LEHIGH UNIVERSITY | P.C. Rossin College of Engineering and Applied Science

FALL 2020 Newsletter

IN THIS ISSUE:

Cover Illustration by Roman Bratschi

Lehigh Bioengineering through the years

LAUNCHED UNDERGRADUATE PROGRAM
2002

GRANTED FIRST BACHELOR'S DEGREES
2006

LAUNCHED GRADUATE PROGRAM
2010

GRANTED FIRST MASTER'S DEGREES
2011

GRANTED FIRST DOCTORAL DEGREES
2014

CONVERSION TO DEPARTMENT OF BIOENGINEERING
2017

COLLEGE OF HEALTH LAUNCHED
2018

ANAND RAMAMURTHI APPOINTED AS DEPARTMENT CHAIR
2020

DEPARTMENT CHAIRS' MESSAGES

Sixteen years and more (who's counting?!) as director, then chair of Bioengineering at Lehigh. It has been a privilege to watch and contribute to the growth of our young program and department in the Rossin College. What I'm most proud of is the great group of faculty and staff — friends all — that I've been involved in hiring and with whom I've worked all these years. It is indeed gratifying to see your success, including those we've lost to other institutions. Thanks to all of you — you've made my job much easier. One of my mentors when I worked at the DuPont company told me that the true way to success is — hire the best people and get out of their way — and I can attest to the veracity of that statement.

I'm very pleased to welcome Anand Ramamurthi as our new chair. There are challenges and opportunities ahead that he will lead us through, but they are all of the good sort. We need to grow, establish our niche in research, continue to improve how we teach, and have fun doing it. So, although this is a farewell to one persona, I'm immediately re-incarnating as a heckling backbencher who will remain fully involved in our joint adventures.

ANAND JAGOTA

As the new Chair of BioE, please join me in applauding my namesake and predecessor, Anand Jagota, for nearly two decades of leadership that transformed BioE from an interdisciplinary program into the dynamic, growing department it is now.

My transition from the Cleveland Clinic to LU BioE has been unconventional to say the least. Daily check-ins with a health monitor App. Empty classrooms. Masked research students socially distanced in time and space. Yet, I've quickly learnt what it means to be part of the Lehigh Bioengineering team — resilient, working together generating out-of-the-box solutions to enhance our mission of innovation in bioengineering education and research. We have taken our collegiality and professionalism virtual. In the early days of the COVID-19 shutdown, our faculty developed a completely virtual curriculum within days and have evolved this further to provide our students a hybrid learning experience of the highest caliber this Fall.

Despite the year's challenges, we have many successes to celebrate! Read on to learn about Lesley Chow's research on 3D bioprinted tissue scaffolds for which she received the prestigious NSF CAREER award. Under the auspices of the Institute for Functional Materials and Devices (i-FMD) led by Himanshu Jain, a team of BioE faculty (Zhang, Cheng, Jagota, and Liu) received a highly competitive, statewide, industry-academic partnership award to develop corona-virucidal functional polymers. Wonpil Im and collaborators released the first ever, open source, all-atom spike protein model of the coronavirus, critical to understanding its molecular level interactions, while Yaling Liu has developed a cutting edge, machine-learning technique to detect rare circulating tumor cells.

We also are thrilled to introduce our new faculty member, Yu Zhang (Stanford University), an expert in computational neuroscience, medical imaging computing and AI, who will undoubtedly advance collaboration with the computation and data science research groups in our new College of Health. The first cohort of our new undergraduate Biocomputational Engineering program will take advantage of new course offerings in the Fall of 2021. We eagerly look forward to the opening of the Health and Science Technology (HST) Building which will further enhance the research resources and collaboration of faculty from the Colleges of Engineering and Health.

Read on to learn about our other successes — publications, grant awards, recognitions and student achievements. And we look forward to hearing from you!

ANAND RAMAMURTHI

A NEW APPROACH TO

TISSUE ENGINEERING

Lesley Chow and her team have demonstrated a new method to create continuous, highly organized scaffolds for tissue regeneration.

Organs, muscles and bones are composed of multiple types of cells that are carefully organized to carry out a specific function. Articular cartilage, for example, protects the ends of bones, at the joints, and is tightly integrated with bone through a region known as the osteochondral interface.

When articular cartilage is absent or damaged, debilitating pain results. Unlike some tissues, cartilage cannot regenerate after an injury. Instead, it degenerates, leading to osteoarthritis, which affects approximately 27 million Americans.

"Medical intervention is the only way to regenerate osteochondral tissue," says ***Lesley Chow***, an assistant professor of ***materials science and engineering*** and ***bioengineering***. "To successfully regenerate this cartilage and make it functional, we must consider the fact that function is related to both the cartilage and the bone. If the cartilage doesn't have a good bone anchor, it's pointless."

It's difficult to create one organ made of two very different tissues, says Chow, so the problem requires a tissue-engineering method that respects the multi-component and organizational manner that tissues form in nature.

Chow has taken a major step in the field's efforts to address this challenge. Her team has demonstrated a new method to create continuous, highly organized scaffolds to regenerate two different tissues, such as those found in the osteochondral interface. Their work, led by Lehigh graduate students Paula Camacho and Hafiz Busari, and co-authors Kelly Seims, Peter Schwarzenberg and ***Hannah L. Dailey***, assistant professor of ***mechanical engineering and mechanics***, was published in ***Biomaterials Science***.

Chow's lab creates scaffolds made of biodegradable polymers, long chains of molecules that can degrade over time. The scaffolds provide cells with structural support, as well as chemical cues that "tell" the cells what type of tissue to form. Used in the early stages of tissue regeneration, scaffolds are designed to be implanted in the body and then degrade as new tissue forms.

The team uses 3D-printing technology to control the deposition of "inks" with different compositions. These inks are prepared by mixing a biodegradable polymer with peptide-modified polymers that provide the chemical instructions to the cells.

"We can take a peptide segment that we know plays a specific and important role in telling cells to grow new tissue and, in a sense, steal from nature," says Chow. "We take this peptide and attach it onto a polymer, then add in the modified polymer while we are constructing scaffolds. We use 3D printing as a way to control the organization of these peptide-functionalized polymers as well as the scaffold's architecture."

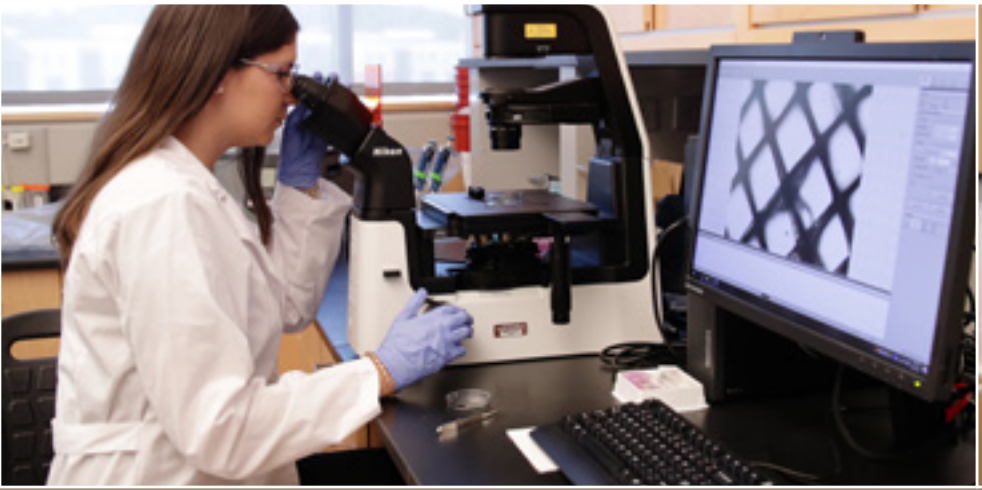
Once the team fabricates the scaffolds, they "seed" them with cells such as human mesenchymal stem cells that can, in response to the peptides, be "coaxed" into becoming different cell types.

Changing the scaffold's properties is simply a matter of changing the inks in the printer, Chow explains. The team can modify peptide concentration as well as location, and they can do this with more than one ink composition.

"What we are doing is creating an environment that fosters the regeneration of two different tissues simultaneously in one scaffold," says Chow. "We make a scaffold that has the correct cues—one that promotes cartilage, one that promotes bone—all in one material."

– LORI FRIEDMAN

*This story by **Lori Friedman** was originally published in the **Lehigh Research Review***



Welcome

NEW BIOENGINEERING FACULTY & STAFF

YU ZHANG
Completed his Postdoc training at Stanford University School of Medicine and recently joined Lehigh as an Assistant Professor of Bioengineering. His research focuses on computational neuroscience and brain biomarker discovery.

WENPENG CAO
Completed his Ph.D. in Bioengineering at Lehigh University and began work as a postdoctoral fellow in the X.F. Zhang research group.

SHATAAKSHI DAHAL
Received a BE in Biomedical Engineering from Purbanchal University, Nepal, then completed her PhD in Biomedical Engineering at Cleveland State University/Cleveland Clinic under the guidance of Professor Anand Ramamurthi. She now joins the Ramamurthi group as a postdoctoral fellow

SAJEESH THAMPI
Completed his PhD in Biomaterial Science (2010) from SCTIMST, India and is a Research Scientist in the research group of Dr. Ramamurthi.

ADDRESSING

THE COVID-19 CHALLENGE

Industry-academic team aims to develop a novel polymer coating for surfaces to prevent COVID-19 spread

Lehigh is one of four universities to receive funding through the Manufacturing PA Innovation Program ***COVID-19 Challenge*** supporting innovative research projects that could potentially impact Pennsylvania›s pandemic response.

Governor Tom Wolf announced seven projects that will receive funding of approximately $25,000 each (see ***news release***). "We are fortunate to have some of the brightest minds in our higher education system," Wolf said, "and they rose to the challenge in supporting our commonwealth during this unprecedented time."

Lehigh's project will address the transmission of SARS CoV viruses, including COVID-19, through contact with common surfaces, such as in healthcare settings and in public spaces. The team seeks to "chemically functionalize" these surfaces with a novel polymer coating that will incapacitate the virus and prevent further transmission. The coating, which will disable the outermost "lipid or fatty envelope" of the virus, will have long-lasting effects compared with typical disinfectants and cleaning products that primarily destroy the existing virus but become ineffective after a short time.

The proposal was generated through Lehigh's Institute for Functional Materials and Devices (***I-FMD***), a hub for interdisciplinary research. The research team brings together expertise in virology, materials surface engineering, disinfection in health care, and virus detection. Industry partner ***Solvay USA, Inc.*** (Bristol, PA) will help develop and translate the technology to the market and manufacture new polymers.

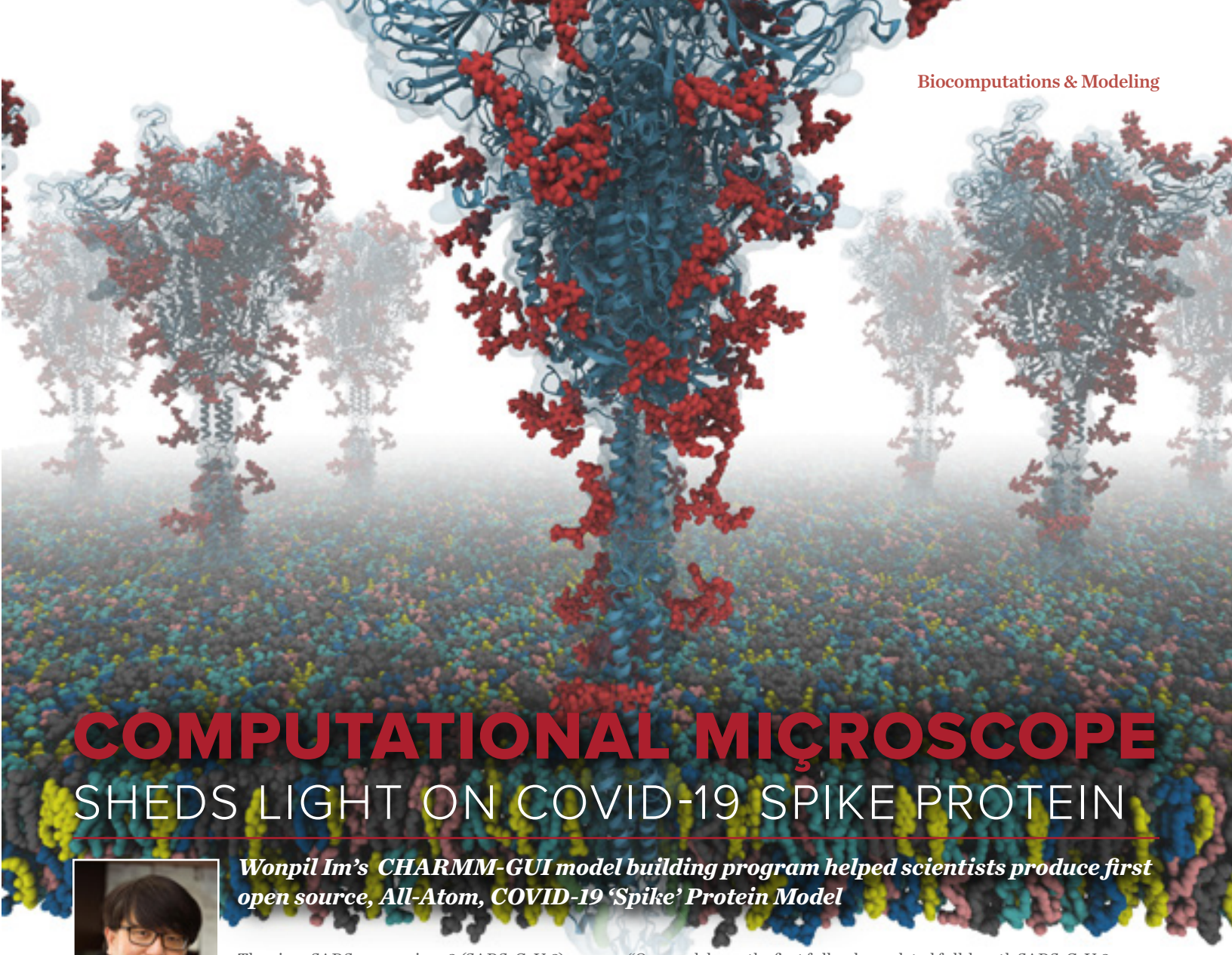
"Developing this virucidal technology to disrupt the indirect transmission of novel coronavirus becomes increasingly more important as our communities move toward resuming normal activities and movements in public," says ***Himanshu Jain***, who serves as director of I-FMD. "A functional material will be much more effective than having to rely on frequent cleanings with standard disinfectants in high-traffic areas, such as entrances to restaurants, restrooms, etc."

Leading the project, entitled "A Novel Technology for Disrupting the Spread of Coronavirus," are P.C. Rossin College of Engineering and Applied Science faculty members ***Frank Zhang***, an associate professor of bioengineering and mechanical engineering and mechanics; ***Xuanhong Cheng***, a professor of materials science and engineering and bioengineering; and Jain, the Diamond Distinguished Chair and Professor of Materials Science and Engineering. Other members of the team include ***K.P. Ananth***, a professor in the University of Cincinnati's James L. Winkle College of Pharmacy; Lehigh bioengineering professors ***Anand Jagota*** and ***Yaling Liu***; and industry partner Solvay USA, a major manufacturer of coating polymers.

Through the COVID-19 Challenge program, the Department of Community and Economic Development (DCED) engaged Pennsylvania colleges and universities in the rapid development and deployment of new technologies, products, and processes with the potential to positively impact the commonwealth's response to the COVID-19 pandemic.

"With business reopening and the perspective of people spending more time indoors over the cold season, the research on virucidal surface treatment could help reduce the chance of contracting COVID-19 from surface contacts in confined spaces," says Cheng. "Our interdisciplinary team is also excited to extend this work as we research new ways to detect viruses and study virus-surface interactions."

*See **Rossin College News** for the original article*



COMPUTATIONAL MICROSCOPE
SHEDS LIGHT ON COVID-19 SPIKE PROTEIN

Wonpil Im's CHARMM-GUI model building program helped scientists produce first open source, All-Atom, COVID-19 'Spike' Protein Model

The virus SARS coronavirus 2 (SARS-CoV-2) is the known cause of coronavirus disease 2019 (COVID-19). The "spike" or S protein facilitates viral entry into host cells.

Now a group of researchers from Lehigh, Seoul National University in South Korea and the University of Cambridge in the UK has worked together to produce the first, open-source, all-atom models of a full-length S protein. The researchers say this is of particular importance because the S protein plays a central role in viral entry into cells, making it a main target for vaccine and antiviral drug development.

This video illustrates how to build the membrane system from their SARS-CoV-2 S protein models. The model-building program is open access and can be found from the home page of ***CHARMM-GUI*** by clicking on the ***COVID-19 Archive*** link, or by clicking the archive link in the header, then the COVID-19 Proteins link in the left sidebar.

Developed by Wonpil Im, a professor in Lehigh's Department of Biological Sciences and Bioengineering Department, CHARMM-GUI (GUI = graphical user interface) is a program that simulates complex biomolecular systems simply, precisely and quickly. Im describes it as a "computational microscope" that enables scientists to understand molecular-level interactions that cannot be observed any other way. More information about CHARMM-GUI can be found in this ***video***.

Illustration by Dr. Yeolkyo Choi/Lehigh University

"Our models are the first fully-glycosylated full-length SARS-CoV-2 spike (S) protein models that are available to other scientists," says Im. "I was fortunate to collaborate with Dr. Chaok Seok from Seoul National University in Korea and Dr. Tristan Croll from University of Cambridge in the U.K. Our team spent days and nights to build these models very carefully from the known cryo-EM (electron microscopy) structure portions. Modeling was very challenging because there were many regions where simple modeling failed to provide high-quality models."

Scientists can use the models to conduct innovative and novel simulation research for the prevention and treatment of COVID-19, according to Im.

The S protein structure was determined with cryo-EM with the receptor binding domain (RBD) oriented up (PDB ID: ***6VSB***), and with the RBD oriented down (PDB ID: ***6VXX***). But this model has many missing residues. So, they then modeled the missing amino acid residues, followed by the other missing domains. In addition, they modeled all potential glycans (or carbohydrates) attached to the S protein. The glycans prevent antibody recognition, which makes it difficult to develop a vaccine. They also built a viral membrane system of an S protein for molecular dynamics simulation.

The team recommends reading the full ***Journal of Physical Chemistry article***, "Developing a Fully-glycosylated Full-length SARS-CoV-2 Spike Protein Model in a Viral Membrane," before using any of the models.

– LORI FRIEDMAN

*See **Lehigh News** for the original article.*

AN ELEGANT APPROACH TO CIRCULATING TUMOR CELL IDENTIFICATION

Yaling Liu's Innovative, High-Accuracy, Machine Learning Technique Detects Rare Circulating Tumor Cells (CTCs) in Blood

Metastasis — tumor growth at a secondary site — is responsible for the majority of cancer-related deaths. It occurs when the primary tumor site sheds cancerous cells which are then circulated through the body via blood vessels or lymph nodes. These become seeds for eventual tumor growth at a secondary location in the body.

Detection of these rare cells, circulating tumor cells or CTCs, is important for early prognosis and to monitor the effectiveness of treatment. Currently, there is only one method for CTC detection approved by the U.S. Food & Drug Administration (FDA), CellSearch, used to diagnose breast, colorectal and prostate cancer.

Results from a recent study — a collaboration between Lehigh University, Lehigh Valley Cancer Institute, and Pennsylvania State University — demonstrate the potential for a new method of detecting circulating tumor cells. Unlike existing methods, which rely on expensive and time-consuming processes, this technique uses a powerful, label-free, detection method. Developed by ***Yaling Liu***, a faculty member in Lehigh's Departments of Bioengineering and Mechanical Engineering and Mechanics, in collaboration with ***Xiaolei Huang***, faculty member in Penn State's College of Information Sciences and Technology, the technique applies a machine learning algorithm to bright field microscopy images of cells detected in patient blood samples containing white blood cells and CTCs.

The blood samples were drawn from participating patients undergoing treatment for stage 4 renal cancer at Lehigh Valley Hospital-Cedar Crest under the care of ***Dr. Suresh G. Nair,*** physician in chief at Lehigh Valley Cancer Institute. The model yielded a accuracy rate: 88.6% overall accuracy on patient blood and 97% on cultured cells. The results have been published in ***an article*** in *Nature Scientific Reports*.

In addition to Liu, Huang, and Nair, authors include three Lehigh PhD students ***Shen Weng***, ***Yuyuan Zhou*** and ***Xiaochen Qin***.

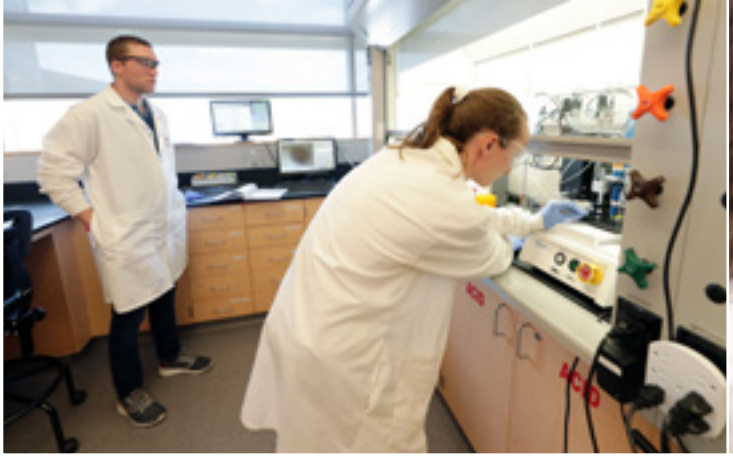
Nair says Liu's innovative technique to isolate rare circulating cancer cells in a tube of blood — which can number as few as 15 cells in one billion — represents "a simpler, elegant and cost effective approach to monitoring patients on therapies such as immunotherapy and targeted therapy for cancer at the circulating cell level rather than scans such as CAT scans."

"This study, though small, demonstrates that our method can achieve high accuracy on the identification of rare CTCs without the need for advanced devices or expert users, thus providing a faster and simpler way for counting and identifying CTCs," says Liu. "With more data becoming available, the machine learning model can be further improved and serve as an accurate and easy-to-use tool for CTC analysis."

The method, he says, requires minimal data pre-processing and has an easy experimental setup. To arrive at the results, the team pre-processed the whole blood samples, capturing bright field and fluorescent images of the cells. They trained a deep learning model with cropped, single cells in bright field images and used the corresponding fluorescent images as ground truth labels. They also trained and tested a model with cultured cell lines as a comparison. The group then summarized the statistical results of the trained model.

"We tuned the details of the model until the outcome reached the state-of-the-art," says Liu. He and his team continue to innovate in this area and are developing a device that combines optical image machine learning and acoustic sorting to automatically process the sample.

Read the full story in the ***Lehigh University News Center***.



USE-INSPIRED RESEARCH

Lehigh's Pasteur Partners PhD (P3) Fellowship Program Pioneers a Student-Centered Approach to Graduate Education

Louis Pasteur, the father of microbiology, heralded ***use-inspired research*** as a fundamentally different approach to the discovery and understanding of natural phenomena. Pasteur started with a practical need or problem and employed it as a guide to identifying important fundamental questions.

This approach, in contrast to traditional curiosity-driven research, is especially valuable to those who wish to see the impact of their doctoral dissertation in real life within a reasonable timeframe.

With support from the National Science Foundation's (NSF) ***Innovation in Graduate Education*** program, Lehigh University's innovative ***Pasteur Partners PhD (P3)*** program is bringing together high-level stakeholders in technological advancement from across industry, government, and academia through a National Workshop Series to promote innovation in U.S. academic-industry partnerships around advanced research and graduate studies.

According to ***Himanshu Jain***, Lehigh University professor of ***materials science and engineering*** and PI on the NSF grant, the United States' approach to graduate education has not changed much since the period after World War II. Given the rapid pace of technological change and the growing need for a technologically skilled workforce, Jain believes that a student-centered, "use-inspired" approach he envisions is not meant to replace conventional methods, but to provide an option for those students who are interested in seeing the impact of their work. "An education more closely aligned with solving real-world industry problems should be available as an option," says Jain.

The P3 Program provides fresh thinking and a new, student-centered approach to the ecosystem of support and resources around talented young minds pursuing doctoral degrees in science, technology, engineering, and math (STEM).

Thanks to the program's active partnership with companies that deliver cutting-edge STEM applications designed to meet the needs of society at large, across industry sectors, the ***P3 Fellowship Program*** is a launchpad for advanced students who are focused on use-inspired research to create an immediate impact in their fields.

Academic rigor remains, as always, firmly at the forefront of a Lehigh education. Students in the program will meet all the requirements of their academic department, and faculty advisers will work closely with students and industry sponsors to ensure that students are prepared to succeed through their doctoral candidacy, and into the workplace.

Those selected as Pasteur Fellows receive a competitive stipend and full tuition for the duration of doctoral studies that are expected to be completed in four years. The aims of the P3 program go beyond those of the prestigious NSF Graduate Research Fellowship program.

Features of the P3 program include:

- A pre-program summer internship at a company to get the 'big picture' of the problem of interest through discussions with industry researchers. AA Fellow gains insight into research questions that matter in the field, leading to active involvement in defining the scope of his/her dissertation.
- A 1-2 semester company residency to ensure use-inspired, industrial perspective, in addition to the rigor of a high caliber doctoral degree.
- Modular, graduate-level professional development courses, in addition to requirements of the Fellow's academic department. These courses are co-taught by faculty and industry researchers on such topics as intellectual property (IP) constraints, economic considerations and the global marketplace, ethical considerations, diversity and cultural sensitivity.

The P3 Program, led by principal investigator Jain, also includes co-principal investigators ***Anand Jagota***, professor and founding chair of Lehigh's ***Department of Bioengineering***; ***Volkmar Dierolf***, Distinguished Professor and chair of Lehigh's ***Department of Physics***; ***H. Lynn Columba***, associate professor of ***instructional technology*** and ***teacher education*** at Lehigh; and Daniel Vaughn, Manager of External Technology Collaborations at Corning Incorporated.

Read more about the ***P3 program*** in ***The Lehigh News Center***

GRANT SUCCESS

XUANHONG CHENG (BIOE, MatSci) and FRANK ZHANG (BIOE, MechE) recently received funding in the amount of $404k from the National Science Foundation (NSF) for a 3-year research project titled *"Bioinspired, Single-molecule Based Shear Switchable Nanomaterials."*

ANAND JAGOTA (BIOE, ChBE) and FRANK ZHANG (BIOE, MechE) were awarded an NSF grant for a project titled *"TIM Protein-Mediated Ebola Virus-Host Cell Adhesion: Experiments and Models."* The pair also were awarded a Lehigh CORE grant for *"Experimental and Computational Study of Coronavirus Spike Protein-Mediated Viral Entry."*

FRANK ZHANG (BIOE, MechE) was awarded an NIH grant focused on *"Single-cell Analysis of Endothelial Mechanotransduction Mediated by Endothelial Surface Glycocalyx."* Zhang was also awarded an NIH grant with collaborators from Emory University for the project titled: *"Structure and Function of Platelet GPIb-IX-V."*

ANAND JAGOTA (BIOE, ChBE) received a nearly $2 million NSF grant for the next five years; Jagota and collaborators from Cornell University and tire manufacturer ***Michelin*** North America seek to develop two novel mechanisms to improve friction of soft materials based on bio-inspired design of near-surface structures.

2020 PUBLICATION SPOTLIGHT

Lehigh Bioengineering faculty members and Bioengineering students co-authored more than 30 publications that were accepted for print in the last year. Some of the notable ones are listed below. (Names in BOLD are current Lehigh BioE faculty or current/former Lehigh BioE students)

Stępniowski, W.J., Wang, K.K., CHANDRASEKAR, S., Paliwoda, D., Nowak-Stępniowska, A., Misiolek, W.Z. 2020. The impact of ethylenediaminetetraacetic acid (EDTA) additive on anodization of copper in $KHCO_3$ – Hindering Cu^{2+} re-deposition by EDTA influences morphology and composition of the nanostructures. *Journal of Electroanalytical Chem* 114245

Dong, Z., MEN, J., Yang, Z. Jerwick, J., Li, A., Tanzi, RE, Zhou, C. 2020. FlyNet 2.0: drosophila heart 3D (2D+ time) segmentation in optical coherence microscopy images using a convolutional long short-term memory neural network. *Biomed Optics Exp* 11, 1568-1579

CAO, W., Cao, W., Zhang, W., Zheng, X.L., ZHANG, X.F. 2020. Factor VIII binding affects the mechanical unraveling of the A2 domain of von Willebrand factor. *J Throm Haemostasis*

Gaspar, M., de Sousa, H., SEABRA, I., Braga, M. 2020. Environmentally-safe $scCO_2$ P. pinaster branches extracts: Composition and properties. *J CO_2 Utilization* 37, 74-84

ZHANG, X.F., CAO, W., JAGOTA, A. 2020. Biophysical characterization of the adhesion between enveloped virus and phosphatidylserine-binding proteins. *J Immunology* 204 (1 Supplement), 248.20-248.20

Wang, J., Lapinski, N., ZHANG, X.F., and JAGOTA, A. 2020. Adhesive Contact Between Cylindrical (Ebola) and Spherical (SARS-CoV-2) Viral Particles and a Cell Membrane. *Mech Soft Mat* 2, 11.

Wang, H., Wang, L. Shang, Y., TAFTI, S.Y., CAO, W., Ning, Z., ZHANG, X.F., and Xu, X. (2020): Peak Force Visible Microscopy. *Soft Matter*, in press

PISAPATI, A.V., Wang, Y., Blauch, M.E., Wittenberg, N.J., CHENG, X., ZHANG, X.F. 2020. Characterizing Single-Molecule Conformational Changes Under Shear Flow with Fluorescence Microscopy. *JoVE* 155

Ma, X., Du, X., Li, L., LADEGARD, C., CHENG, X., Hwang, J. 2020. Broadband Electrical Sensing of a Live Biological Cell with i*n situ* Single-Connection Calibration. *Sensors* 20 (14), 3844

Liu, Z., JAGOTA, A., Hui, C.Y. 2020. Modeling of surface mechanical behaviors of soft elastic solids: theory and examples. *Soft Matter* 16, 6875-6889

CUI, X., Lapinski, N., ZHANG, X.F., JAGOTA, A. 2020. Length of Mucin-Like Domains Enhance Cell-Ebola Virus Adhesion by Increasing Binding Probability. *BioRxiv (preprint).*

Wu, H., Moyle, N., JAGOTA, A., Hui, C.Y. 2020. Lubricated steady sliding of a rigid sphere on a soft elastic substrate: hydrodynamic friction in the Hertz limit. *Soft Matter* 16 (11), 2760-2773

Nikfar, M., Razizadeh, M., Paul, R., LIU, Y. 2020. Multiscale modeling of hemolysis during microfiltration. *Microfluid Nanofluid* 24

Nikfar, M., Razizadeh, M., Zhang, J., Paul, R., Wu, Z.J., LIU, Y. 2020. Prediction of mechanical hemolysis in medical devices via a Lagrangian strain-based multiscale model. *Artif Organs* 44, E348-E368

Wang, S., ZHOU, Y., QIN, X., Nair, S., Huang, X., LIU, Y. 2020. Label-free detection of rare circulating tumor cells by image analysis and machine learning. *Sci Reports* 10, 12226

Krook, N.M., Jaafar, I.H., Sarkhosh, T., LeBlon, C., Coulter, J.P., JEDLICKA, S.S. (2020). In vitro Examination of Poly (Glycerol Sebacate) Degradation Kinetics: Effects of Porosity and Cure Temperature. *Intl J Poly Mat Poly Biomat* 69, 535-543

WE'D LOVE TO HEAR MORE FROM YOU!

Send your news to inbioe@lehigh.edu, or visit our home page, lehigh.edu/bioe and scroll down to our news update link!

FACULTY

NOTABLES AND MEDIA MENTIONS

XUANHONG CHENG (BioE/MSE) has been promoted to the rank of full professor.

LESLEY CHOW (BioE/MSE) presented a seminar titled, "Spatially Organized Biomaterials to Engineer Functional Tissues" in the Pre-Tenure Bioengineering Faculty e-Seminar Series. This virtual seminar series features up-and-coming investigators in bioengineering, sponsored by the Focus Group on Immunodelivery in the Controlled Release Society.

SABRINA JEDLICKA, (BioE/MSE) has been named associate dean for academic affairs in the Rossin College, effective July 1, 2020. Jedlicka will succeed Greg Tonkay, an associate professor of industrial and systems engineering, who has served in the role for nearly a decade.

SUSAN PERRY, a professor of practice in the Department of Bioengineering, has been appointed as assistant dean for academic affairs. In this role, she joins the Rossin College's Office for Academic Affairs as a key leader in curriculum innovation, student recruiting, and experiential learning.

LESLEY CHOW (BioE/MSE) was recently awarded a National Science Foundation (NSF) CAREER award titled, "CAREER: Developing Spatially Organized Biomaterials to Engineer Complex Tissue Interfaces." This award also enables Chow to create hands-on 3D printing activities and YouTube videos to engage students from backgrounds underrepresented in STEM and increase awareness to the general public about biomaterials.

Three BioE faculty members were among those recognized at the Rossin College's annual awards ceremony: SABRINA JEDLICKA (BioE/MSE) (*Citizenship Award*),

XUANHONG CHENG (BioE/MEM) (*Interdisciplinary Research Excellence Award*) and SUSAN PERRY (BioE) (*Experiential Learning Excellence Award*).

LORI HERZ (BioE) is a semi-finalist for the Food Systems Vision Prize, an award sponsored by the Rockefeller Foundation. The Vision, "Improving Nutrition and Food Self-Sufficiency in Sierra Leone Using a Market-Based Approach," was developed through a collaboration with Khanjan Mehta, Vice Provost for Creative Inquiry at Lehigh, and World Hope International, an NGO with operations in Sierra Leone. The team is one of 79 semi-finalists from a field of over 1300 applicants. Top Visionaries will be announced in December 2020.

GRADUATE

GRADUATE STUDENT NEWS

Congratulations to our 2020 Bioengineering doctoral degree recipients: JING MEN, PhD, YANYAN CHEN PhD, WENPENG CAO PhD, and our Master of Science degree recipients: NELLY CHERUIYOT, YINCHEN (BELLE) DONG, BENJAMIN FERMAN and MARYAM KHAN.

NICOLE MALOFSKY '19 was awarded the Kappa Delta Graduate Student Volunteer Scholarship! The Kappa Delta Foundation provides scholarships to undergraduate and graduate student members to reach their educational goals.

PAULA CAMACHO has been inducted into the Rossin Professional Development Program. This program is designed to prepare high-achieving Lehigh engineering doctoral students for successful future academic careers. Camacho was also a featured speaker at the Virtual Symposium on Bioengineering Cell-ECM Interactions in June. This symposium featured rising star trainees in different bioengineering fields. Camacho presented her work during a session on musculoskeletal regenerative engineering.

ALUMNI

ALUMNI UPDATES

KAYLYNN GENEMARAS '15 put her doctoral research on hold at Tulane University to help increase diagnostic testing capacity in Louisiana and perform lab work for clinical trials on the virus. ***Read More***

KATHRYN KUNDROD '15 is on a Rice University team working on a faster, simplified Covid-19 test for use in limited-resource settings. ***Read More***

STEVEN WEI PHD '14 accepted a position with Bristol-Myers Squibb as part of the Cell Therapy team

YU SONG PHD '16 accepted a position as Lab Research Assistant at Tsinghua University

WHITNEY LAI BS '16, MS '18 was promoted to Senior Virtual Reality Engineer at Surgical Theater

UNDERGRADUATE
STUDENT SUCCESS

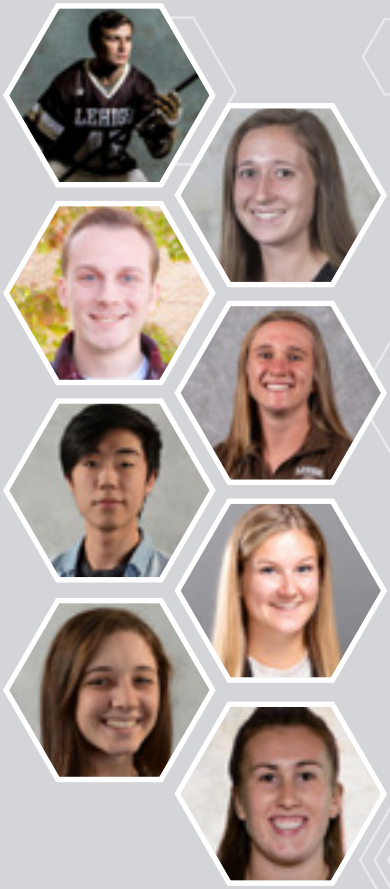
TEDDY LEGGETT '21, was one of 12 collegiate players added to the Canadian Men's Senior Field Lacrosse Team roster as the squad begins its evaluation process for the 2022 World Championships. He played for Canada in the 2019 Team USA Fall Classic.

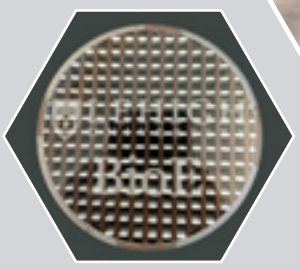
ASHLEIGH CRAWFORD '20, a Clare Booth Luce Research Scholar and standout member of the Lehigh cross country and track and field teams, was chosen to speak at the 2020 Honors Convocation, held virtually, on behalf of the P.C. Rossin College of Engineering and Applied Science. Crawford discussed the perspective she developed through the unusual learning environment of the semester. While it was difficult to have the athletic season cut short and to miss on-campus experiences, she said, she learned many key lessons as a result of the pandemic's impact.

NATHAN YUCHIMIUK '21 received the 2020 Bill Hardy Memorial Award, bestowed annually, to a rising senior in recognition of academic achievement, leadership and character. (Yuchimiuk Photo Credit: Sareena Karim)

Four Bioengineering students were among those receiving Student Life Leadership awards during the May 2020 virtual awards ceremony. Congratulations to MIRANDA ROYDS '21 (Contribution to Student Life), JESSICA DONALDSON '20 (John W. Smeaton Pillar of Integrity), and MORGAN GILLIES '20 and NAAKESH GOMAINE '20 (James J. Duan III Student Life Leadership).

Five Bioengineering students participated in the 2020 David and Lorraine Freed Undergraduate Research Symposium, in May 2020. This event showcases the academic capabilities of Lehigh engineers and highlights the opportunities the university provides to undergraduates. AMANDA FERRANTE '20 won the top prize, while KEVIN (DONGMIN) KIM '20 earned the honorable mention, making it five years in a row that Bioengineering students received recognition for their outstanding research work. Ferrante and Kim were joined by fellow Bioengineering students ASHLEIGH CRAWFORD '20, MARIA LANCIA '21 and MATTHEW FAINOR '20.





INTERESTED IN SUPPORTING UNDERGRADUATE RESEARCH?
*At **gocampaign.Lehigh.Edu** click on **give now** — Under Areas of Support, add* BIOENGINEERING *in the comments box*

BIOENGINEERING RESEARCH
AT LEHIGH UNIVERSITY

Names in BOLD are Lehigh BioE core faculty

BIOCOMPUTATIONS AND MODELING

Biomolecular Modeling
Bioinformatics
Bioengineering Systems & Controls
Biophysics
Modeling of Biological Systems
Computational Bioengineering
Data Analytics
Biomedical Image Analysis

Y. BERDICHEVSKY, B. Chen, **J. HSU**, **A. JAGOTA**, M. Kotare, **Y. LIU**, D. Lopresti, J. Mittal, **D. OU-YANG**, D. Vavylonis, A. Voloshin, **Y. ZHANG**

DIAGNOSTICS, SENSORS AND DEVICES

Biomedical Imaging
Biophotonics
BioMEMS
Biosensors
Microfluidics
Bioelectronics
Medical Devices

Y. BERDICHEVSKY, D. Brown, **X. CHENG**, H. Dailey, J. Hwang, **Y. LIU**, D. Lopresti, L. Lowe-Krentz, **D. OU-YANG**, **S. TATIC-LUCIC**, D. Vavylonis, D. Vezenov, **Y. ZHANG**

MATERIALS AND THERAPIES

Biomaterials
Molecular Bioengineering
Biopharmaceutical Engineering
Cell & Tissue Engineering
Neuroengineering
Biofluid & Solid Mechanics
Biomolecular & Cellular Mechanics
Environmental Bioengineering

Y. BERDICHEVSKY, A. Brown, D. Brown, **X. CHENG**, **L. CHOW**, H. Dailey, M. Falk, J. Hsu, **A. JAGOTA**, **S. JEDLICKA**, H. Jain, **Y. LIU**, **D. OU-YANG**, **T. PASHUCK**, **A. RAMAMURTHI**, **I. SEABRA**, K. Shultz, **S. TATIC-LUCIC**, D. Thevenin, D. Vezenov, A. Voloshin, **X. F. ZHANG**

Additional Bioengineering related research can be found in
Industrial Systems Engineering ISE.LEHIGH.EDU
Healthcare Systems Engineering HSE.LEHIGH.EDU

Faculty members missing from the picture: **YEVGENY BERDICHEVSKY**, **SABRINA JEDLICKA**, **INES SEABRA**, **YALING LIU**, & **FRANK ZHANG**.

Department at a glance:

16
CORE FACULTY MEMBERS

16
ASSOCIATED FACULTY MEMBERS

4
POST-DOCTORAL SCIENTISTS

1
TECHNICAL &
2 ADMINISTRATIVE STAFF

22
PHD LEVEL GRADUATE STUDENTS

8
MS LEVEL GRADUATE STUDENTS

198
UNDERGRADUATE STUDENTS IN 2 MAJORS

(Bioengineering and Biocomputational Engineering)

www.lehigh.edu/bioe

LEHIGH UNIVERSITY | P.C. Rossin College of Engineering and Applied Science