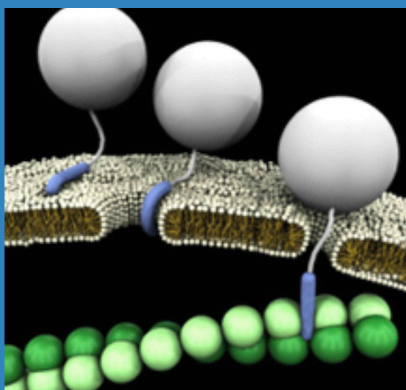
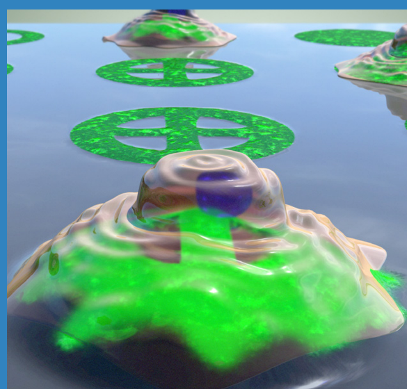
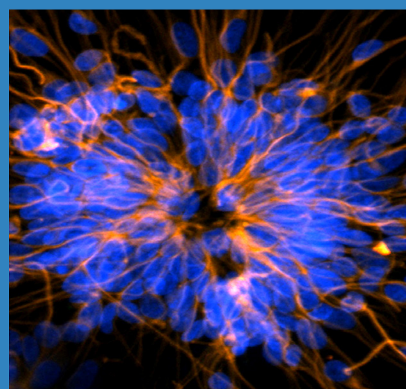
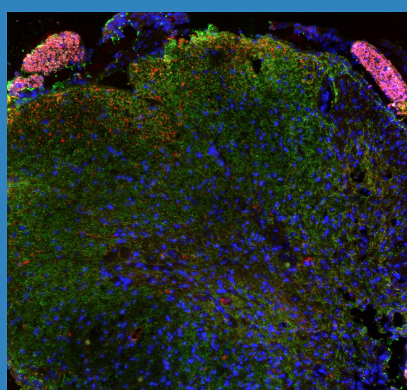
UCLA Samueli School of Engineering

BIOENGINEERING




Performing cutting-edge research that benefits society and training future leaders in the wide range of possible bioengineering careers.

MESSAGE FROM THE CHAIR

As one of the top-10 research institutions in the world, UCLA offers an excellent multidisciplinary environment for bioengineering research and education. Two decades ago, the Department of Bioengineering was founded around an interdepartmental graduate program. Since then, it has become one of the best bioengineering programs in the country, being ranked as a top-10 program by the National Research Council.

Our faculty has pioneered research in many areas, including molecular and cellular engineering, biomedical devices, imaging and signal processing, and systems biology and bioinformatics. A highlight of the past year is a new joint NSF ERC Center on Precise Advanced Technologies and Health Systems for Underserved Populations, led by Aydogan Ozcan, Dino Di Carlo and Omai Garner at UCLA. Our department has over 100 faculty from various disciplines, including 22 Fellows of American Institute for Medical and Biological Engineering, who collectively contribute to our program.

We are in an exciting growth period with the addition of more than 10 new faculty in the next few years. In 2017, we welcomed Ali Khademhosseini, a leader in biomaterials and tissue engineering, and Aaron Meyer, a rising start in systems biology. In 2018, we welcome Zhen Gu, an outstanding innovator in drug delivery for treating cancer and diabetes.

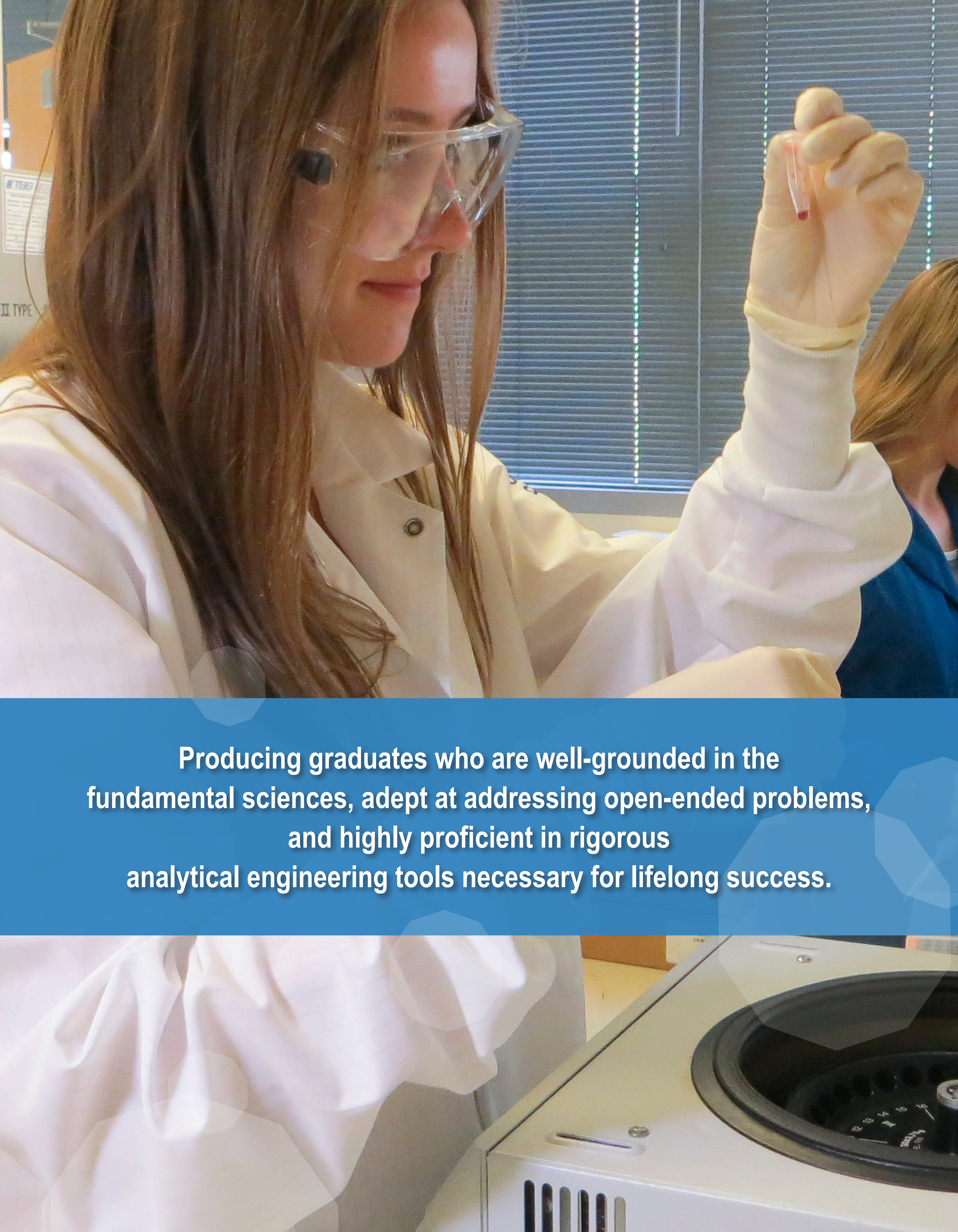
Our education program remains highly competitive and admits top-tier students from around the world. Extensive research experience is a tradition of our undergraduate program – more than 90% of our students graduate with over a year of research experience. Faculty and students are also very active in translating discoveries into applications to improve healthcare and serve our societies. Numerous startup companies have been spun off over the past five years.

Our goal is to perform cutting-edge research and train the leaders in bioengineering. The proximity of a top engineering school and medical school on campus offers a unique opportunity and tremendous resources to foster the growth of the department. We will keep up our momentum, bring together faculty in engineering, medicine and other disciplines, develop strategic collaborations with biotechnology industries, and move UCLA Bioengineering to new heights.

Best regards,

Song Li, Ph.D.
Chancellor's Professor and Chair

UCLA Bioengineering



Producing graduates who are well-grounded in the fundamental sciences, adept at addressing open-ended problems, and highly proficient in rigorous analytical engineering tools necessary for lifelong success.

ABOUT THE DEPARTMENT

The mission of the Department of Bioengineering at the University of California, Los Angeles is to perform cutting-edge research that benefits society and to train future leaders in the wide range of possible bioengineering careers by producing graduates who are well-grounded in the fundamental sciences, adept at addressing open-ended problems, and highly proficient in rigorous analytical engineering tools necessary for lifelong success.

Over the past few years, our Bioengineering Department has established a vibrant under-graduate degree program and has recruited excellent faculty with diverse backgrounds who are directing innovative research programs. Our Bioengineering faculty bring an extensive range of expertise to the Department, with specialties including bioengineering, chemistry, materials science, chemical engineering, physics, electrical engineering, and medicine. This broad range of experience has proved to be extremely valuable in preparing and teaching our undergraduate curriculum. Our faculty have earned numerous awards, including NSF Career Awards, PECASE awards, Young Investigator Awards, NIH Director's New Innovator Awards, Frontier Research Program Initiator Awards, Northrop Grumman Teaching Awards from the Henry Samueli School of Engineering and Applied Science, UCLA faculty service awards, and a Samsung-IUPAC Young Scientist Award from the IUPAC Macromolecular Division.

22
AIMBE Fellows

12
Research Centers and Institutes

4
PECASE Recipients

121
Faculty Members

3
NIH Director's New Innovator Awardees

50
Graduates in 2018-2019

3
New Faculty Added in 2017-2018

4.0
Undergraduate Median GPA

OUR FACULTY

Adept at addressing open-ended problems, and highly proficient in rigorous analytical engineering tools necessary for lifelong success.

Faculty highlighted awards and recognitions

Timothy Deming
- 2015-2016 Fulbright Scholar - Fulbright-Toqueville Distinguished Chair Award
- 2010 Fellow of the American Institute for Medical and Biological Engineering (AIMBE)
- Young Investigator Award, Materials Research Society, 2003

Dino Di Carlo
- 2016 Presidential Early Career Award for Scientists and Engineers (PECASE)
- 2016 Elected Fellow of the American Institute of Medical and Biological Engineering (AIMBE)
- 2016 Materials Research Society Outstanding Young Investigator Award

Warren Grundfest
- 2014 Pierre Galletti Award, AIMBE
- 1995 Inducted into NASA Space Technology Hall of Fame
- Fellow, American College of Surgeons

Zhen Gu
- 2018 Biomaterials Science Lectureship Award
- 2017 Young Investigator Award, Controlled Release Society (CRS)
- 2016 National Academy of Engineering (NAE) Frontiers in Engineering Invitee

Daniel Kamei
- 2015 UCLA Academic Senate Distinguished Teaching Award
- 2016 Society for Laboratory Automation and Screening (SLAS) Fellow (inaugural class)
- 2017 UCLA Engineering Lockheed Martin Teaching Award

Andrea Kasko
- 2014 Doc Stevenson Award for Outstanding Faculty in Residence
- 2011 NIH Director's New Innovator Award
- 2007-2008 UCLA Faculty Career Award

Ali Khademhosseni
- 2018 Elected Member of the Canadian Academy of Engineering
- 2017 Society for Biomaterials Clemson Award
- 2011 PECASE

Song Li
- 2016 Biomedical Engineering Society National Conference Chair
- 2014 Fellow, Biomedical Engineering Society
- 2014 Fellow, American Institute for Medical and Biological Engineering (AIMBE)

Wentai Liu
- 2018 Fellow of AIMBE
- R&D-100 Top Editor Award
- 2016 IEEE Life Fellow

Aaron Meyer
- Fellowship Grant, Terri Brodeur Breast Cancer Foundation, 2017
- 2016 Ten to Watch, Amgen Scholars Foundation
- 2014 NIH Director's Early Independence Award

Jacob Schmidt
- 2007-2012 NSF Career Award

Stephanie Seidlits
- 2017 National Science Foundation CAREER award
- 2012-2014 NIH NRSA F32 Fellowship for Post-Doctoral Training
- 2010-2012 Institute for BioNanotechnology in Medicine-Baxter Early Career Award, Northwestern University

Gerard Wong
- 2011 Fellow of the American Physical Society
- 2016 Fellow of the American Academy of Microbiology
- 2018 Fellow of the American Institute for Medical and Biological Engineering

Benjamin Wu
- 2007-Present Active Fellow, Academy of Prosthodontics
- 2004 Northrop Grumman Teaching Award, UCLA School of Engineering
- 2003 Faculty Service Award, UCLA Biomedical Engineering Student Society

Ali Khademhosseini, Ph.D.

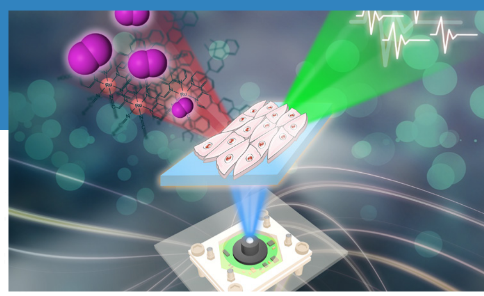
Levi Knight Chair Professor

Ali Khademhosseini, Professor of Bioengineering is the newest addition to our department. He is the Founding Director of the Center for Minimally Invasive Therapeutics as well as an Associate Director at California NanoSystems Institute (CNSI). He is also affiliated with the Department of Chemical and Biomolecular Engineering as well as the Radiology Department.

He joined UCLA in Nov. 2017 from Harvard University where he was a Professor at Harvard Medical School and a faculty at the Harvard-MIT's Division of Health Sciences and Technology, Brigham and Women's Hospital and the Wyss Institute for Biologically Inspired Engineering.

His research is based on developing micro- and nanoscale biomaterials to control cellular behavior with emphasis in engineering biomimetic materials and systems for tissue engineering. He is currently developing 'organ-on-a-chip' systems that aim to mimic human response to various chemicals in vitro. In addition, his laboratory is working on technologies to control the formation of vascularized tissues with appropriate microarchitectures as well as regulating stem cell differentiation within microengineered systems. He has also pioneered various high-performance biomaterials for medical applications that are currently being pursued for clinical translation.

Among the various technologies he has developed are (i) shear thinning hydrogels that are used to induce endovascular embolization for replacing metallic coils, (ii) vascularized thick tissues made by a sacrificial three dimensional bioprinting, (iii) microscale biosensors for monitoring in vitro as well as in vivo systems, (iv) platforms for creating stretchable and degradable electronics and smart drug delivery systems to name a few. He is an author on >500 journal articles and >20 patents/ patent applications.



Aaron Meyer, Ph.D.

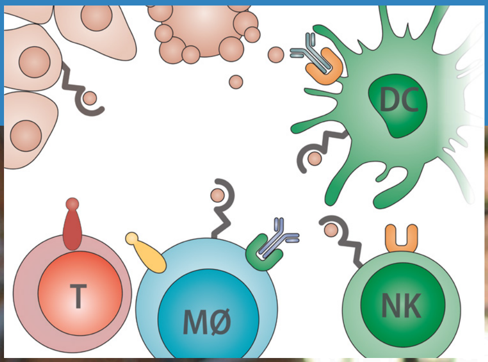
Assistant Professor

The Meyer lab combines machine learning and experiments in concert to study and manipulate the complex signaling of cancer and immune cells. Through these efforts, the lab aims to identify design principles for better immune and cancer therapies.

As an example of this work, the lab has been working to understand the factors that lead to TAM receptor activation. These receptors are aberrantly activated in multiple cancers, including those of the breast and lung, and also in viral infection. In 2015, the lab utilized a computational model to identify that these receptors specifically sense "spots" of their binding partners on the cell surface, and this behavior is intricately tied to their normal and pathological activation. Since then, the lab has applied this discovery, working with others, to elucidate TAM function in melanoma, Zika infection, and breast cancer. They are currently funded by the National Cancer Institute and Terri Brodeur Breast Cancer Foundation to apply this model in pinpointing cancer patients who would benefit from TAM therapies and developing new, more effective, therapies.

Nearly any therapy has multiple effects within a cell and among cells and tissues. A central focus of the lab is to develop techniques to pinpoint which among these pleiotropic effects are essential for efficacy. This information can both identify prognostic measurements to predict which patients would benefit and guide the design of better therapies. The lab is now exploring this approach for other receptor families.

In parallel, the lab has been active in improving the application of machine learning methods in biology. By borrowing from fields in which model uncertainty and interpretation are handled more rigorously, the lab aims to make systems biology faster and more reproducible.

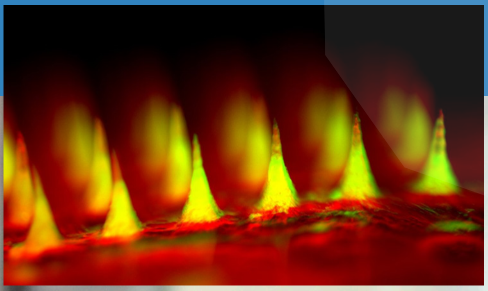


Zhen Gu, Ph.D.

Professor

Professor Zhen Gu joined UCLA as a Director of iMedication Laboratory in July 2018 from the University of North Carolina at Chapel Hill and North Carolina State University, where he was a Jackson Family Chair Professor and Founding Director of the Translational Innovation (TraIn) Practice Master of Science Program in the Joint Department of Biomedical Engineering. Professor Gu's research is focused on controlled drug delivery, bio-inspired materials and micro-/nanobiotechnology, especially developing bioresponsive materials and relevant drug formulations/devices that leverage physiological signals for delivering therapeutics with enhanced efficacy. He is dedicated to engineering glucose-responsive drug delivery systems, mimicking the function of pancreatic beta-cells for treating diabetes. His group has pioneered bioresponsive closed-loop patches, which is a therapeutic platform featuring "smart insulin patch", a painless microneedle array loaded with glucose-responsive insulin vesicles. They have also demonstrated a biomimetic vesicle-vesicle fusion process for "insulin secretion". Additionally, his group has utilized platelets, in situ-formed gels or transdermal patches for local/targeted delivery of immune checkpoint inhibitors to promote anticancer efficacy and reduce systemic toxicity.

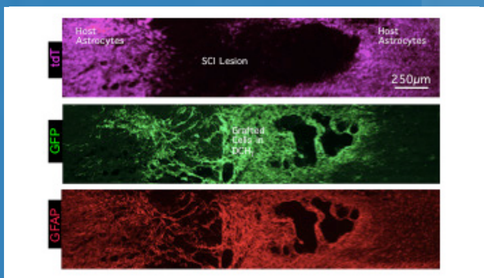
Professor Gu has published over 140 research papers and applied over 40 patents. He is a co-founder of 4 start-up companies. He serves as an Associate Editor for *Nano Research*. He is the recipient of the Sloan Research Fellowship, Young Investigator Award of the Controlled Release Society, Pathway Award of the American Diabetes Association, Biomaterials Science Lectureship Award, and Young Innovator Award in Cellular and Molecular Engineering of the Biomedical Engineering Society. *MIT Technology Review* has listed him as one of the global top innovators under the age of 35 (TR35).



Timothy Deming, Ph.D.

Professor

Professor Deming's research is focused on synthesis, processing, characterization and evaluation of biological and biomimetic materials based on polypeptides. These materials are being studied since they can be prepared from renewable resources, they can be biocompatible and biodegradable, and possess unique self-assembling properties. The group utilizes innovative chemistry techniques to synthesize materials with properties that rival the complexity found in biological systems. The polymers are then processed into ordered assemblies, which are characterized for both nanoscale structure as well as biological function. This interdisciplinary approach stimulates innovations and ideas which direct this research into new, exciting areas.



Dino Di Carlo, Ph.D.

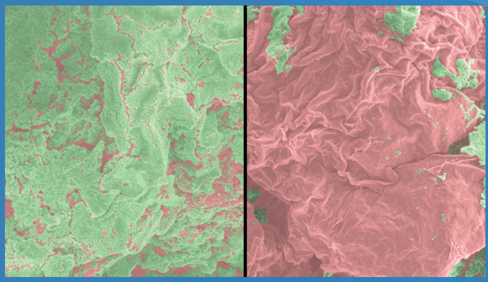
Professor and Graduate Vice Chair

The Di Carlo lab works at the intersection of micro-, nano- and information technology and biology – spanning fundamental investigations in fluid flow and single-cell behavior to clinical and industrial applications. Prof. Di Carlo has been pioneering the field of "Inertial Microfluidics." The group has used inertial fluid dynamic effects to manipulate particles, cells, and fluids in precise ways, enabling the isolation and preparation of samples of blood and other fluids, and performing single-cell analysis. His group also pioneered new approaches to quantify single-cell mechanical properties at high rates.

Warren S. Grundfest, M.D., FACS

Professor

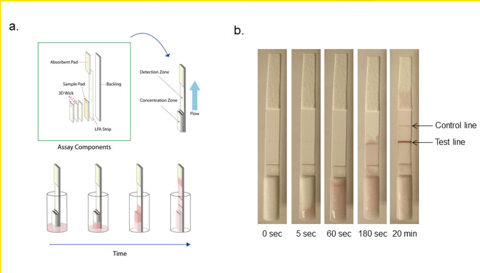
Professor Grundfest's research begins with fundamental engineering studies and translates knowledge gained into new designs for image guided medical devices. The laboratory investigates new ultrasound, terahertz, and optical imaging technologies as guidance methods for procedure planning and real time imaging. In addition, the laboratory explores a variety of lasers for tissue ablation, mechanical devices, and radio frequency/ microwave devices for tissue manipulation. This broad mix of tools allows our group to identify optimal image guidance procedures and matches them with the most effective mechanisms for tissue manipulation. These investigations have resulted in our laboratory conducting the world's first clinical trial of terahertz imaging for corneal hydration monitoring in collaboration with Professor Deng at the Jules Stein Eye Institute.



Daniel Kamei, Ph.D

Professor

Professor Kamei's research laboratory is developing novel point-of-care (POC) diagnostics. Early detection of diseases in resource-poor settings can lead to better patient management, faster administration of treatments, and improved outbreak prevention. Such a POC device could also be used in developed countries to more readily monitor disease and health conditions that currently require lab testing. A common paper-based POC diagnostic is the lateral-flow immunoassay (LFA), a rapid antibody-based test that has been used successfully in over-the-counter pregnancy tests. Despite its strengths as a POC device, the detection limit of LFA is still inferior in comparison to that of gold-standard laboratory assays.



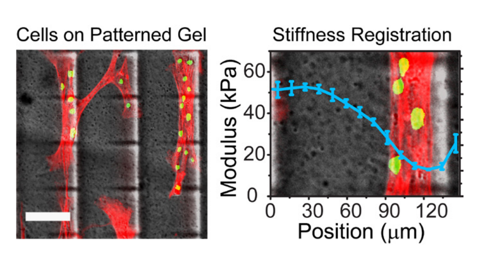
Andrea M. Kasko, Ph.D.

Associate Professor

The Kasko Lab's research is centered on developing polymeric materials for bioengineering applications. The group is specifically interested in designing stimuli-responsive biomaterials for applications in drug delivery and tissue engineering, and in making biomimetic materials that recapture biological function.

The Kasko research group focuses on the synthesis of new complex polymeric biomaterials. Their goals are to develop materials that can be manipulated spatially and dynamically in a predictable manner using different (chemical) mechanisms, and to incorporate increasing levels of biomimicry into synthetic materials for use as biomaterials and/or as wholly synthetic therapeutics.

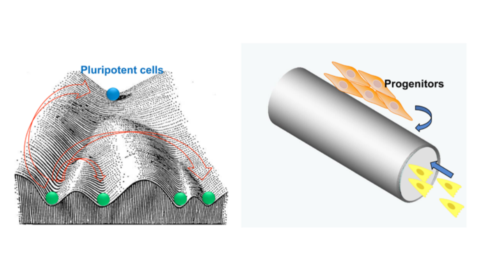
Within these themes, they have three separate projects – dynamically responsive biomaterials, novel antimicrobials and new glycomimetics.



Song Li, Ph.D

Chancellor Professor and Department Chair

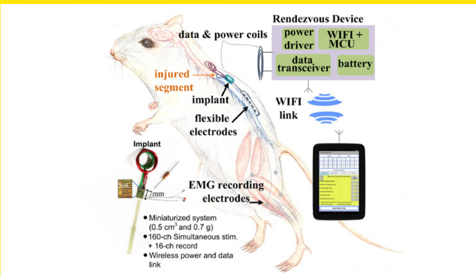
Our research is focused on cell and tissue engineering. We investigate how biophysical factors such as mechanical cues and the micro/nano structure regulate stem cell differentiation and cell reprogramming, and specifically how cell phenotype and epigenetic state are modulated. These studies will have applications in regenerative medicine, disease modeling and drug screening. On the other hand, we engineer stem cells and design bioactive materials to deliver drugs, cells and scaffolds to promote tissue regeneration and treat diseases. We also use stem cell delivery and theranostic engineering approaches to regenerate nerve and muscle. In addition, we engineer immune cells to treat diseases such as cancer, atherosclerosis and transplant rejection.



Wentai Liu, Ph.D

Distinguished Professor

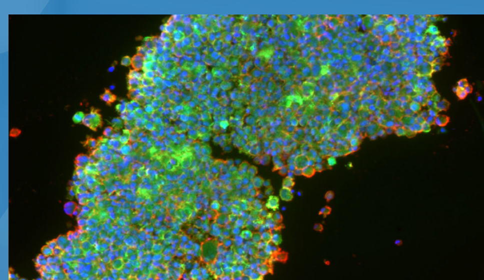
The Liu Lab (Biomimetic Research Laboratory (BRL)) engages in interdisciplinary research of bionic engineering and neural prosthesis. The integration of science, engineering, and technology supports the aims of 1) regaining eyesight for the blind; 2) restoring motor function for the paralyzed; 3) replenishing the cognition impaired; 4) reanimating automatic nerves; 5) brain-to-brain communication. Since the early stages of retinal prosthesis in 1988, BRL has led the engineering efforts for vision restoration in blind patients. Notably, BRL has the unique credential of retinal prosthesis development from conception to the final implant. These efforts led to successful commercial implants (code name Argus-II by Second Sight) for blind patients, receiving both CE Mark in 2011 and US FDA approval in 2013.



Stephanie Seidlits, Ph.D

Assistant Professor

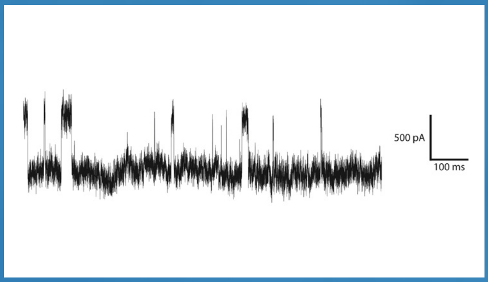
The Seidlits lab develops biomaterial microenvironments and high-throughput arrays to i.d. disease-mediated changes in the central nervous system and develop novel therapies that target these changes. Specifically, they advance the basic understanding and clinical treatment of 1) glioblastoma, a highly lethal brain cancer, and 2) spinal cord injury. The lab has engineered hydrogel biomaterials that can be tuned to mimic biochemical and mechanical changes associated with cancer, injury and regeneration in brain and spinal cord tissue. They are developing these as culture platforms for glioblastoma cells isolated from patients – providing a fast and affordable method to evaluate clinically predictive, patient-specific responses to drugs.



Jacob J. Schmidt, Ph.D.

Professor and Undergraduate Vice Chair

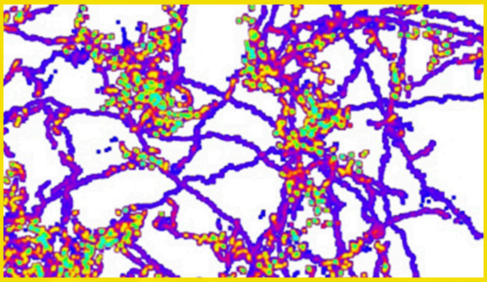
The Schmidt lab has a device-centered focus, primarily covering sensor and instrumentation development. The group has studied the use of protein and inorganic nanopores for single molecule detection, specifically sensing of nucleic acids and proteins. In these measurements, changes in the electrical conductance of an electrolyte-filled nanopore are monitored to detect individual molecules and other small objects entering or occluding the pore. The size, shape, and identity of these molecules can be inferred from analysis of the measured conductance signals. Detecting single molecules enables use of very small analyte volumes—a long term goal is single cell protein characterization.



Gerard C. L. Wong, Ph.D.

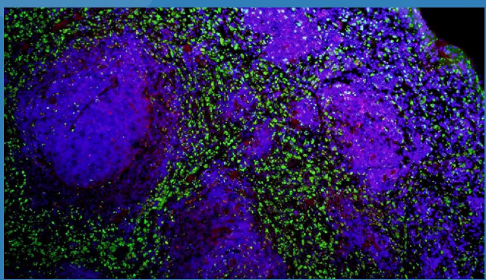
Professor

Gerard Wong's research group uses multidisciplinary approaches to solve problems in infectious diseases, auto-immune disorders and inflammation, with implications for respiratory diseases, heart disease, and cancer. Wong's honors include: the Beckman Young Investigator Award, Alfred P Sloan Fellowship, and Sackler Distinguished Speaker. He is a Fellow of the American Physical Society, a Fellow of the American Academy of Microbiology, and a Fellow of the American Institute for Medical and Biological Engineering. His group has produced 11 professors since 2006. The lab's interests include: Bacterial biofilm communities, innate immunity, autoimmune diseases, antibiotic design, machine learning, neurodegenerative diseases, viral replication, programmed cell death, immunotherapy of cancer.



Benjamin Wu, D.D.S., Ph.D.
Professor

Professor Wu's research group uses cutting-edge bioengineering strategies to address unmet needs and open-ended problems. His group has extensively analyzed the effects of processing parameters on the formation of biomimetic apatites, and this fundamental understanding has led to applications in the areas of art conservation, drug delivery, separations, and biosensors. Additionally, his group has also shed light on the interplay between orthobiologic growth factors and adult stem cells in the area of bone repair. The gorup has developed practical methods to effectively deliver the bone-forming molecule, NELL-1, for bone and cartilage repair, and systemic delivery of NELL-1 is currently being studied in zero-G environment on the International Space Station as a potential strategy to slow and/or reverse bone loss during spaceflight.



In addition to core faculty, the department has 23 joint faculty and 74 affiliated faculty in engineering, physical sciences, life sciences, and medicine.

ALUMNI STATISTICS

1,076
Number of alumni (through 06/2018)

60
Physicians

40
Professors

140
Alumni who are current students (MD, PhD, JD, MBA, MS, etc)

7
Dentists

14
Attorneys

88
Total # of BE alumni who received the outstanding BS, MS, and PhD awards at Commencement (since 2001)

Companies hiring the most alumni:

Abbott Laboratories (including St Jude)
Accenture
Amgen
Cedars-Sinai Medical Center
Genentech
Illumina
Medtronic

ALUMNI SUCCESS STORIES

The company aims to introduce a line of novel rapid point-of-care test kits for a range of clinical and non-clinical applications.

Phase Diagnostics, Inc.

Founded by bioengineers at the UCLA Department of Bioengineering, Phase Diagnostics, Inc. is a fast-growing biotech startup **developing cutting-edge technologies to change the landscape in diagnostics and healthcare management.** Leveraging their proprietary paper microfluidic concentration platform, the company aims to introduce a line of novel rapid point-of-care test kits for a range of clinical and non-clinical applications. **They have been awarded upwards of $2.5 million in grant funding from the National Institutes of Health, National Science Foundation and the Bill and Melinda Gates Foundation.** They have further closed their Seed Round of financing to launch their lead Oral Health product, which is expected to receive European CE mark later this year. Pipeline projects include an at-home rapid diagnostic kit for sexually transmitted diseases and a rapid saliva-based malaria test for resource-poor countries. The founders include Ricky Chiu, PhD, Garrett Mosley, PhD, Prof. Daniel Kamei and Prof. Benjamin Wu.

www.phasediagnostics.com/

Forcyte Biotechnologies, Inc.

Forcyte Biotechnologies, Inc. is an up-and-coming startup company spun out of UCLA Bioengineering that was **started in March 2017 by 3-time Bruin, Ivan Pushkarsky (B.S. 2012, PhD 2017, postdoc 2018)** together with his graduate advisor Prof. Dino Di Carlo and their colleague Prof. Robert Damoiseaux.

Forcyte is automating the life sciences with specific focus on simplifying and miniaturizing measurements of cellular "strength" to inform drug-makers of how different chemical compounds functionally affect patient cells. In doing so, the technology can identify beneficial chemical compounds that could become medicines (but would otherwise be overlooked). It can also detect dangerous or ineffective compounds and remove them from drug pipelines sooner and more cheaply than before.

This exciting new technology was developed during Pushkarsky's PhD work under Prof. Di Carlo between 2013 and 2017. Pushkarsky, who began as an undergrad volunteer with the Di Carlo Lab in 2011, says that he and Prof. Di Carlo knew as soon as they started on the project in Fall 2013 that it had commercial potential.

"From the start, Dino preached, and I believed, that this technology we wanted to work on could have a big impact outside of university research. With this in mind, we made our strategic decisions with a long-game view of advancing healthcare in the commercial realm," said Pushkarsky.

"That's the cool thing about this department – pretty much every Professor here has spun out a company (or 5) with students based on their research. That's the responsibility of engineers working on healthcare problems – to solve them and get the solutions out to the rest of the world."

www.forcytebio.com

The technology can identify beneficial chemical compounds that could become medicines (but would otherwise be overlooked).

Vitality Biopharma, Inc.

Vitality Biopharma, Inc. is a drug development company led by **Robert Brooke, who obtained his M.S. in Biomedical Engineering from UCLA in 2005.** After graduating, Mr. Brooke worked in healthcare finance with an investment firm in Westwood before founding a cancer drug development company that is now known as Iovance Biotherapeutics. In 2012, he founded Vitality Biopharma, which was originally focused upon development of an enzymatic biosynthesis process to make better tasting versions of stevia, a zero-calorie sweetener. However, in 2015, the company discovered that its biosynthesis process had far more applications than previously realized. It was found that an enzyme from the Stevia plant was able to glycosylate or "sugar-coat" many other compounds, including cannabinoids such as THC. **This technology enabled the production of proprietary oral THC drug formulations that deliver the compound in a targeted manner to the intestinal tract, providing local therapeutic effects without any psychoactivity or intoxication.** Vitality is entering clinical trials in 2018 and plans to initially study treatment of inflammatory bowel disease, irritable bowel syndrome, and narcotic bowel syndrome, a severe form of opiate-induced abdominal pain. With collaborators at UCLA and also in Canada, the company is also now planning observational studies that monitor the use of cannabinoids as a safe alternative to opioid painkillers.

www.vitality.bio

The company discovered that its biosynthesis process had far more applications than previously realized.

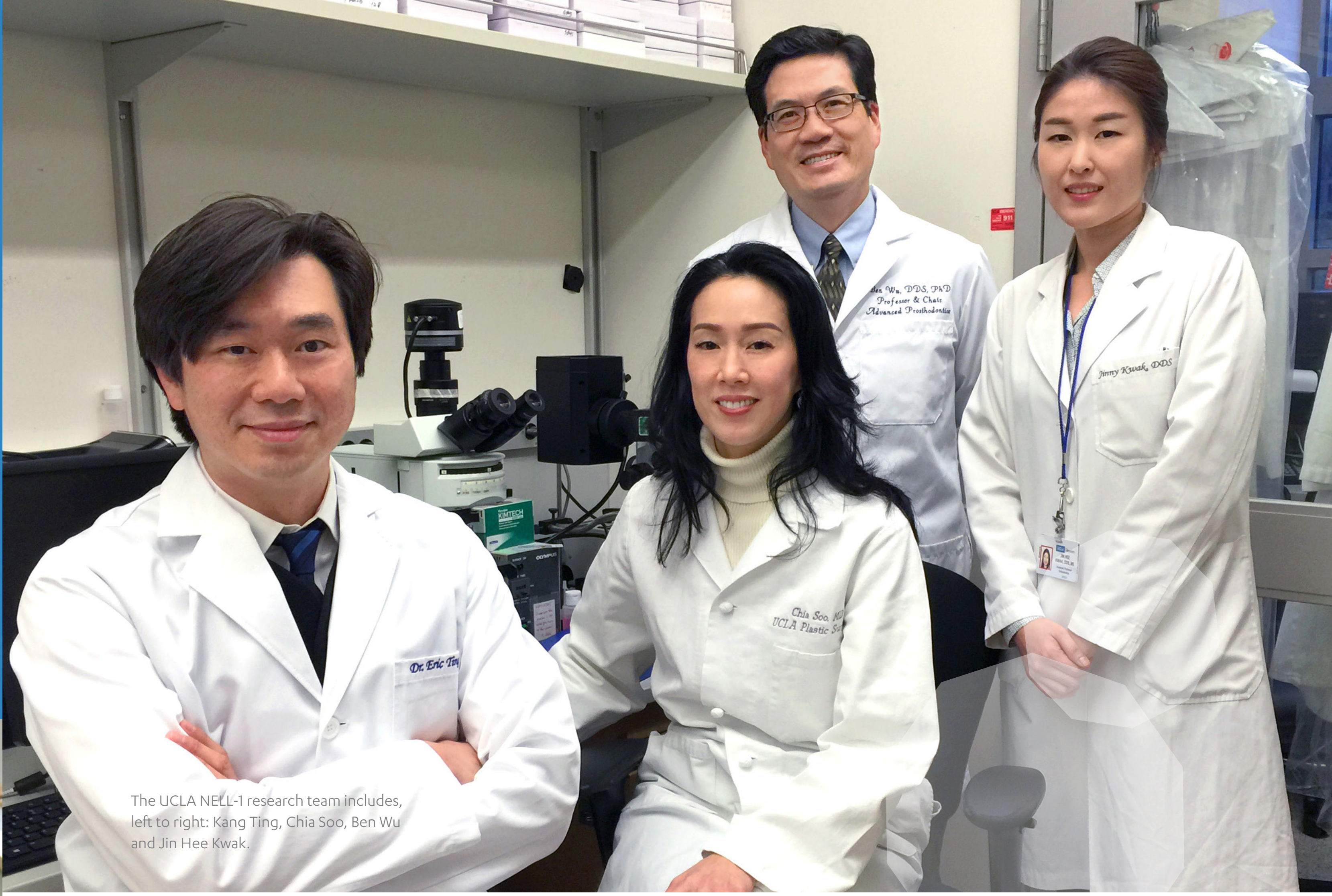
Consortium links experts in engineering, medicine to improve health in underserved communities

UCLA joins Texas A&M, Rice, Florida International to focus on care for people with diabetes and cardiovascular disease.

One of the enduring problems in America's health care landscape is managing chronic disease among people who live in low-income communities. Because access to health care services is so often a challenge, many who have serious illnesses and live in these neighborhoods aren't diagnosed until their health worsens — and when the cost of treating their diseases are higher. To address that need, experts from UCLA, Texas A&M University, Rice University and Florida International University are joining forces to develop technologies to help people with diabetes and cardiovascular disease, two of the leading causes of death in low-income communities. With funding from the National Science Foundation, the universities have formed the Precise Advanced Technologies and Health Systems for Underserved Populations engineering research center, or PATHS-UP. The consortium aims to create health monitoring devices to prevent, delay and better manage diabetes and heart disease. The UCLA effort is being led by Aydogan Ozcan (Electrical and Computer Engineering), Dino Di Carlo (Bioengineering), and Omai Garner (Pathology and Laboratory Medicine). They will develop wearable and mobile technologies that will be tested by doctors and patients in neighborhoods in South Los Angeles that have a higher-than-average incidence of chronic disease.

— BY AMY AKMAL

Professors Dino Di Carlo, Aydogan Ozcan and Omai Garner will lead UCLA's participation in the four-university initiative, which is funded by the National Science Foundation.



The UCLA NELL-1 research team includes, left to right: Kang Ting, Chia Soo, Ben Wu and Jin Hee Kwak.

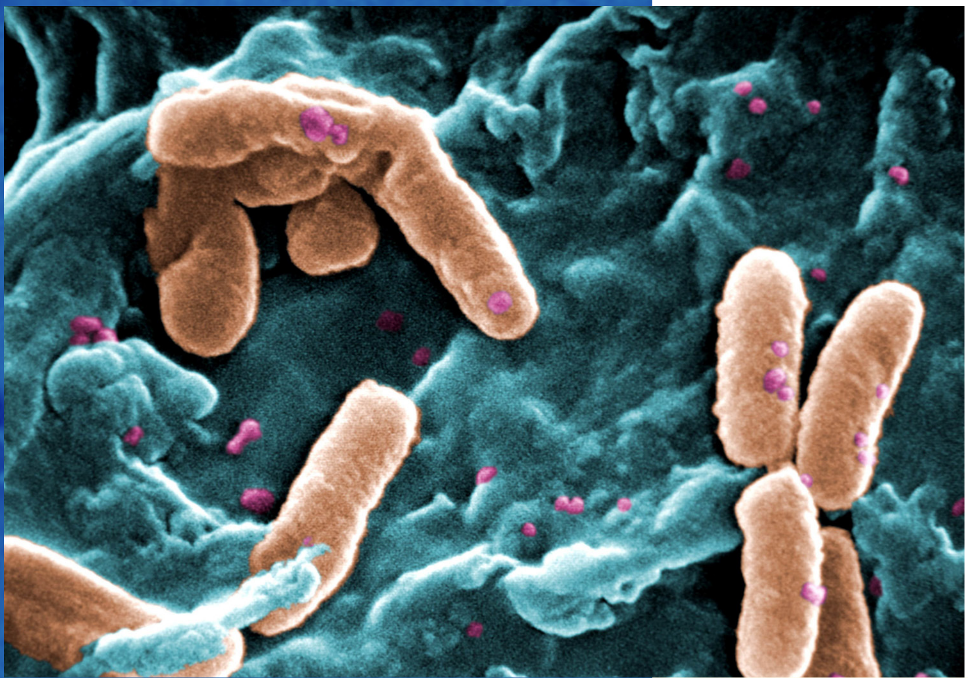
Mice headed for space to test bone-building drug developed by UCLA team

A team of UCLA scientists is bringing these three elements together to test an experimental drug that could one day result in a treatment for osteoporosis, which affects more than 200 million people worldwide.

The drug could also potentially help those with bone damage or loss, a condition that afflicts people with traumatic bone injury, such as injured military service members, as well as astronauts who lose bone density while in space.

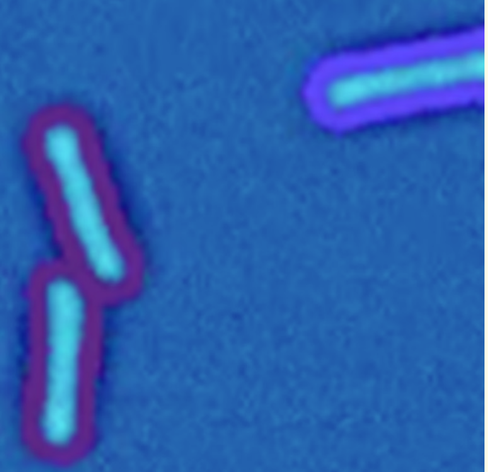
Led by Dr. Chia Soo and Dr. Kang Ting, who met and married while working on this project, as well as Dr. Ben Wu, the UCLA research team is scheduled to send 40 rodents to the International Space Station this week. Once there, the rodents will receive injections of the experimental drug, which is based on a bone-building protein called NELL-1. The project is being done in collaboration with NASA and the Center for the Advancement of Science in Space, which manages the U.S. National Laboratory on the space station.

"This is really a pivotal point in the study of NELL-1's effect on bone density," said Soo, principal investigator on the study, the vice chair for research in the UCLA Division of Plastic and Reconstructive Surgery, and a member of the UCLA Eli and Edythe Broad Center of Regenerative Medicine and Stem Cell Research. "We would not be at this point without many years of funding and support from the National Institutes of Health, the California Institute for Regenerative Medicine and several UCLA departments and centers. We are honored to conduct the next phase of our research in the U.S. National Laboratory." — BY MIRABAI VOGT-JAMES



Bacteria can pass on memory to descendants, UCLA-led team discovers

Findings are a major step toward understanding persistent infections that affect people with cystic fibrosis.



Led by scientists at UCLA, an international team of researchers has discovered that bacteria have a "memory" that passes sensory knowledge from one generation of cells to the next, all without a central nervous system or any neurons.

These findings, published online in the Proceedings of the National Academy of Sciences, are a major step toward understanding hard-to-treat infections caused by bacterial biofilms in people with cystic fibrosis. The research was led by Professor Gerard Wong.

The team studied Pseudomonas aeruginosa, a bacteria strain that forms biofilms in the airways of people with cystic fibrosis and causes persistent infections that can be lethal. Bacterial biofilms can also form on surgical implants, like an artificial hip; when they do, they can cause the implant to fail.

To analyze cells that are in the process of "sensing" the surface, the scientists used a multigenerational cell tracking method that was developed by Wong's research group, along with several other data analysis methods.

The approach revealed that two events were linked in a rhythmic pattern: the expression of cyclic AMP, a signaling molecule inside bacterial cells, and the activity level of type IV pili, the appendages on bacteria cells that are involved in the cells' movement. The study revealed that the events are separated by only a few hours.

The study's other authors include Jaime de Anda, a UCLA graduate student and co-first author, and Kun Zhao of China's Tianjin University.

— BY MELODY PUPOLS

The new technology could lead to advances in bio-inspired robotics, regenerative medicine and medical diagnostics.

UCLA Bioengineering leads development of stingray-inspired soft biobot

UCLA bioengineering professor Ali Khademhosseini has led the development of a tissue-based soft robot that mimics the biomechanics of a stingray. The new technology could lead to advances in bio-inspired robotics, regenerative medicine and medical diagnostics. The study was published in Advanced Materials.

The simple body design of stingrays, specifically, a flattened body shape and side fins that start at the head and end at the base of their tail, makes them ideal to model bio-electromechanical systems on.

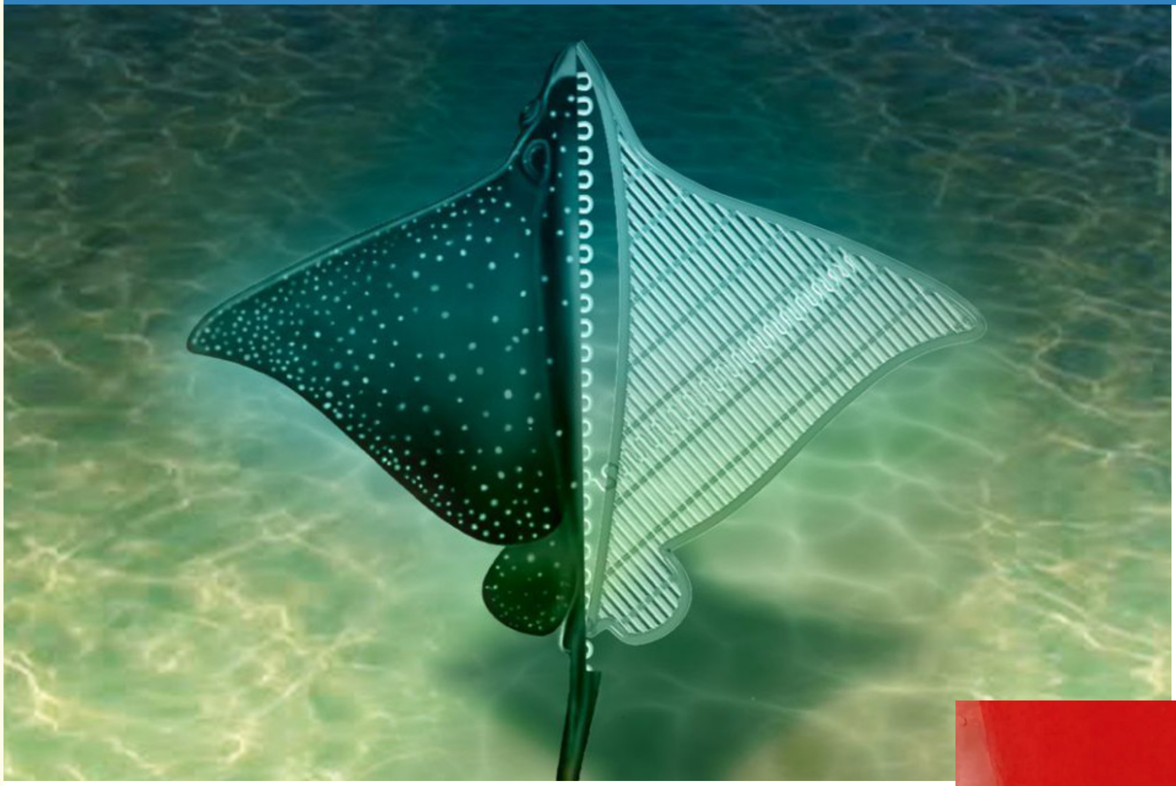
The 10-millimeter long robot is made up of four layers: tissue composed of live heart cells, two distinct types of specialized biomaterials for structural support, and flexible electrodes. Imitating nature, the robotic stingray is even able to "flap" its fins when the electrodes contract the heart cells on the biomaterial scaffold.

"The development of such bioinspired systems could enable future robotics that contain both biological tissues and electronic systems," Khademhosseini said. "This advancement could be used for medical therapies such as personalized tissue patches to strengthen cardiac muscle tissue for heart attack patients."

"I came to UCLA due to its amazing potential for interfacing medicine and engineering," he said. "The excellence of the engineering and medical schools here, and their close proximity to each other is unique in the country. As such I believe that there is much opportunity to build interdisciplinary research initiatives that spans different schools to enable the next generation of medical therapies."

The research was supported by the Defense Threat Reduction Agency. Additional funding support came from the National Institutes of Health, the Presidential Early Career Award for Scientists and Engineers, and the Air Force Office of Sponsored Research.

— BY MATTHEW CHIN



Artist's concept of a stingray soft robot.

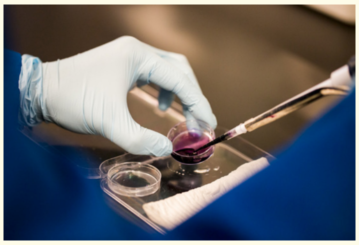
Video of soft robot is available at: https://drive.google.com/file/d/1F7OcSxdEwNcWURophC4HlP4BdaXmtdv2/view

BIOMEDICAL ENGINEERING SOCIETY

The Biomedical Engineering Society at UCLA was established to provide a forum for student discussion and collaboration, to promote academic and professional success, supplement hard and soft skill development, and improve social bonding within the community of the UCLA Bioengineering Department.

BMES encourages forging stronger relationships between students, faculty, and the department as well as helping create the bioengineering student experience at UCLA. The club encourages academic excellence of its members by offering class advising and group study sessions as well as graduate and medical school info sessions. Professional development is also supported through helping students find positions in research labs, resume building workshops and hosting industry info sessions by biotech company representatives. BMES also provides opportunity for students to build the skills they will be putting on their resume through educational and competitive project teams centered around creation of medical devices. BMES supports giving back to the community through events like the Bioengineering Big Buddies educational outreach program.

▼ BMES and faculty at Discover Bioengineering Day 2018



> **Strives to ensure the success of any student interested in bioengineering with academic goals at UCLA and future career aspirations.**

THE BIOENGINEERING GRADUATE ASSOCIATION

The Bioengineering Graduate Association aims to support every student to reach their full development potential through graduate school, and be prepared for a successful post-graduate career.

The Bioengineering Graduate Association (BGA) at UCLA was established to facilitate the communication of graduate students with department members, encourage the involvement of students in the graduate community, and establish platforms for the academic and professional development of its members.

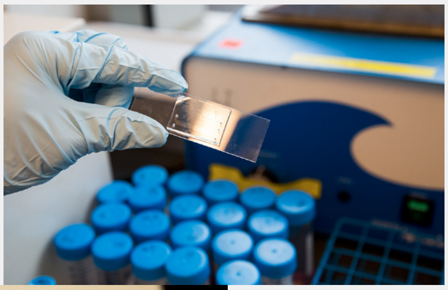
BGA coordinates with the department to provide resources of academic outreach for graduate students, including arranging lunch with guest speakers, organizing annual retreats to promote intra- and inter-departmental research exchange, and releasing other opportunities for student involvement.

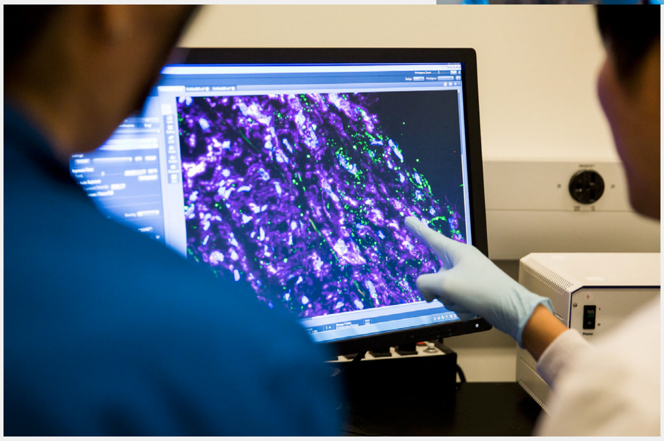
BGA also works to enrich the life of graduate students and form close bonds within the department. The council provides peer advising and mentoring, facilitates new student orientation, leads social gatherings and after hours, and provides community support for current students.

Capstone Design course groups of 5-6 undergraduate seniors in Bioengineering work in a team on a design project for the two continuous quarters.

SENIOR CAPSTONE DESIGN COURSE

This year in the Bioengineering Senior Capstone Design course we had 9 teams of 5-6 students, each working on a unique, interdisciplinary project. At the end of the course, we held a symposium where the student teams had the opportunity to share their work with their peers and faculty. The symposium included a friendly competition, judged by faculty, between student teams. This year the winning project was "Cytoshear – An Experimental Platform for Modeling Traumatic Brain Injury." In Cytoshear team developed a new method to measure the responses of single neural cells to repeated injuries. Ultimately, the team hopes their system will help researchers to better understand the effects of multiple, mild concussions in patients, including professional athletes. Other projects included an at-home device for monitoring vital signs, a liposomal drug delivery system, a device to improve outcomes from knee surgery, and 4D-moldeling of heart development. While one winner was selected at the symposium, all of the teams did excellent work and outcomes include research publications, entry and top honors in national design competitions and patent applications.





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