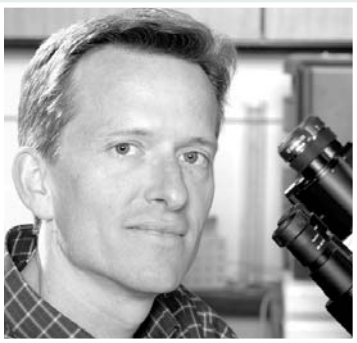
BMEDiscovery

SPRING 05

The Henry Samueli School of Engineering

University of California Irvine

Department of Biomedical Engineering



The 2004-2005 academic year has been extremely active for the Department of Biomedical Engineering in many important areas as we strive to continue our rapid and aggressive growth. This term, we initiated the Distinguished Seminar Series inviting distinguished biomedical scientists and engineers from around the country and world to visit our program. This year we will host a total of eight distinguished visitors, recently we were honored with lectures by Antonios Mikos (Rice University), Ken Diller (University of Texas at Austin) and David Mooney (Harvard University). Coming up in the Fall, we will host Matthew O'Donnell (University of Michigan), Mory Gharib (California Institute of Technology) and Mike Ramsey (University of North Carolina). And looking forward to the Spring quarter, Dorian Liepmann (University of California, Berkeley) and Scott Delp (Stanford University) will join us. Stay tuned for dates and location.

Our partnership with OCTANe@UCI to launch the Faculty-Industry Technology Forum is off to an excellent start following events in the Fall and Winter focusing on "UCI Biomedical Engineering Ready for Commercialization" and "Emerging Cardiovascular Devices," respectively. The forum continued this Spring with an ophthalmic device theme on May 12th.

I would also like to introduce our newest faculty member – Dr. Zoran Nenadic who joined our faculty as an Assistant Professor on April 1, 2005. His research interests are in the general area of engineering neural systems, and he is the first in a cluster of faculty members to be hired in this exciting area. His most recent appointment was at the California Institute of Technology where he used control systems theory to develop algorithms that facilitate the placement of electrophysiologic probes in the brain in real time.

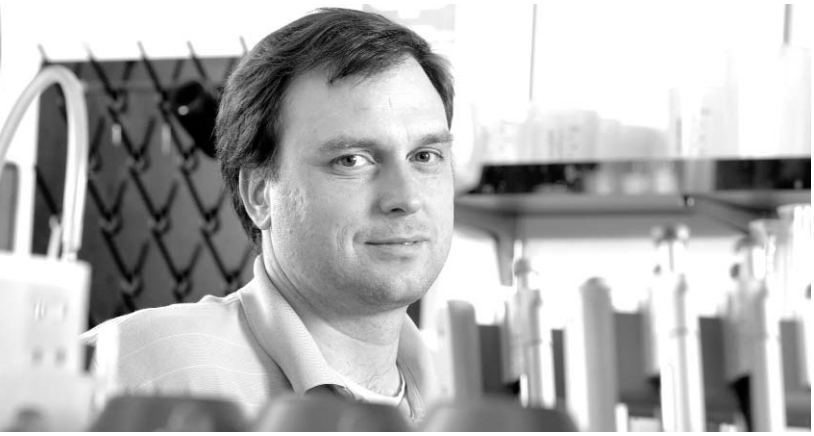
More information on these events and people are available on our website (www.bme.uci.edu), and additional news on our undergraduate and graduate programs, and faculty are presented in the following pages. I hope you enjoy this edition of BMEDiscovery.

Best,

Steven C. George

William J. Link Professor and Chair

Dr. Jim Brody is Focused On Cancer and Nanotechnology



James P. Brody, Ph.D., is an Assistant Professor in the Department of Biomedical Engineering at UC Irvine. He joined the faculty in 2000.

Dr. Brody, a native of Michigan, received his B.S. in Physics from the Massachusetts Institute of Technology, and M.S. and Ph.D. degrees in Physics from Princeton University. He did postdoctoral work it the Department of Bioengineering at the University of Washington and in the Applied Physics and Biology Departments at the California Institute of Technology before joining the UCI faculty. While at the University of Washington, he co-founded a company, Micronics, which miniaturizes fluidics to integrate and automate laboratory processes.

As a member of the UCI faculty, Dr. Brody has focused his research in two main areas: cancer research and nanotechnology.

His work on cancer uses a number of different techniques to attack the problem. For instance, cancer patients with apparently similar disease can have substantially different reactions to treatment, presumably due to molecular differences in the tumors. One approach to discerning the molecular differences in tumors is through the use of DNA microarrays, which can be used to identify a molecular signature of a tumor. Dr. Brody has worked to better understand the significance and errors in DNA microarray results. Identifying these molecular signatures might not only help in treating cancer patients, but also might lead to a better understanding of how cancers develop. To pursue this, Dr. Brody used a computational analysis of gene expression in normal and diseased tissue to identify a molecular signature that occurred in different types of tumors. This led to the identification of four new tumor markers: p62/SQSTM1, PDEF, S12/PSMD7, and Zibra. Further research is ongoing trying to understand what these tumor markers have in common.

His research in nanotechnology has two thrusts: applying the tools developed for modern biology to nanotechnology and, in turn, applying nanotechnology to better understand biology. He has worked with Professor Peter Burke of UCI's Electrical Engineering and Computer Science department to explore how electrical manipulation of DNA and proteins might lead to 3-dimensional electronic circuit assembly, an application of biology to nanotechnology.

He has two projects employing nanotechnology to better understand biology. The first uses an effect called surface plasmon resonance, in which the reflectivity of a nanoscale film of metal deposited on glass varies depending on the amount of biomolecules that absorb to the surface. Graduate student Limin Lin developed an assay based upon this effect to identify regions of DNA that bind to protein and turn on or off the expression of genes. The second, led by graduate student Alan Lee, generates nano-scale test tubes and uses these to probe the activity of single enzyme molecules.

In his career, he has published over 30 scientific papers and holds 11 patents.

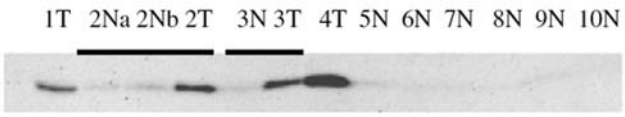


Figure 1: Work in Brody's laboratory led to the identification of a new breast tumor marker, shown in the figure. This protein, known as p62, was present, as indicated by the dark band, in tumors originating in four different women. Very little of this protein was detectable in normal tissue. The numbers indicate the patient number, while the N or T indicates normal of tumor tissue.

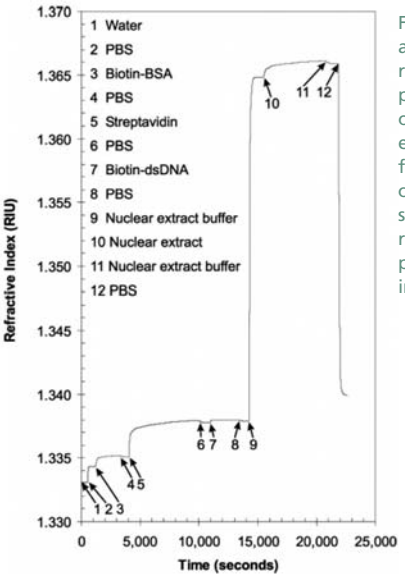


Figure 2: Brody's laboratory uses an effect called surface plasmon resonance to measure whether proteins bind to control regions of DNA. Results from a typical experiment are shown in this figure. Measurements are made continuously throughout a twelve step protocol. Further analysis reveals whether and how much protein bound to DNA that is immobilized on the sensor.

BME Celebrates First Undergraduate Class

The Henry Samueli School of Engineering is pleased to introduce the inaugural class of biomedical engineers. From the time of its launch in 1998, as the Center for Biomedical Engineering, this discipline has realized a rapid progression due to the Whitaker Foundation's generous donation of $3 million. The Department of Biomedical Engineering was established in 2002, highlighted by two undergraduate degree programs: biomedical engineering, and biomedical engineering - premedical. Today the department is exceeding expectations with enrollments of more than 400 undergraduate students.

Some of the students graduating with a degree in biomedical engineering will enter medical schools or pursue graduate studies. The rest will enter the workforce equipped to support the growing biomedical device field – combining engineering expertise with medical needs for the enhancement of health care. It is a branch of engineering in which knowledge and skills are developed and applied to define and solve problems in biology and medicine. Students choose the biomedical engineering field to be of service to people, for the excitement of working with living systems, and to apply advanced technology to the complex problems of medical care. Biomedical engineers may be called upon to design instruments and devices, to bring together knowledge from many sources to develop new procedures, or to carry out research to acquire knowledge needed to solve new problems.

Over the last 20 years, we have witnessed unprecedented advances in engineering, medical care, and the life sciences. The combination of exploding knowledge and technology in biology, medicine, the physical sciences, and engineering, coupled with the changes in the way health care will be delivered in the next century, provide a fertile ground for biomedical engineering. Biomedical engineering, at the confluence of these fields, has played a vital role in this progress. Traditionally, engineers have been concerned with inanimate materials, devices, and systems, while life scientists have investigated biological structure and function. Biomedical engineers integrate these disciplines in a unique way, combining the methodologies of the physical sciences and engineering with the study of biological and medical problems. The collaboration between engineers, physicians, biologists, and physical scientists is an integral part of this endeavor and has produced many important discoveries in the areas of artificial organs, artificial implants, and diagnostic equipment. They will help transform the future of medicine by providing the technology needed to minimize costly in-patient procedures, shifting medical diagnostics and continuous monitoring as well as patient care to the homes.

Doctorate Degrees

We are pleased to announce two newest doctorate degrees conferred by BME: Dr. Sheng Liu and soon-to-be-Dr. Limin Lin. They have made great contributions to the BME field and we wish them all the best knowing that they will make us proud. Go BME Anteaters! The following are brief descriptions of their accomplishments:

Sheng Liu successfully defended his dissertation on Jan. 27, 2005, after working hard for 4 years in the program. His dissertation title was: "Clear speech acoustics and perception: Implications for hearing aid design." He investigated why some speech sounds are easier to understand than others and attempted to design digital signal processing algorithms to make speech clear. His research has significant implications for hearing aid design and cell phones: Wouldn't you like to make the cell phone's speech clear in a noisy environment? By the time he defended his thesis, he published two papers in the Journal of Acoustical Society of America, submitted another two for consideration for publication, and is working on his fifth one to be submitted. He regularly attended national and international meetings and made friends in both academia and industry. He received multiple competing offers from coast to coast and finally settled for a start-up company in Palo Alto, CA, SoundID (www.soundid.com). Although he has zero-year experience, his salary doubles a full professor's at UCI.

Limin Lin will graduate with a Ph.D. in Biomedical Engineering this summer. Her research focuses on understanding how genes are turned on and off. It is known that this process is controlled by proteins binding to short pieces of DNA within the gene, however the identitiy of these pieces is not known for most genes. Limin developed an assay, based upon the effect called surface plasmon resonance, to detect proteins binding to DNA. She built the assay around a commercial surface plasmon resonance sensor, manufactured by Texas Instruments. Her research established that this assay was sensitive to measure binding between nuclear proteins and DNA. She is an author on two journal publications and she has presented her work at several conferences.

BME Discovery

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