds that chemical engineers are in a particularly unique position to do this because its far less technically focused than other engineering disciplines, allowing for expansion into management and leadership. Simultaneously, the value of a Lafayette ChemE is not their knowledge of equations or their ability to plug and chug. Its how they “integrate their skills into other parts of the problem” and draw inferences to craft solutions. Learning how to approach a problem as a chemical engineer is incredibly valuable in his experience, and it is why he continues to introduce himself as a chemical engineer while in the business field.

During his time at Lafayette, Asad involved himself in numerous opportunities. He studied abroad in Bremen, travelling through a lot of Europe during that semester, and then returning to campus jobs at the gym, being a Residential Advisor and later an Head Resident, as well as doing research in the ChemE department. In fact, he set up the micro-fabrication lab and 3D printer in the UO lab. Having his hands in a lot of pots influenced his appreciation for unfamiliar tasks and diverse experiences.

Additionally, he worked closely with Tom DeFazio as a lab assistant and maintains that he learned more from Tom than anything else at Lafayette. Working in an environment of uncertainty and gaining knowledge heuristically is one of Asad’s greatest joys of attending

Lafayette. Even as a sophomore, he worked under Tom as the TA for the ED1 lab component, an opportunity that came from his knowledge of the equipment, procedures, pitfalls etc. “Nothing beats the real-world learning” as he puts it.

While at Lafayette, he did not expect to steer off the normal engineering path, however, he always knew that he wanted to work on hard problems, with diverse teams, and add value that goes beyond just clocking in and out. He advised that as chemical engineering students, we have opportunities to “broaden our horizons” and explore opportunities outside of chemical engineering, contacting alumni on non-traditional paths because they genuinely want to help you.

Congratulations to Professor Melissa Gordon!

Trent Eastman, '19.

Congratulations to Professor Gordon on her wedding! Melissa Gordon and Robert Lovelett were married on Saturday, June 2nd at the David’s Country Inn in New Jersey this past summer.

Professor Gordon and her husband met during their freshman year at Lafayette College, where they both lived in Ruef Hall and majored in chemical engineering. They had most of their ChemE classes together, but they didn’t start dating until senior year. After Lafayette, they both pursued further degrees at the University of Delaware.

They celebrated their “black and white” themed reception with 130 of their closest friends and



family. Professor Gordon had three bridesmaids, all of whom were Lafayette alumni. The bridesmaids were in floor length black gowns, while the men were in tuxedos, and the tables had varying

sizes of white and pink flowers. The couple had a sparkler send off at the end of the night, and their party favors were donations to St. Jude’s and the Malaria Foundation.

ChBE Students Win Nationwide Recognition

Assistant Prof. Michael Senra.

The quality work occurring in the labs on the second floor of Acopian has not gone unnoticed by people across the country. Two of the most recent awards were **Rachel Young '18** earning a prestigious National Science Foundation Graduate Research Fellowship and **Zvikomborero Machikiti '19** being selected for the Future Leaders in Chemical Engineering Symposium held at North Carolina State University.

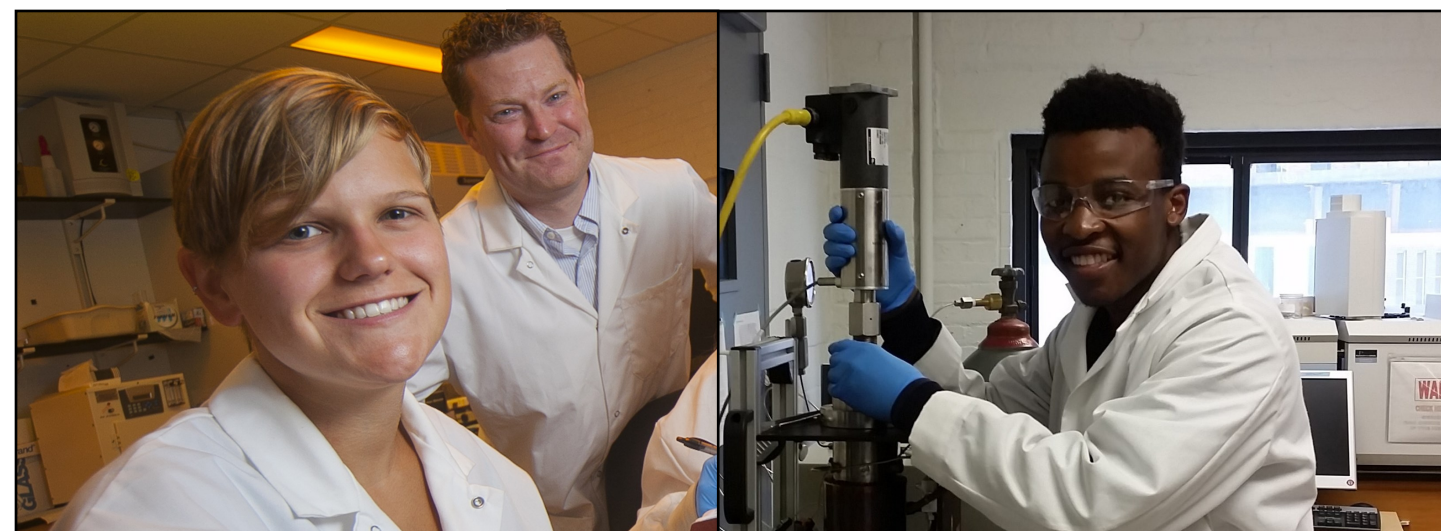
Young has begun her graduate studies in the Ph.D. program in Bioengineering at the University of Pennsylvania. When asked about what she thought was most helpful in earning her fellowship, Young replied that she “found having strong letters of recommendation from advisors I have worked with closely important for speaking to my work ethic and character. Also, having prior research experience was important for building a thorough and feasible research plan to use for the research proposal component of the application.” At Lafayette, she completed an honors thesis entitled Optimization of

Electrospun Thermo-responsive Substrates for Cell Culture under the tutelage of Professor Lauren Anderson. According to the Young, the fellowship has provided her greater flexibility in choosing a research advisor and project for her Ph.D. (She is studying under Dr. Dan Huh, who studies the use of microfluidic technology to develop research platforms to study human health and disease.) and also programs that enable fellows to gain additional experiences for career development.

In addition to Young’s selection as a fellow, four other ChBE alumni earned honorable mention. These students were: Katarina DiLillo '18 (now a Ph.D. student in Biomedical Engineering at Michigan), Rachel Elias '17 (now a Ph.D. student in Chemical Engineering at Michigan), Issac Lavine '14 (now a Ph.D. student in Statistics at Duke) and Patrick Leggieri '18 (now a Ph.D. student in Chemical Engineering at UC-Santa Barbara). This feat is all the more impressive as only seven current or former Lafayette students gained recognition

with Young being the only one to receive the fellowship.

Machikiti was one of 19 undergraduate students nationwide selected to attend NC State’s symposium, which gave students an opportunity to showcase their research and learn more about what graduate school is like. He is currently pursuing an honors thesis, Green Production of Biopolymers, under the guidance of Professor Lindsay Soh. When asked about what he found most interesting about the trip, Machikiti responded that “the most interesting thing about my trip was the diversity of the research being done across the country. Amongst all of us selected, everyone was doing something different, and the amount of enthusiasm about these chemical engineering research fields was really wonderful to be a part of. It was also really nice to meet some chemical engineering students who also share similar interests outside chemical engineering such as music.” He also enjoyed visiting various sites in Raleigh, eating different foods and the warm weather.



Left: Rachel Young '18 with Assistant Professor Christopher Anderson; Right: Zvikomborero Machikiti, '19.

Alumni Focus — Asad Akram, Class of 2013

Sidharth Vijay, '21

“Life is non-linear.” This is a core tenet of the path that **Asad Akram**, '13, has taken. Asad came to Lafayette from Pakistan, deadest on becoming a chemical engineer and venture into the world of energy, however, his life has taken him on a very nontraditional path that neither he, nor his professors could have expected. Given how much research he did at Lafayette, a PhD seemed the natural route, however, he decided to join a materials science start up called Bioformix, known today as Sirius. More than just gaining experience here, Asad joined an industry that immersed him in unfamiliar tasks and several disconnected projects, from welding and

circuitry to presentations for CEOs of multimillion-dollar companies. Over a year later, he moved to Houston and joined a business consulting firm in downstream chemical engineering. Here, he connected the business and engineering side, enjoying how it was no longer black and white. “Business operates in the grey, and I like the grey”. This pushed him to stay in Houston, currently pursuing an MBA at Rice University, with a job at KPMG afterwards.

Asad's path is interesting to say the least and hearing him articulate it, you cannot help but derive certain themes. His appeal to the business side is driven by the opportunity to experience diversity and interact with individuals with



differing skillsets and perspectives. The importance of interpersonal relationships drives how he operates, and he emphasizes the loss of money and time that can be avoided by proper communication. The business world teaches you how to “plug into the opportuni-

Continued in AKRAM

ChBE Senior Design Team Travels to Dominican Republic

Trent Eastman, '20.

Every spring the seniors take on the challenge to combine the chemical engineering expertise they have gained throughout their Lafayette education into their senior design project. These projects range in nature based on the desires of the group from partnerships with outside companies, tests run on in-house equipment or paper projects that are conceptually based.

This past spring, a senior design group of Gabi Lassinger, Colleen McGovern, Aditya Mehta, and David Okeibunor formed a partnership with B. Braun, a global medical devices company with a facility in Bethlehem, through one of the visiting faculty members, Alex Wol-

tion, while they were there they also had the opportunity to do some community service work and help in the process of rebuilding some of the workers homes that were destroyed by Hurricane Maria. They brought with them donations raised by the students and faculty of the Lafayette chemical engineering department.

The group experienced and learned much in overcoming the distance barrier as well as in part a language barrier in order to effectively communicate problems and results. Thank you to Mr. Wol-

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Professors Aseel Bala and Ryan van Horn Join Lafayette ChBE



Kotoe Abe, '21.

This year the Department of Chemical and Biomolecular Engineering welcomes two new professors to the faculty, **Assistant Professor Aseel Bala**, and **Associate Professor Ryan Van Horn**.

Professor Van Horn received his B.S. in Chemical Engineering from Lafayette College and his Ph.D in Polymer Science from the University of Akron. For Professor Van Horn's first semester at Lafayette, he taught Experimental Design I (CHE 312) and a first-year seminar called “A Plastic World” (FYS 150). Reflecting on the semester, Professor Van Horn has said that he is still settling in but so far it has been a wonderful experience. The research Professor Van Horn does is on structure-property relationships in polymers. His advice to students is to pursue your passions and do what is best for you.

Professor Bala received her B. Eng in Chemical and Process Engineering from Sultan Qaboos University in Oman and her Ph. D in

Chemical Engineering from Michigan State University. At Lafayette, Professor Bala has taught Thermodynamics (CHE 222) and Design Analysis (CHE 415). This was Professor Bala's first semester teaching and she has said that it was rewarding and a huge learning experience for her. Prior to coming to Lafayette, Professor Bala had been researching the thermodynamics of hydrogen bonding and will be continuing to explore this topic here at the college. One piece of advice Professor Bala has for the students here is to take advantage of as many opportunities you can in college.

Outside the classroom Professor Bala also likes to paint in her free time and Professor Van Horn likes to spend time with his daughter and play sports, they both enjoy listening to music.

Overall, both Professor Bala and Van Horn's favorite part of Lafayette is how the college values teaching and research and allows for a close relationship with the students.

Continued from RESEARCH

sustainability division for her position on her previous work with bio-feedstocks and green solvents. But like Professor Senra, her current project revolves around the cold flow properties of fuels. Professor Senra explains, “My research focuses on how fuels act at low temperatures, often referred to as cold flow properties...Specifically, what my work looks at is how does the composition of the fuel impact its cold flow properties, most notably 1.) at what temperature does solidification begin and 2.) at what tem-

perature does the system transition to a gel.” For crude fossil fuels oils, the cold temperatures of the transportation pipes cause the oil to solidify and form a gel around the inside surface of the pipe, slowing the flow of the oil. More dangerous for biofuels, this solidification can occur in engines at low temperatures, damaging the engine and other related parts. Ensuring the safety of using biofuels drives the current work of Lafayette students and professors aiming to find a good blend of biofuels that

will not damage engines and will prevent human injury.

When talking to the professors and students, it is clear that they are all invested in their work and enjoy what they are doing. Professor Senra put it best when asked about what drew him to the energy field, stating, “it is an area that is greatly relevant to the ability of the human race to not only thrive, but also survive, both now and into the future.”