Enthusiastic Students Revive the Biomedical Engineering Society at UC Irvine

A group of enthusiastic and highly motivated undergraduate students have recently revived the student chapter of the Biomedical Engineering Society at UC Irvine. Led by current chapter president Karen Liu, a third year BME undergraduate student, the group has been holding monthly dinner events in the BME department's new conference room in Natural Sciences II. These events feature speakers from industry and academia, and are designed to expose students interested in biomedical engineering to the exciting and diverse career opportunities available. Many students have been attending the lectures enjoying food, conversation, networking, and exploring possible career paths.

Events for 2006-07 are being planned, and the group welcomes your support and input. Please contact the chapter officers directly at bmes.ucirvine@gmail.com, or faculty advisor, Professor Andrew Putnam at aputnam@uci.edu, if you would like to get involved, offer to speak, or wish to support the group's activities.

Upcoming Events 2006

June 20, 2006, 7:45 – 9 a.m.

Engineering Innovations Lecture Series IV
Visualization on Multiple Scales: From Small to Large

Featuring Falko Kuester & Joerg Meyer, UC Irvine
Location: UCI University Club
Email engineerRSVP@uci.edu or call 949.824.3923 to RSVP

BME Distinguished Lecturer Series Update

We would like to thank those who attended the BME Distinguished Lecturer Series this year, and look forward to continuing the tradition of featuring prominent leaders in the biomedical engineering field during our 2006-07 series. Please stay tuned for a complete schedule of Distinguished Lecturer events, beginning in fall 2006.

For more information please visit
www.bme.uci.edu
or call 949.824.6284

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The Henry Samueli School of Engineering
University of California Irvine
Department of Biomedical Engineering

Dear Friends,

This January, we were excited to welcome Professor Enrico Gratton to the Biomedical Engineering department as a distinguished senior faculty in the area of biomedical imaging and bio-computation. Professor Gratton came to us from the department of Physics and Astronomy at the University of Illinois at Urbana-Champaign, one of the top-ranked Physics departments in the country. He is the Principal Investigator and founder of the Laboratory for Fluorescence Dynamics (LFD), beginning in 1986, and his contributions to the growth and stature of the Physics and Astronomy department are widely recognized.

The LFD is a national research resource in biomedical fluorescence spectroscopy, supported by the National Center for Research Resources, a division of the National Institutes of Health. Professor Gratton's scientific contributions are vast and broad, spanning areas from physics, to biology and medical applications. Among his accomplishments, he has successfully used multiphoton techniques and fluorescence correlation spectroscopy to study protein interactions in cells, to investigate the process in which a molecule binds to a receptor embedded in a cell membrane, and to follow the subsequent aggregation of receptors.

Another highlight includes using near-infrared optical techniques to study brain functions, and being the first to detect neuronal activities in the brain by using optical techniques. The LFD, along with Professor Gratton's research team, is now relocated in the new Natural Sciences II building on our campus. Professor Gratton has authored more than 400 publications, holds 10 patents, and has been invited to numerous prestigious lectureships. Further, his technology is the basis for the formation of ISS Inc., which focuses on fluorescence spectroscopy and microscopy instruments, and remains a leading company in this area.

Additionally, five other faculty members and their research facilities, as well as the BME department office, have also moved into the new building to help accommodate our continuous growth. We adopted an open lab concept, combining five research labs in one area without partitions. The graduate student office areas were also designed to allow easy interaction among groups. As a result, researchers from all the labs have been enjoying the benefits of this arrangement, promoting communications, interactions and collaborations.

I am also pleased to announce that Dr. Abraham Lee, Dr. Bruce Tromberg, and I were inducted as Fellows of the American Institute for Medical and Biological Engineering (AIMBE) in March. We were recognized for our contributions in advancing biomedical engineering in each of our respective areas of research and expertise.

In this issue of BMEDiscovery, you can read more about the latest research activities in new microfluidic devices for nerve cells, as well as review our upcoming events calendar. For more information, visit our website at www.bme.uci.edu.

Best Regards,
William C. Tang
Interim Chair and Professor

FACULTY

New Microfluidic Device for Nerve Cells May Aid Efforts for Neurodegenerative Disorders, Spinal Cord Injury Cures

Study enables imaging inside living neurons

A new, easily manufactured microfluidic chamber will allow scientists to examine axons in living nerve cells and may lead to a better understanding of neurodegenerative disorders such as Alzheimer's disease, and may be used to screen drugs to overcome spinal cord injuries, according to researchers in The Henry Samueli School of Engineering.

Biomedical engineer Noo Li Jeon, Ph.D., and colleagues have designed a microfluidic device, which uses tiny volumes of fluid to culture, or grow neurons. The technology enables live imaging of neurons by fluidically isolating axons from other complex parts of the cell. This method allows researchers to examine and manipulate the axons for their deficiencies in signal propagation, while looking at how they affect particular brain diseases and disorders.

Axons are the threadlike neuron fibers that send information via nerve impulses and other signals throughout the central nervous system.

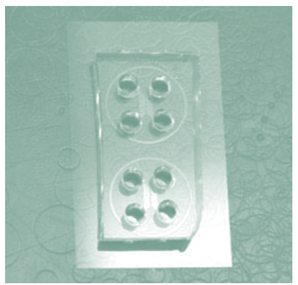
"Previous solutions were extremely challenging to fabricate and assemble, precluding high-throughput experimentation," said Jeon, who is an assistant professor in The Henry Samueli School of Engineering. "Our microfluidic culture platform consists of a molded elastomeric polymer piece placed against a glass cover slip. The design incorporates a physical barrier with embedded microgrooves separating two mirror image compartments. Additionally, this method allows us to use 100 times less liquid, therefore reducing costs."

By developing a device with separate micro-compartments and creating small tunnels to connect the "rooms" of the compartments, Jeon and his team were able to study neuron damage by subjecting axons to different treatments and applications without compromising the entire cell body.

"Microfluidics is becoming an increasingly useful tool for cellular biologists because it allows us to precisely control, monitor and manipulate cellular environments," Jeon added. "Through the use of microfluidic chambers, we are able to isolate and direct the growth of axons without the use of neurotrophins, providing a highly adaptable system to model many aspects of neurodegeneration and injury."

Jeon and his team have applied for a U.S. patent and are currently negotiating a licensing agreement for manufacturing and distribution. They expect that the device will become commercially available by 2007.

Findings are highlighted in the August 2005 edition of Nature Methods magazine, and can be viewed at http://www.nature.com/nmeth/journal/v2/n8/abs/nmeth777.html.



Jeon said that The Roman Reed Spinal Cord Injury Research Program, and encouragement from Oswald Steward, Ph.D., director of the Reeve-Irvine Research Center, played an important role in bringing him and his team into spinal cord injury research. The Roman Reed Program works to support unique, innovative faculty research projects throughout the UC system and California.

GRADUATE PROGRAM

Celebrating Department Growth

The graduate committee is nearing completion of the intensive three month admissions and recruitment "season." The department is pleased to report that both the quality and quantity of applicants has continued to improve, attesting to the department's growing reputation and prime location in the heart of the "biomedical device valley."

The department received 268 applicants this year in comparison to 224 last year, and 40 were offered Ph.D. or M.S. / Ph.D. admission. BME also offered 25 admissions for the M.S. only applicants. The average GPA of the admitted applicants was 3.68, and the GRE scores averaged V567, Q769, A4.47, all record highs. To the department's knowledge, these students also received multiple offers from top schools.

On March 10, the department held a recruitment visitation event, inviting the domestic admits to visit the campus. In addition to a general BME department introduction, current graduate students and faculty participated in a poster session, as well as an open house lab tour for the students to familiarize themselves with current research activities and accomplishments. At this time, the department has already received 15 Ph.D. applicants who have accepted their offer.

Graduate Student Accomplishments

BME's current graduate students have accomplished several significant achievements this year, including four students who received fellowships. Two Ph.D. students, Lindsey Van Schoiack and Cyrus Ghajar, received the Achievement Rewards for College Scientists (ARCS) Fellowship, and Jonathan Diomampo received the Regent's Fellowship. Another Ph.D. student, Paul Marc, was given the Cancer Biology Training Grant. In addition, one of the department's master's students received the Regent's Fellowship for two quarters. During the 2005-06 academic year, five Ph.D. candidates successfully completed their dissertation research, and six master's students graduated from their program.

UNDERGRADUATE PROGRAM

Undergraduate Student Enrollments and Achievements

During the 2005-06 academic year, four BME undergraduate students were awarded The Henry Samueli School of Engineering Research Fellowship. This fellowship is given to students who are most likely to be published, and who have expressed interest in pursuing a master's or doctorate degree. Two of these awardees have been accepted into the BME graduate program.

The BME undergraduate program continues to experience steady growth, including 120 freshmen who have accepted the offer of admission, an increase of 13 students from fall 2005. BME anticipates conferring 36 bachelor's degrees for the department's second graduating class in 2006.

OCTANe@UCI and BME Present Faculty-Industry Technology Forum Series

In partnership with OCTANe@UCI, the Biomedical Engineering department launched a new Faculty-Industry Technology Forum series, focusing on important themes and issues facing the biomedical and information technology community.

Event topics have included "UCI Biomedical Engineering: Ready for Commercialization" and "Emerging Cardiovascular Devices," as well as "Genetic Medical Imaging: Converging Technologies for Personalize Medicine and Treatment," and "Optical Medical Devices: Emerging Market Opportunities."

This program is comprised of entrepreneurs, leading Orange County companies, both public and private, seed and venture capital, university researchers and others involved in the process of business creation.

Upcoming events include a "Frontiers in Biomedical Devices Panel" scheduled for June 8 from 5:30 – 8:00 p.m. at the UCI University Club, and "Emerging Trends in Ophthalmology" on June 22 from 7:30 – 9:30 a.m., also at the University Club. Please contact Cynthia Bemis at cynthia.bemis@octaneoc.org for event reservations and further information and cost details.

For more information, visit https://octane.uci.edu/index.asp.

STUDENT PROFILE

Undergraduate BME Student, Ryan Langan, Inspires the Advanced Prosthetic Hands Project

Ryan Langan, a second year BME student, is responsible for motivating the "Advanced Prosthetic Hands Project," which started with a small grant from the Undergraduate Research Opportunities Program (UROP). Prior to enrolling at UC Irvine, Langan had the chance to meet a triple amputee Iraq war veteran. After spending time with this individual, he learned of the difficulties amputees encounter with their hand and arm prostheses, and realized the crucial need for improved upper-limb prosthetics.

While at UC Irvine, Langan took advantage of UROP, and submitted a grant proposal based on the concept of developing a better hand prosthetic for amputee soldiers. His undergraduate advisor, Professor William Tang, assembled a team to begin developing this project.

Consequently, the Defense Advanced Research Projects Agency (DARPA) called for proposals to revolutionize prosthetics for the military's amputee veterans from the war on terrorism. Tang, along with his team: Professors Abraham Lee and Zoran Nenadic in the Biomedical Engineering department, Professors James Fallon and William Bunney in the department of Anatomy and Neurobiology, and Professor Payam Heydari, in the Electrical Engineering and Computer Science department, responded to DARPA's call and submitted a proposal as a subcontract to the Johns Hopkins University Applied Physics Laboratory, which has been funded for four years.

In addition, Joan Irvine Smith contacted Langan after reading an article in The Orange County Register. She provided a seed gift of $10,000 to fund the project through the Reeve-Irvine Research Center, particularly focusing on the synergistic research in helping patients who lose functionalities of the upper extremities due to cervical spinal cord injuries.

Langan, with his unquenchable drive and enthusiasm, continues to pursue the research in Tang's Microbiomechanics Laboratory, and studies how to create artificial muscles to replace motors and gears currently used in prosthetic hands. His goal is to provide as much of a life-likeness as possible to prosthetic hand-users. Ultimately, with the DARPA funding and gift from Irvine Smith, the team hopes to advance the technology in prosthetics, which will benefit patients who suffer losses of mobility of various kinds.

Professor Putnam Highlighted Biomaterials for Tissue Engineering Research at Engineering Innovations Breakfast Lecture Event

This spring students, alumni, and local industry leaders were invited to hear **Andrew J. Putnam**, assistant professor of Biomedical Engineering and Chemical Engineering and Materials Science, highlight his research in biomaterials for tissue engineering and regenerative medicine applications. Professor Putnam, an invited lecturer for the 2005-06 Faculty Breakfast Lecture Series, discussed the process of engineering new materials that "talk" to cells, and the potential benefit in translating stem cell-based therapies from bench to bedside.