The Richard and Loan Hill Department of Bioengineering hosted 21 professional bioengineers from across a diverse range of industries on October 25, as part of the department’s Bioengineering Industry Day 2019.

The learning and networking event gave 120 bioengineering students a chance to connect with alumni and other professional partners.

The engineers are employed at a variety of companies and organizations, including Abbott Laboratories, Medline Industries, the U.S. Food and Drug Administration, Hollister Incorporated, Medical College of Wisconsin, Pfizer, Stryker, and many others.

The professionals in attendance ranged from CEOs, R&D engineers, medical device specialists, operations project managers, biomedical solutions specialists, and more. Among these experts were 19 UIC alumni.

Students were able to speak with a rotation of industry partners during an hour and a half of roundtable chats. The event concluded with an hour of open networking time and refreshments.
Faculty News

NEW FACULTY: Beatriz Peñalver Bernabé

The Richard and Loan Hill Department of Bioengineering has expanded its already extensive research portfolio through the hiring of systems reproductive biology expert Beatriz Peñalver Bernabé. Peñalver Bernabé, who will serve as an assistant professor in the department, received her bachelor’s degree in chemical engineering from the University of Massachusetts at Amherst, and her PhD in chemical and biological engineering at Northwestern University. Peñalver Bernabé also spent several years serving as a lead polymer process development engineer with General Electric in both Spain and in the United States. She holds five patents for the production and purification of polyetherimides.

Peñalver Bernabé said she is focused on understanding multicellular dynamic biologic complex systems in reproductive biology. She is applying her engineering and data science expertise to track and understand the complex relationships among mental health, endocrine, neurological and immunological systems, and gut microbiome during and after pregnancy. “I feel very privileged to be part of the bioengineering department at UIC, which will be an extraordinary environment for our interdisciplinary research in systems reproductive biology,” Peñalver Bernabé said. “I believe that through collaborations with UIC’s top researchers, including microfluidics, tissue engineering, women’s mental health, nursing, and obstetrics, and in conjunction with outstanding core facilities, we can revolutionize women’s reproductive health.”

Peñalver Bernabé has available positions for undergraduate, MS, PhD, and postdoctoral students in her lab. Students with backgrounds in bioengineering, computer science, mathematics, physics, nursing, neuroscience, biology, and psychology are encouraged to contact her at penalver@uic.edu for more information. “Students with interests in clinical research, specifically reproductive biological engineering, data science and/or systems biology are encouraged to apply,” Peñalver Bernabé said.

UIC bioengineering professor helps develop 3D-printed ‘hyperelastic bone’ that may help generate new bone for skull reconstruction

UIC Richard and Loan Hill Bioengineering Associate Professor Ramille Shah and her colleagues recently published a paper that found 3D-printed hyperelastic bone may offer a new way to help reconstruct skull defects in patients. Shah and her colleagues from UIC and Northwestern University published a paper titled “Three-Dimensionally Printed Hyperelastic Bone Scaffolds Accelerate Bone Regeneration in Critical-Size Calvarial Bone Defects” in the May edition of the Plastic and Reconstructive Surgery journal.

The researchers noted hyperelastic bone is created using the main mineral in bone known as hydroxyapatite and polyglycolic acid. In this study, the team used the material to create synthetic scaffolds with complex latticework, mimicking the structure of natural bone. Shah and her associates then implanted the scaffolds in 8-millimeter calvarial or skullcap defects in rats, finding the scaffold was 74 percent effective after eight weeks and 65 percent after 12 weeks. The researchers concluded that the 3D-printed alternative bone could also be effective as a treatment for human cranial defects.

In addition to Shah, the paper was co-authored by Yu-Hui Huang of the University of Minnesota Medical Center, Adam Jakus of Dimension Inc., Sumanas Jordan of Northwestern University, Zati Dumanian of UIC, Kelly Parker of Northwestern University, Lingping Zhao of UIC, and Pravin Patel of UIC.

You can read more about the research at the American Society of Plastic Surgeons and 3D Printing Industry.

Bioengineering and ophthalmology professors receive more than $1 million to develop affordable ultra-widefield fundus camera

Richard and Loan Hill Professor Xincheng Yao and Ophthalmology Professor Robison P. Chan recently received $1.87 million from the National Eye Institute of the National Institutes of Health to develop and fine-tune a portable and more cost-effective device that can be used to screen and classify diabetic retinopathy (DR).

A study by the Centers for Disease Control and Prevention found that almost one-third of diabetes patients 40 years old and above have DR. This works out to 4.2 million adults with DR and 655,000 who had vision-threatening DR in the U.S. between 2005 and 2008.

Knowing that prompt screening and early diagnosis is critical in preventing visual impairment and blindness, Yao and his lab set out to create a portable pan-retinal imaging device that utilizes contact-free trans-pan-planar illumination for an ultra-widefield fundus camera to capture the whole retina in a single-shot image.

“We have already demonstrated the feasibility in the lab; now we similarly need to take time to augment the design, to make the system user-friendly, and to make sure the image quality is repeatable in clinical environments,” Yao said.

The new imaging equipment also could make the whole process for patients much easier as it removes the need for the patient’s pupils to be dilated. Yao said the scanner uses the whole available pupil for imaging purposes, which removes the need to pharmacologically dilate the size of the pupil. “It will be quicker, safer, more comfortable without pharmacological dilation, and it can even be cheaper,” Yao said.

He noted that eye imaging machines on the market are either limited in how much of the retina they can actually cover within one image because they need to use part of the pupil to light up the retina or are expensive and not portable. His research found that by freeing the whole pupil for imaging purposes, the trans-pan-planar illumination provides a unique opportunity to provide ultra-widefield coverage.

By lowering the cost and removing the need for pupil dilation, Yao is optimistic that this device will allow other general healthcare providers to screen for DR, which will make a substantial impact on diabetics who need to be monitored, particularly those who live in rural and underserved areas where both expensive instruments and skilled operators are not available.

The grant, which started on September 1, will run for four years. Chan is the clinical PI of this project, Felix Chau, associate professor of ophthalmology, and Devrim Toskak, visiting scholar of bioengineering, are also key investigators on this project.
High-Tech Gel Aids Delivery Of Drugs

Drugs that help prevent the formation of unwanted or harmful proteins are currently being developed to treat a number of diseases, including cancer. The drugs are based on small interfering RNA, or siRNA, which are pieces of nucleic acids that work by interfering with the production of proteins. But getting these drugs to the right target, such as to a tumor, remains challenging because siRNAs can degrade rapidly in the body — making systemic delivery inefficient.

Eben Alsberg, the Richard and Loan Hill Professor of Bioengineering and Orthopaedics at the University of Illinois at Chicago, and colleagues report on a hydrogel-based carrier that can deliver siRNAs directly to where they are needed. They report their findings in Science Advances.

Biologically compatible hydrogels have been used to deliver biologics or drugs directly to specific areas in the body. A drug-infused hydrogel plug or sheet can be placed directly where the drug is needed — say in a joint or at a break in bone, or even injected.

Alsberg, together with Matthew Levy, associate professor of biochemistry at Albert Einstein College of Medicine, and their colleagues developed a unique hydrogel strategy that allows for more control over the release of siRNAs over time.

“We maybe be able to use this technology in the future to, for example, prevent the production of certain proteins that are known to promote certain diseases, or to help transform stem cells into cells needed to repair damaged tissue such as bone or cartilage,” Alsberg said.

UIC bioengineering researchers develop digital human brain that offers radical new model to study brain disease

Richard and Loan Hill Department of Bioengineering Professor Andreas Linninger and his former PhD student Ian Gould received the Microcirculatory Society’s 2019 Wiederhold Award for the most highly cited original manuscript.

Linninger and Gould published the article “Hematocrit Distribution and Tissue Oxygenation in Large Microcirculatory Networks” in the journal Microcirculation. The work has been cited in 46 different manuscripts since it was published in July 2014.

“I think the paper introduces this somewhat radical new perspective, which is that the anatomy of the brain is mathematically describable and departs with old-school engineering models that had single cylindrical vessels and other simplifications that were not really true to the complexity of the anatomical space in the brain,” Linninger said. “The wide citations demonstrate the interest of the community to learn about these new processes and embrace them, even though initially people were skeptical.”

Linninger’s Laboratory for Product and Process Design has been focused on creating virtual brains through computer models and mathematics to map and understand the metabolic processes and blood flow within the brain. This model can then be used to study brain diseases, the effects of aging, and dementia with an anatomically detailed model down to individual cells.

UIC attends 2019 BMES meeting in Philadelphia

A contingent of Richard and Loan Hill Department of Bioengineering students and faculty attended the 2019 Biomedical Engineering Society’s annual meeting in Philadelphia.

Professor and Department Head Thomas Rosston, Professor David Eddington, Clinical Assistant Professor Anthony Felder, Associate Professor Salman Khetani, Clinical Assistant Professor Zhan Wang, and Assistant Professor of Bioengineering and Pharmacology Jae-Won Shin all attended the conference from UIC. The faculty were joined by UIC BMES President Agata Bogdanowicz and PhD students Maheshwar Iyer, Regeant Panday, Chase Monckton, Yang Yuan, and Stephen Lenzini.

The attendees were able to listen to keynote addresses, attend presentations, and network with other engineers focused on using engineering and technology to advance human health and well-being. BMES’s mission is to help create and support the biomedical engineering community.

Bogdanowicz said she was interested in attending the conference to represent UIC’s student BMES chapter and to meet other student leaders in her field.

“Getting exposure to all of the incredible research happening in the field of bioengineering/biomedical engineering was very neat, in addition to listening to presentations and talks that covered a variety of topics,” she said.

“Getting exposure to all of the incredible research happening in the field of bioengineering/biomedical engineering was also very neat in addition to listening to some of the presentations and talks that covered a variety of topics.”

– Agata Bogdanowicz, UIC BMES President
Hill Professorships Now Total Seven

The Richard and Loan Hill Department of Bioengineering celebrated the investiture of Eben Alsberg, PhD, as the new Richard and Loan Hill Professor. Alsberg is now one of the seven professors endowed by Richard (BS ’74) and Loan Hill.

The Alsberg Stem Cell and Engineered Novel Therapeutics Lab is focused on engineering strategies to replace or regenerate damaged or diseased tissues in the body. Alsberg’s lab uses the complex signals that are implicated in tissue morphogenesis, repair, and homeostasis as a template for the development of innovative systems to drive functional tissue regeneration. Through the precise temporal and spatial presentation of biomaterial physical and biochemical properties, mechanical forces, and soluble bioactive factors, the lab aspires to create biomaterials and microenvironments that regulate gene expression and new tissue formation. Some areas of active investigation include engineering new biomaterials and drug-delivery vehicles for functional tissue regeneration and cancer therapy, controlling stem cell fate decisions, developing technologies to control the temporal and spatial presentation of signals to regulate cell behavior, understanding the influence of mechanics on cell behavior and tissue formation, therapeutic angiogenesis, organoids and organogenesis, and studying cell-cell interactions.

The Hills believe endowed professorships such as Alsberg’s reinforce UIC’s role as a major player in Chicago’s biotechnology sector. The Hills donated almost $9 million to the university, which includes a $6.5 million pledge to the Richard and Loan Hill Department of Bioengineering. The department’s name was changed in 2013.

Rick Hill graduated from UIC with a bachelor’s degree in bioengineering. He has held engineering and management positions at General Electric, Hughes Aircraft, Motorola, and Tektronix. In 1993, he became CEO of Novellus Systems, a small semiconductor capital equipment company in Silicon Valley, which he led to become one of the top 10 semiconductor equipment manufacturers in the world.

Alsberg received bachelor of science degrees in both biomedical engineering and mechanical engineering and materials science from Duke University in 1994. He received his master of science degree also in biomedical engineering and mechanical engineering from the University of Michigan in 1998. He then received his PhD degree in biomedical engineering from the University of Michigan in 2002 and completed a postdoctoral fellowship at Harvard Medical School in 2005.

After spending more than 13 years on the faculty of Case Western Reserve University’s Department of Biomedical Engineering, Alsberg joined UIC in 2019 in this endowed position in the Richard and Loan Hill Department of Bioengineering.

Alsberg has been a pioneer in the tissue engineering and biomaterials research community, with more than 125 peer-reviewed articles published since 1999 in journals such as Advanced Materials, Advanced Functional Materials, JACS, Nanoletters, PNAS, Science Translation-Medicine, Science Advances, Advanced Science, and Materials Horizons, and 25 patents pending or granted. He has also received many academic honors and awards, including being elected into the American Institute for Medical and Biological Engineering College of Fellows, the UIC President’s Distinguished Hire award, the Ellison Medical Foundation New Scholar in Aging Award, and the Crain’s Cleveland Business 2009 Forty Under 40 Award.

He has received extensive funding support from federal government and private foundations, such as the National Institutes of Health, the U.S. Department of Defense, the Ellison Medical Foundation, the Musculoskeletal Transplant Foundation, the Coulter Foundation, the AO Foundation, and the National Brain Tumor Foundation.
“High-throughput exploration of chemomechanical crosstalk in the maturation of iPSC-derived human hepatocytes”

Salman Khetani (PI)
MPI: Gregory Underhill (UIUC)
Funding Source: National Institute of Environmental Health Sciences (NEIHS)
Award Period: 09/23/19 - 07/31/2021
Amount: $409,024 (split evenly between UIUC and UIUC)
Description: The ability of induced pluripotent stem cell-derived human hepatocyte-like cells (iPSC-HHs) for drug screening and disease modeling applications is severely restricted by the inability to adequately differentiate these cells into adult hepatocytes with appropriate functional maturity. In this project, we will investigate the effects of two major signaling pathways that are important for liver development and function, namely Notch and Wnt signaling. These pathways are critical for liver lineage specification and the differentiation of hepatic progenitor cells into mature hepatocytes. The proposed studies will address these critical questions and provide valuable insights for the development of functional human liver cultures.

“Collaborative Research: Protein nanofiber growth factor delivery platforms for modulating phenotype of iPSC-derived human hepatocytes and liver non-parenchymal cells”

Salman Khetani (PI) in collaboration with Matthew Kipper of Colorado State University
Funding Source: NSF Org: CBET/Engineering of Biomedical Systems
Award Period: 10/1/19 to 09/30/22
Amount: $800,000 total (UIUC share: $300,000)
Description: Drug and chemical toxicity to the liver is a major cause of acute liver failures. The Food and Drug Administration mandates the testing of drugs and chemicals that are intended for human use in animal models prior to human clinical trials; however, animal experiments are slow, costly, and cannot always predict drug-induced liver toxicities in humans. Unfortunately, there is a severe shortage of donor organs for transplanting human liver tissues for transplantation. Alternatively, human induced pluripotent stem cell (iPSC)-derived human liver cells could provide a nearly infinite and patient-specific source of cells, but current methods are not able to mature these cells to the same functional levels as in the native liver. This project seeks to address this critical challenge by developing nanofiber scaffolds that can be used to mature iPSC-derived liver cells. The proposed studies will address these critical questions and provide valuable insights for the development of functional human liver cultures.

“Nonmydriatic ultra-widefield fundus photography employing trans-pars-planar illumination”

Xinzhong Yao (PI)
Collaborators: EV Paul Chan (PI), Felix Chau (Co-I), and Devlin Tosak (Co-I)
Funding Source: National Eye Institute of the National Institutes of Health
Award Period: 08/1/2018 - 08/31/2023
Amount: $872,983
Description: This project is to develop a portable pan-retinal imaging device employing trans-pars-planar illumination. Without the requirement of pupil dilation, the proposed non-mydriatic ultra-widefield fundus camera (u-WFC) can provide fundus view up to 230° in a single snapshot image, which will benefit easy screening, diagnosis and treatment evaluation of DR and other choroidal conditions.

“Passive, Mobile Assessment Of Scler, Circadian Timing, And Keyboard Dynamics To Prospectively Predict Depression Severity, Cognition, Emotion Processing, And Emotion Regulation”

Alex Levine (M-PI) with Heidi Klumpf (M-PI)
Funding Source: NIH National Institute of Mental Health
Award Period: 08/11/19 – 6/30/21
Amount: $400,000
Description: Passive sensing technologies uniquely capture transitory, dynamic behaviors in real-life settings and as such are well-suited to advance our understanding of disturbances in sleep and circadian organization, which are common in depression. This longitudinal project combines wrist-schlgrity that utilizes real-activity patterns with BAAFeD an innovative mobile smartphone technology that utilizes typing kinematics metadata. These technologies will be used to prospectively predict depression symptomatology.

“Highly-Sensitive Imaging Markers For Early Detection Of Alzheimer’s Disease Using Multi-View Connectomics”

Alex Levine (PI)
Funding Source: NIH National Institute on Aging
Award Period: 08/11/19 – 6/30/21
Amount: $400,000
Description: Alzheimer’s disease (AD) is the most common form of dementia, with the number of affected Americans expected to reach 13.4 million by the year 2050. In this proposal we will develop a novel multi-view connectome framework that will analyze instances “sees” of stable high-level connectivity properties across modalities and across spatiotemporal scales. We will apply this framework to two large Alzheimer’s imaging cohorts, leading the discovery of novel sensitive imaging markers for the early detection of AD.

“Imaging Intra-voxel Tissue Heterogeneity”

Richard Magin (Co-I) and Jie Zhou (PI)
Funding Source: NIH National Institute of Biomedical Imaging and Bioengineering
Award Period: 08/1/19 – 8/31/23
Amount: $2,000,000
Description: Tissue heterogeneity at the microscopic level contains valuable information about the underlying biological processes that are of great importance for monitoring disease progression and regression, understanding disease mechanisms, and ultimately developing effective therapies. The proposed project focuses on developing and validating a novel imaging tool for probing microscopic intra-voxel tissue heterogeneity on human subjects non-invasively and non-destructively. Successful completion of the project will address a significant unmet need in biological sciences and clinical medicine, and provide new insights into diagnosis and treatment of a host of diseases, especially cancer, that involve alterations in tissue microstructural heterogeneity.

“MDM12 and Progesterone Receptor Interaction in Uterine Leiomyoma”

Therefore, there is an urgent need for in vitro (outside the body) models of the human liver that can be used to screen for drug toxicity prior to testing in live humans.

Drugs

Yang Dai (PI)
Funding Source: Northwestern University/NH
Award Period: 08/1/2019 – 04/31/2024
Amount: $443,459
Description: Uterine leiomyoma (U.Lm) is the most common tumor in women. No long-term medical treatment is available. Each LM seems to originate from the clonal expansion of a single mutated LM stem cell (LSC) in the myometrium (MYO, LSC comprises 5% of tumor mass and differentiates into an intermediate cell population (UC, 7%), which then become terminally differentiated cells (LDC) comprising 98% of the tumor bulk. Driver mutations of mediator complex subunit 12 (mut-MED12) occur in 70% of all LMs. Progesterone (P4) and its receptor PR are essential for LM growth. PR-rich LIC (LIC; LSC) express paracrine factors to activate their proliferation. Lipopolysaccharide (LPS) in a PR-selective P4 antagonist, shrinks LM and reduces its symptoms, but its use was halted because of risk of liver injury. Our overall goal is to define the role of genomewide P4 action in the etiology of mut-MED12 associated LM tumorigenesis and identify novel therapeutic targets. We will use CHP-seq, RNA-seq, STARR-seq, and CRISPR/Cas9 gene editing strategies, and involve FOX and mut M12 knock-in mouse models followed by bioinformatic and omics data analysis to achieve the goal. Deciphering the genomewide mechanisms at a defined cell population level will help us identify genotype-specific novel targets associated with mut-MED12 for pharmacoregulation and precision medicine in the treatment of LM.

“Grants”

Featured Publication

Papautsky Lab featured in Lab Chip, microfluidics journal

Title: Size-dependent enrichment of leukocytes from undiluted whole blood using sheath-induced diffusion

Authors: Jan Zhou and Ian Papautsky

Description: Size-dependent lateral migration of cells in flow of untreated whole blood is demonstrated and successfully applied to enrichment of leukocytes from whole blood. High-speed imaging revealed migration of cells directly from undiluted whole blood. Label-free separation and enrichment of cells directly from whole blood can be used in diagnosis and monitoring of a wide range of diseases, including cancer. Papautsky Lab was invited to be featured on the back cover of Lab Chip on 21 October, 2019, Issue 20
IEEE EMBC Conference in Berlin

Members of the Richard and Loan Hill Department of Bioengineering at UIC were able to network, learn, and present their work at the 2019 IEEE Engineering in Medicine and Biology Conference in Berlin, Germany. The conference, one of the largest gatherings of bioengineers in the world, is an invaluable resource for cutting-edge information and ideas across the bioengineering field. The 41st annual conference covered a wide range of topics, including micro- and nano-scale devices, engineering, biomedical sensors and wearable systems, bio-robotics, signal processing, health informatics, and cardiovascular and respiratory systems engineering. The UIC team attended scientific sessions, listened to keynote speakers, discovered new biomedical companies, startups, and biomedical institutions; and networked with others researching biomedical engineering. The list of UIC activities at the conference included:

- Dieter Klett chaired the minisymposium titled “Magnetic Resonance Elastography: Quantification of Viscelastic Parameters from Speckle Tracking in Vivo Organs.”
- Jie Liang co-chaired an oral session titled “Modeling of Networks and Diseases.”
- Biswajit Maharjan presented “Central Sulcus is a Barrier to Cerebral Propagation in Epileptic Networks.” James Patton and Jeffrey Lebo both contributed to the research.
- Rolf Otto Reiter presented “Review of MR Elastography Methodology and Future Directions for Data Acquisition and Processing.” Dieter Klett also contributed to the research.
- Martina Guidetti presented “Transformation of Elastography: Reconstruction by Correlation to Convert Anisotropy and Inhomogeneity into Isotropy and Homogeneity.” Harith Pahlitkar, Dieter Klett and Thomas Royston all contributed to this research.
- Rolf Otto Reiter presented “Prototype Cancer Assessment using Ex Vivo MR Elastography at 9.4 Tesla.” Shreyan Majumdar, Steven Keeney, Andre Kaupcy-Beals, Virgilia Macias, Winnie Mar, Brandon Caldwell, Michael Abem, and Dieter Klett contributed research.
- Jie Liang presented “Sensitivities of Regulation Intensities in Feedback Loops with Multistability.” Anna Terebus also contributed to the research.
- Chiara Di Vrese presented “GLOS: GLow for Speech Recognition.” Giulia Crocioni and Hananen Esmailisig both contributed.
- Zachary Wright contributed to the presentation “Post-Stroke Motor Deficit are most Evident at Frequencies Near 125 Hz in EMG Multivariate Probability Distributions.”

Student News

Biomedical Implants Student Assembly

The Biomedical Implants Student Assembly was held once again this year in December as part of Associate Professor Mathew Mathew’s Biomechanics/ Mechanical Engineering 562: Biomedical Implants in Orthopedics and Dentistry.

BISA 2019 started with a lecture from Louis Mercier, a temporomandibular joint surgeon at Rush University Medical Center, and then featured three-minute presentations from the students in the class on their selected topics. The topics at this year’s symposium included recent developments and history in spine implants and different biomaterials utilized in dental implants to promote implant stability and success. Guest judges selected winners among the students for their manuscripts and presentations, including Kritika Garg and Siddhant Thakur, who tied for first place, and Yani Sun, who came in second.

IEEE EMBC Conference in Berlin

Students at who attended RSNA 2019 learned about the clinical uses of imaging technology, saw new commercial imaging systems, attended lectures, viewed demonstrations with imaging machines with actors playing the roles of patients, and talked directly with some of the biggest companies in the industry, including Siemens, Philips, Bayer, GE Healthcare, and Canon USA.

Every year at the end of the fall semester, Magin brings his biomedical imaging class to the Radiological Society of North America’s annual meeting, which has been held in Chicago for 105 years. The society allows faculty and students to attend the meeting free of charge.

Students who attended RSNA 2019 learned about the clinical uses of imaging technology, saw new commercial imaging systems, attended lectures, viewed demonstrations with imaging machines with actors playing the roles of patients, and talked directly with some of the biggest companies in the industry, including Siemens, Philips, Bayer, GE Healthcare, and Canon USA.

“Not a space the students drop resumes, but the conference expands their minds with what a large industry this is and how there is a role for almost everyone from radiologists to the medical techs who run the systems,” Magin said.

Participants received extra credit in the biomedical imaging class, but Magin said he also believes the experience is a real boost to their future careers. They are able to meet and talk with representatives from hundreds of companies, some of whom are Magin’s former students. The students who are interested in pursuing medical careers can also see how the imaging and diagnostic equipment fit into the healthcare system, he added.

“They are just in awe while attending,” Magin said. “I could talk about tech and jobs all day in class, but when they see the breadth and depth on display at RSNA, they realize that whatever they are interested in they can find in this field.”

Student Awards

Bioengineering PhD student wins MicroTAS grant, presents research on novel gas control device

Adam Szmelzer, a fourth-year MD-PhD student in the department, presented his research on a novel device that he hopes will make it easier for researchers to understand how gas affects cells at The Chemical and Biological Microsystems Society MicroTAS 2019 Conference in Basel, Switzerland, which took place in October.

Szmelzer’s creation is a 3-D printed device that functions as a gas control adapter for a standard platform for growing cells called a 96-well plate. He developed the device in Professor David Eddington’s lab, where he has studied for the past three years.

“Controlling gas concentrations reliably is difficult for researchers and is most often ignored, even by those who specialize in biological gas research. They can only deliver one concentration at a time making these types of studies very slow and inefficient,” Szmelzer said. “I am hoping that this method will make it easy for researchers since it fits into a tool they already use and allows for many experiments with many different gas concentrations to take place at once.”

CCTS Fellowship

Richard and Loan HIll Department of Bioengineering PhD student Prithviraj Mukherjee has been awarded a Pre-doctoral Education for Clinical and Translational Scientists Fellowship from UIC’s Center for Clinical and Translationa l Science (CCTS). Mukherjee is working under Richard and Loan HIll Professor Ian Papautsky in the Papautsky Laboratory Microfluidics BiobioSys- tems. The lab’s mission is to understand and create microfluidic systems and point-of-care sensors for enhancing public health and safety, along with developing microfabrication and nanofabrication techniques.

The CCTS is a unique hub on campus that allows research teams to tackle scientific and operational challenges in clinical and translational research. The center is focused specifically on work that can be best addressed collaboratively.

Mukherjee is developing a prototype microfluidic device that is able to separate leukocyte subtypes into granulocytes and agranulocytes using only the fluidic forces generated in a microchannel.

“It does not require any external power source like some active sys- tems, requires only small sample volume and does not result in cell loss,” Mukherjee said. “This will potentially aid a cheaper and more frequent analysis, closer and continuous monitoring of patients.”

Outstanding Thesis and Dissertation Award

Wei Tian, PhD

Mentor: Jae Liang
Program: Bioinformatics
Title: Computational Investigation of Structural and Thermodynamic Properties of Beta Barrel Membrane Proteins

The annual Outstanding Thesis and Dissertation Award (OTDA) rewards outstanding scholarship in each of the Graduate College’s four divisions. Winners may compete in regional and national competitions.

Provost’s Graduate Research Award

Trinh Lam, Eddington Lab

The Provost’s Graduate Research Award (PGRA) supports mul- tidisciplinary scholarship and provides a way for students early in their studies to develop new research directions for their PhD dissertations or terminal degree thesis/capstone project. This seed funding helps students to develop stronger applications for funding from external sources.
CADMIM’s mission is to develop microscale tools and technologies that create simpler, faster, and cheaper analytical solutions addressing human health, agriculture, and the environment. The National Science Foundation Industry/University Cooperative Research Center is composed of the University of Illinois at Chicago and the University of California at Irvine.

This year’s meeting featured an expanded poster presentation section from graduate and undergraduate students from both universities. The IAB meeting also included talks from Ian Papautsky, Richard and Loan Hill professor and center co-director, and Abraham Lee, center director and UC-Irvine site leader.

CADMIM’s advisory board includes Amgen, Asahi Kasei, Beckman Coulter, Corning, Corteva Agriscience, Agriculture Division of DowDuPont, ESI Group, Genomics Institute of the Novartis Research Foundation, Genus, KWS SAAT, VTT Technical Research Center of Finland, and Wainamics.

This year’s event also included tours of several Richard and Loan Hill Department of Bioengineering labs, including Associate Professor Salman Khetani’s lab, Papautsky’s lab, Richard and Loan Hill Professor Eben Alsberg’s lab, and Professor David Eddington’s lab.

“At CADMIM, I presented an inertial microfluidic project I have been working on, which aims to make a microfluidic device that separates the G1 and G2/M cell phases in various cancer cell lines. The microfluidic approach uses inertial forces to separate the cells by size and consequently by phase to provide biologists with a chemical-free approach to study cells for them to better understand the mechanisms that lead to cancer.

The presentation experience was helpful in allowing me to practice my communication skills with graduate students and faculty who are knowledgeable about microfluidics, and emphasized the importance of other’s perspectives while working on a research project.

At this year’s CADMIM meeting, I learned about the various applications of microfluidics like device development for capturing circulating tumor cells and growing cells on a microfluidic chip, and talked with professors who gave me feedback on my poster and ideas on how the device could be used in the future within their lab.”

-- Amanda Bogseth, undergraduate bioengineering student

CADMIM held its semiannual Industrial Advisory Board Meeting on September 4 and 5 in Student Center East.

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“At CADMIM, I presented project processing results and a poster presentation. It provided me with an opportunity to meet industry and academic scientists; the experts track our projects and mass us advice.” — Hua Gao, PhD student

Bioengineering student Amanda Bogseth and Department Head Thomas J. Roybal, PhD.