Tennessee Technological University

Fall 2020, Volume 1, Issue 1

Department of Chemical Engineering News

A field trip to the fish hatchery brought mass transfer design to life for CHE students Nathan Johnson, M. Logan Smith, Annalies van der Bleek, Kellie Malone and Gabriel Johnson.

Changes and the Chair

Hello from Dr. Holly Stretz! We have a lot to share, dear friends, so hang onto your seat! The biggest news: Dr. Pedro Arce has been our fearless Department leader for 17 years, and he is now moving to work on a special project for Dean Joe Slater to create a new PhD in Engineering Education for the College. He remains teaching classes with us, so we will not loose him entirely, and are grateful for his leadership now and for all these years.

Dr. Stretz, with 15 years of faculty service in the Department is now stepping in, appointed by the Dean, to be the interim Department Chair. Stretz is simultaneously this Fall serving as the elected Faculty Senate President: a member of President Oldham's cabinet, the voice of the voice of the faculty (the Senate), and appointed to numerous working groups and teams that have been and are fashioning and implementing Return to Tech. While the learning curve in becoming a Department Chair may be sometimes steep, co-appointment as Faculty Senate President does bring an unusual view of the "big picture" for return to campus, a unique set of resources for helping our students and faculty engage in extraordinary learning while keeping everyone safe. We now have 10 faculty in the Department, all extremely talented engineers and teachers, working hard for student learning and student success. You will see their stories and those of the students they serve in these pages.

These are unusual times, as we struggle with reigniting the US economy, quarantining from the assault of the COVID pandemic, and transition. The big question on campus at the moment is how to return to face to face personalized instruction and learning that Tennessee Tech is known for? We will through these brief articles let you know how that transition will take place. Other stories in these pages include the new grants won recently by our professorial team, the new influx of money from the Dean's office to refurbish, resupply and reimagine the Prescott 101 Unit Operations Lab, a call for alumni to consider partnering with one of our Capstone Lab teams through your company, and the extra work of Department professors helping to plan a new Engineering Building (which will be situated in Sherlock Park in 4-5 years). Oh yes, we also want to keep you informed about new initiatives championing diversity and inclusion. Enjoy and don't forget, we welcome your support and gifts, thank you. You, our alumni, are the lifeblood of a great Department, helping us serve this state by creating new knowledge and training and educating the next generation of engineers.

Inside this issue

Special points of interest

- Renovation to Unit Operations Lab
- Competitive grants awarded on enhancing student– centered learning and diversity
- Development of a new and improved engineering building

Capstone Lab Works Thro COVID Quarantine

Capstone Laboratory students worked hard in the Spring of 2020 to finish sponsored projects despite the difficulties of a fully online end to the semester. Many came on campus in small groups to finish data sets while others worked hard on professional analysis and reporting of the data sets. Our proud team of external Sponsors included Eastman, A. W. Stiles, Federal Mogul, Red Silo, Oak Ridge National Laboratory and the Center for Management, Utilization and Protection of Water Resources (Water Center.) Many of our 18 Chemical Engineering Teams were also sponsored by TnTech research groups. and worked alongside of a graduate student. Any interest in your company supporting such a team for Spring 2021 can be directed to Dr. Holly Stretz. Examples of the projects include significant work on redesign of a tank aeration device for the Tennessee Fish Hatcheries, selenium sorption for water purification using recycled tire products, kinetics of natural organic matter in surface water which leads to membrane fouling, process-based sprouting of barley seeds, rheology of wound healing or the crosslinking of fibrinogen, and creation of a device to detect the precursor to heart attack (troponin). The last entrepreneurial project was entered in the TnTech Eagleworks competition and the team won prize recognition! The class objectives are to demonstrate professional experimental planning, design, implementation and analysis as well as project management. The Capstone Lab along with Capstone Design, (Dr. Joe Biernacki) are the culminating experience for our seniors.

" I like…to do meaningful projects that actually can benefit someone."
" My experiences can be worked into most situational interview questions."

Student Design experience

As a senior student in design, the thought that was on everyone's mind in the beginning of the fall semester was confusion and doubt that a design class could do well with the COVID changes. Almost immediately, those doubts were put to rest as the faculty made every effort to be available and teach the content without a rush. This year's design project was focused on the conversion of starch to glucose for eventual PLA production. The proposed project plan included different unit operations such as milling, screening, jet and column cookers, and reactors. Each team designed a process flow diagram with the specified material balances. Overall, the design course was a resounding success for the students.

Changes to the Unit Ops Lab

How many of you have given us over the years feedback that the Unit Operations Lab needed a serious upgrade and update? Teeming thousands I think. Your day has finally come! Dean Slater has awarded the Department nearly $300K in funds to refurbish and resupply the Unit Operations Lab. This news comes in a year in which we will be visited by an ABET accreditation team, and is a very welcome investment in student success. The modifications to the lab will include a new "mechanic's" floor and wall paint, new cabinetry and lighting. The walls will now be lined with black top lab stations to provide space for design projects for the teams. New small equipment planned includes a new UV-visible spectrometer (no more trips to Chemistry to use theirs) and various other small equipment for design teams such as flow controllers and pumps. The investment also includes a new remote control heat transfer laboratory station, which has a number of advantages. This station will be a pilot to determine feasibility for a cluster of new remote control stations, perhaps as many as 10, including plans for fermentation reactors and water treatment/separations equipment. The glass distillation tower will still be the center though. One of the advantages of these remote control stations is the ability to assign multidisciplinary teams to projects on them, since it removes the problem of student teams having to attend class at the same time across different Departments.

We all sadly watched Perry Melton, the long time CHE Department lab technician and our trusted colleague, retire to a better life fishing the Upper Cumberland waters last year. A new lab coordinator has just been hired, and decentralized lab support is now envisioned across the College of Engineering. More on that in the next newsletter as the new COE lab coordinator hits the ground running.

Dr. Ying Zhang in Mechanical Engineering has won funding for a new gas atomizer, which will be housed in Prescott 101. This large pilot-scale piece of research equipment can produce a fine metal powder using molten metal and argon gas. Motivated by the difficult search for a place to put this new large equipment, the new Engineering Building plan now incorporates a similar high bay laboratory inspired by the flexibility and utility of Prescott 101.

Stretz and Hinshaw disinfecting 3-D printed headsets prior to shipping.

Changing to Keep us Safe During COVID

New procedures governing life on campus are evident all across the Tennessee Tech main web page and in our lives. If you were to visit campus today, perhaps the biggest change you might see is that classrooms have fewer seats or seats marked off to provide social distancing. Masks are now and will for the semester be required of everyone. The office staff in our Department have moved offices around and placed an "X" on the floors where visitors should stand while doing business. Signage is going up in Prescott Hall for which direction to enter, exit and move. Hand sanitizer stations are everywhere. Less evident are the changes in modality of instruction. Most of our classes, for lack of classroom space to expand into, will be in "hybrid" mode. This means students will be physically sitting in class one day out of 3 or 1 day out of 2 in many cases. All classes will have online content offered simultaneously, such as livestreamed lectures, and students will be allowed to use empty classrooms as study halls to attend a livestream session. Professors may be wearing a face covering during live lecture that looks something like a bee-keeper's hat. A new portal to the web was introduced at the end of Spring 2020, "Tech Express", and that portal has a red banner on it where all employees are now required to sign in and enter medical details including temperature when they start their work day. There will be no meetings that are face to face generally (including student activities), and no travel to conferences this semester (including student travel). Every meeting will be via Zoom or Teams. However, athletics have projected safe ways to engage in certain University events and music has had some unusual accommodations for livestreamed events and practice such as putting a "mask" over a horn! Planning all of this took an enormous amount of work this summer, with many faculty working hard and overtime on teams set up by the Provost to imagine solutions to the complex and "wicked problem "of returning to campus safely. There was a commencement August 8 in place of the Spring event that would have normally taken place, yes the graduates wore masks, and while it had a very different energy and feel compared to previous graduations it went very well. Great move in Day was now Great move in Week. And we have welcomed the 10,000 plus students on campus August 24! Tech and the Chemical Engineering Department are committed to student learning, and we are here for the students!

TTU 3-D Prints Headsets to Keep Health Workers Safe During COVID

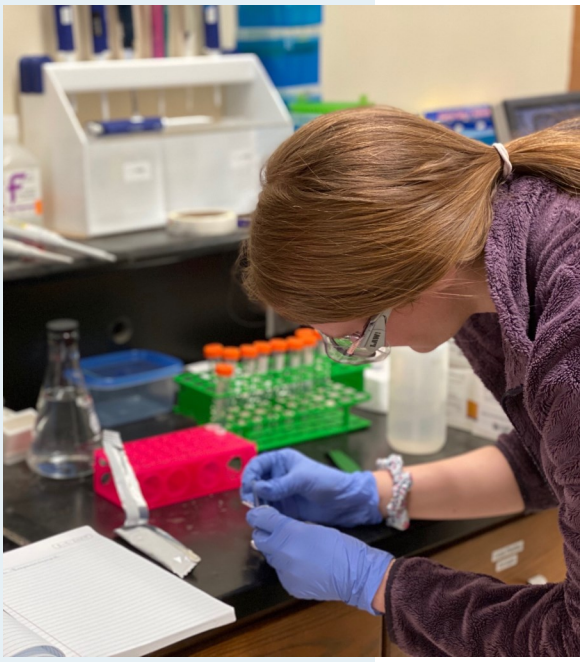
The College of Engineering under Dr. Ismail Fidan organized a 3-D printing networks which included the iMakerSpace (Hunter Hinshaw and Dr. Stretz pictured here with some of the product). Stretz provided disinfectant for the project when supplies in

TTU CHE Students Take Awards at LSAMP Research Competition

CHE students Viviana Cruz and Mohera Narimetla took awards at the Fall 2019 LSAMP research oral presentation competition for minority undergraduate student researchers hosted at the University of TN—Knoxville. Dean Joe Slater is proudly moving the college to greater diversity with new initiatives, now headed by Student Success Center leader Harry

Team Troponin Wins at Eagleworks

Team members originating in Dr. Robby Sanders and Dr. Melissa Geist's interdisciplinary Clinical Immersions class created an analytical device to help with early detection of the heart attack marker in the blood, troponin. The team members included CHE students Shelley Edwards, (pictured below) Cody Bowerman and MacKenzie Pugh. These types of team are the product of ongoing work in the Renaissance Foundry.



Diversity and Inquiry Learning Front and Center in Faculty Grant Work

During the Summer 2020 semester, the Renaissance Foundry Research Group (RFRG), comprised of Drs. Pedro E. Arce, Stephanie Jorgensen, and J. Robby Sanders (faculty in the Department of Chemical Engineering) and Dr. Andrea Arce-Trigatti (faculty in the College of Education) in collaboration with Michael Aikens (Director of Innovation and Entrepreneurship) have been awarded two competitive student-centered grants focused on enhancing diversity and inquiry learning within the undergraduate student experience. These include a faculty grant by Venture Well – an organization focused on promoting innovation and entrepreneurship to solve larger, societal problems - and a Tennessee Board of Regents (TBR) Student Engagement, Retention, and Success (SERS) grant.

The Venture Well grant is a wonderful opportunity for the RFRG to continue with the implementation and assessment, across the Chemical Engineering Curriculum, of the Renaissance Foundry Model (RFM) focused on the development of the "holistic-style" engineering professional (see https://sites.tntech.edu/foundrymodel/ for more details). Students will have the chance to adopt and adapt elements of Biomimicry in three fundamental courses (heat transfer, fluid mechanics, and transport phenomena in biosystems) to develop prototypes of innovative technology that are friendlier to the environment and with technology more benign and sustainable which mimics nature. Through the program efforts, the RFM will have student teams engage in iterative efforts to identify and solve societal problems which will progress throughout their enrollment in these courses. For more information about the faculty grants and other related projects, please see https://venturewell.org/spring-2020-faculty-grantees/.

The TBR SERS grant funds the Holistic Foundry Undergraduate Engaged Learners (FUEL) program which uses the RFM coupled with the Rural Reimagined Grand Challenge initiative at TN Tech to provide students with an opportunity to transform learning towards the development of skills associated with holistic engineers. The program's purpose is to provide inclusive and comprehensive training to diverse populations in engineering that will help them develop learning strategies aligned with those of holistic engineers useful for their academic career through the development of a student-team research project. Program objectives align with Rural Reimagined, with the expectation that the research projects will have ties to participants' hometowns via outreach activities in partnership with Mr. Carlos Galindo and the Science Olympiad Collegiate Scholars program. For more information, please see longer story at https://www.tntech.edu/grand-challenge/news/articles/20200804-fuelgrant.php.

AICHE News

The Tennessee Tech AIChE Chapter has made great accomplishments this year despite navigating challenges with the COVID semester. Most recently was the gained traction and success of our Car Team throughout this competition season. Our team placed first in the Southern Regional Conference thus propelling them to the national stage to finish their season 10th in the world. Additionally, we extended an invitation to several guest speakers for our students this semester including Tate & Lyle, Nashville Chemical, and Nuclear Fuel Services (NFS). Several of the professionals who presented to our students pursued their degree here at Tennessee Tech and were formerly involved in our chapter. We value the experiences within the industry that you, as alumni, have the potential to share with our students. As former students, you have the ability to speak to the opportunities and background of Tennessee Tech integrated with established knowledge and context from your professional experience. Traversing future semesters, our wish is to build sustainable contact with our alumni such that there is open communication with our chapter's progression. If you wish to become further involved with us and open that

AICHE, continued.

door of communication, we can be reached directly at our chapter's email (tntechaiche@gmail.com). We look forward to hearing from you and building a connection with our organization!

"The field of chemical engineering is ripe with innovation and imagination. Chemical engineers around the globe strive to better our society "

Engineering Building Planning and the Chemical Engineering Student

While we are witnessing completion of a new Science Building next door to Prescott in which the Chemistry Department will be housed and a new Fitness Center named after Mark Burnett near the STEM Center (yes, there is finally a climbing wall), Tennessee Tech's planned new 100,000-square-foot engineering building is an investment in Tech as the state's only technological university. This new, modern facility will allow Tech to continue to provide a top engineering education and serve the students of the College of Engineering, which annually awards nearly a quarter of the total engineering and computer science degrees from Tennessee's nine public universities. Chemical Engineering's own Dr. Cindy Rice is one of three design leaders in the planning process. All faculty have been working hard on the design in Zoom meetings with the engineers and architects for the building, which will include a new high bay and new facilities for interdisciplinary lab studies.

Estimated Dates & Budget
Start: ; Finish:
Budget: $55 million

More information at: https://www.tntech.edu/news/construction/

Chemical Engineering

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Box 1915
Cookeville, TN 38505

Thank you for your continued support!

Faculty Focus

The Biomolecular Medicine Laboratory , or the BML, is led by Dr. Robby Sanders in the chemical engineering department. The BML focuses on experimental and mathematical approaches in areas of research such as the understanding of the wound healing process, Biotransport phenomena, drug delivery, and protein engineering. Dr. Sanders also teaches courses on Mass Transfer and Biotransport. In these areas of research and courses, Dr. Sanders focuses on innovation-driven learning with a focus on student learning in clinical immersion experiences and problem solving methods. These methods succeed with a collaborative approach from other faculty and require the active involvement of undergraduate and graduate students in courses and in research projects.

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