



BIOFEEDBACK

B I O E N G I N E E R I N G @ M A R Y L A N D

A newsletter for friends
of the Bioengineering
Graduate Program

INSIDE

- 1 Bioengineering Continues Rapid Growth**
- 2 Message from Dr. Bentley**
- 3 Program News**
Fischell Fellowship
Kim Building
Dedication
Center for
Nanomedicine and
Cellular Delivery
- 4 Student News**
Incoming class profile
Profile of BIOE student
Martha Betz
- 5 Faculty/Staff News**
Recent Hires and
Appointments
Promotions
Awards Received
- 6 Current Research
Grants Awarded**

Bioengineering Continues Rapid Growth

2005 has been an eventful year for the University of Maryland's Bioengineering (BIOE) Program. Between moving into our new home on the third floor of the Kim Building, welcoming the largest class in program history, and increasing the number of Bioengineering faculty to over 50, this is certainly an exciting time for Bioengineering at Maryland.

The program moved into the Jeong H. Kim Engineering Building in the summer of 2005. This state of the art building now houses Bioengineering faculty, staff, and graduate student offices, as well as the Biomaterials, Orthopaedic Mechanobiology, and Functional Macromolecular laboratories. The program has started to develop an identity on the 3rd floor of the Kim Building, and the increased interactions between program faculty, students, and staff have been much-welcomed by all involved. Dr. John Fisher says of his new lab space, "The laboratories in the Kim Building are excellent. They provide us with the capability to carry out the collaborative research that is absolutely necessary in bioengineering today. Furthermore, the environment provided by the Kim Building will allow us to continue to attract the highest level of student researchers to the Clark School of Engineering." According to Anshu Rastogi, a second year student work-

ing in the Orthopaedic Mechanobiology Laboratory lab, "The Kim Building has a great architectural design; very modern and new. The facilities are equipped with the latest technologies, which is a nice feature. The lab space is well laid out, so it will be very exciting to finally get things started here!"

The excitement surrounding the Kim

continued on page 2



A view from the first floor of the Kim Engineering Building



Message From Dr. Bentley

GREETINGS from the BIOE Program; it is hard to believe we are in our third year of operation! We've seen momentous growth in our program since its inception, but the past 12 months in particular have been a whirlwind. We welcomed our largest class in history into the program, and moved our program offices, various faculty offices, and a number of laboratories into the new Kim Engineering Building. Additionally, we've appointed over a half-dozen new faculty members into BIOE this year. You can read about each of these developments in more detail in this issue of Biofeedback.

Our continuing students are hard at work in their respective labs. BIOE students can be found across the University of Maryland in the Departments of Chemical and Biomolecular Engineering, Mechanical Engineering, Electrical and Computer Engineering, Diagnostic Radiology (UMB), Kinesiology, and Materials Science and Engineering, to name just a few. Our faculty continues to grow with new additions on the College Park campus and at the University of Maryland Biotechnology Institute and the University of Maryland, Baltimore (Schools of Medicine and Pharmacy.) We continue to establish collaborations with external agencies and other UMD campuses. With support from the College Park administration, we have created

seed funding for research projects between College Park faculty and clinically focused faculty from the Schools of Medicine, Pharmacy, and Dentistry. We have also established a relationship with the Center for Nanomedicine and Cellular Delivery at the School of Pharmacy. Several of our BIOE faculty are actively engaged in next generation "nano" methods for disease diagnosis and drug delivery.

We are enhancing our collaborations with the FDA this Fall; several BIOE faculty visited their Medical Imaging and Diagnostics Laboratory at the Center for Devices and Radiological Health and gave presentations about the research being done in the BIOE Program. We found many points of connectivity for future research partnerships. We also anticipate the impact of our education program will be enhanced by connecting with regulatory agencies such as the FDA.

If you have ideas, time and interest and would like to contribute towards mapping the future of Bioengineering@Maryland, please let us know. Now that our program has a permanent home, I also hope you will find the time to stop in and visit!

With Best Wishes,
WEB

2

continued from page 1

Building helped us recruit the entering class of Fall 2005. The new class is the largest in the Bioengineering Program's history, with 10 new students joining us in College Park in late August. More about the incoming class can be found in this issue's Student News section.

In addition to growing the stu-

dent body, we continue to grow the Bioengineering faculty as well. We now have over 50 faculty affiliated with our program. BIOE faculty come from over 12 academic departments on the College Park campus, the Schools of Medicine and Pharmacy in Baltimore, and the University of Maryland Biotechnology Institute

(UMBI.) Our newest assistant professor, Dr. Helim-Aranda Espinoza, joined us in August 2005. Dr. Aranda-Espinoza is profiled in this issue's Faculty News.

Fischell Fellowship in Biomedical Engineering Awarded

Congratulations to **Matthew Dowling**, recipient of the 2005 Fischell Fellowship in Biomedical Engineering. His proposal, “Gelatin Nanoparticles Containing Stabilized Vesicles: A



Matthew Dowling, first year BIOE student and Fischell Fellowship winner

Novel Chemotherapeutic Delivery System for Treatment of Malignant Glioma,” impressed the members of the selection committee, who awarded him this prestigious fellowship. Matt comes to UMD via Notre Dame, where he earned his B.S in Chemical Engineering in 2004.

The Fischell Fellowship supports a full time graduate student in a Ph.D. program at the University of Maryland as they work to develop a new medical device or system that could be valuable in the treatment of a human disorder. It is designed to go beyond scholarly achievement to produce new medical systems and devices to treat disease. The awards are made based on competition, ingenuity, and original ideas. In addition to financial support, the recipient of the Fischell Fellowship receives the support of UMD faculty drawn from life sciences, physical sciences, and engineering, as well as access to the entrepreneurial opportunities at the Clark School’s Engineering Research Center and at the R.H. Smith School of Business.

Matt hit the ground running and has already expressed an interest in taking classes in entrepreneurship and product development at the Robert H. Smith School of Business. We are sure to see more of Matt and his research in the future.

Jeong H. Kim Engineering Building Dedicated

The Bioengineering Program’s new home, the Jeong H. Kim Engineering Building, was formally opened at a dedication ceremony on September 19, 2005. The 140,000 square foot building includes a new clean room facility, as well as more than 16 new state-of-the-art laboratory facilities. In addition to bioengineering, major emphases of the Kim Building include information technology, micro-electronics and MEMS, sensors and actuators, environmental engineering, transportation systems, and space research. In addition to the multidisciplinary research labs, the Kim Building houses six educational labs, each of which was built so that it can adapt to technology advances.

The Kim Building is a research and education center where labs are shared



BIOE faculty, students, and staff at work in the Orthopaedic Mechanobiology Lab in the Kim Engineering Building

across departments to encourage cross-disciplinary work. Its facilities and layout encourage both major conferences and small, impromptu discussions where new ideas are exchanged and its spacious design and communications systems foster a spirit of openness.

The Kim Building’s construction components serve as a working laboratory. For example, in certain areas students will be able to alter heating, cooling, and other mechanical controls; different types of window glass will teach students about heat transfer; transparent parts of the building will demonstrate construction principles; and sensors will measure the vibration of outside traffic.

Bioengineering faculty who have office and/or lab space in the Kim building include Helim Aranda-Espinoza, William Bentley, John Fisher, Reza Ghodssi, Adam Hsieh, and Peter Kofinas. The Bioengineering Program Office is also housed in the Kim Building.

UMD Creates the Center for Nanomedicine and Cellular Delivery

Successful research and development in nanomedicine requires the interaction of a multitude of disciplines including material science and engineering, cellular biology and clinical translational research. To meet this need, faculty from the Schools of Pharmacy, Dentistry, Medicine, and Greenebaum Cancer Center at the University of Maryland, Baltimore and Colleges of Engineering and Life Sciences at the University of Maryland College Park created the Center for Nanomedicine

Continued on page 6

Fall 2005 Entering Class Profile

We are proud to welcome the Fall 2005 entering class to the Bioengineering Program: the largest in BIOE Program History! The admissions process was highly competitive this year and the ten students who joined us this Fall come armed with impressive academic and research credentials.

Michael Armani loved the University of Maryland so much as an undergraduate he decided to remain a Terrapin for his graduate work. **Marina Chumkov** comes to UMD from Lehigh

University with a degree in Materials Science and Engineering. **Brendan Casey**, a Massachusetts native still “on Cloud 9” from the 2004 Red Sox World Series win, joins us from Duke University. A Notre Dame graduate, **Matthew Dowling** has been a special student at UMD for the past year and has done work in Professor Srinivasa Raghavan’s lab. **Ian Gifford** chose UMD so that he could work with Professor Mohamad Al-Sheikhly. **Andreas Jahn** joins us from the National Institute of

Standards and Technology (NIST), where he has been working with Professor Don DeVoe. **Susan Lee**, an alumna of The Johns Hopkins University, will be working with Professor Nam Wang. **Leann Matta** comes to us with a B.S. in Microbiology from Wagner College. **Peter Thomas**, a graduate of the University of Florida, has been working most recently at the NIH. Finally, **Hsuan-Chen Wu** wins the award for the longest commute- he comes to College Park all the way from Taiwan’s National Taiwan University.

Q&A with BIOE Student Martha Betz



Martha Betz, second year BIOE student

Martha Betz is a Ph.D. student who entered the Bioengineering Program in Fall 2004. She is currently working in Dr. John Fisher’s Biomaterials lab. We sat down with Martha recently to learn more about her background, her experiences in

the BIOE Program, and what she plans to do when she graduates.

Biofeedback: First things first. Being a New Englander, how do you like the chances of a repeat Red Sox World Series Championship?

Betz: Well, I would like to say that they could do it. Currently we are in the lead but there is so much time until the end of the season. We can still hope though! I also like our chances with the Patriots.

Biofeedback: Tell us a little about your background. Where are you from in New England? What did you study as an undergraduate?

Betz: I grew up in a very small town outside of Bangor, Maine and I attended Tufts University (go Jumbos!), just north of Boston, Massachusetts. At Tufts I majored in Chemical Engineering and Biotechnology and graduated in May

2004. That fall I decided to leave New England for a while and moved down here to start the Bioengineering program. In January I joined Dr. Fisher’s Biomaterials laboratory.

B: Why did you decide to pursue a Ph.D. in Bioengineering? And why did you pick the University of Maryland?

Betz: I decided to pursue a Ph.D in Bioengineering as a continuation of what I was working on as an undergraduate. At Tufts I worked in a lab studying the differentiation of stem cells and I wanted to explore more topics in depth in that area. I looked at a lot of schools before making my decision on where to attend. I chose the University of Maryland because there were specific professors I was interested in working with and I enjoyed talking with the faculty and students I met while I was here. Also, the program is small and tight-knit, and just seemed like the place for me.

B: What has been your favorite part of the BIOE Program thus far?

Betz: My favorite part of the program has been getting to know the other students and faculty I've been working with. Everyone comes from a different background and it's interesting to see how we all got here. In addition, the program is so diverse that it is fun to learn about everyone's projects and possible collaborations between labs. Of course, going out in D.C. with the other students is fun too!

B: Does Dr. Fisher give you any time for R & R? If so, what do you do in your spare time?

Betz: I definitely have free time. Granted it's not a lot, but I have time to go out to dinner, attend baseball games, explore D.C. during the day and night, and just relax and watch movies with my friends. This summer I have also made use of the campus pool and tennis courts, and am hoping to go camping in Shenandoah Valley sometime soon. When I have a longer amount of time I like to go out west, specifically to Colorado, to go hiking and maybe this winter to go skiing.

B: Tell us a bit about what you are working on in the lab. What's your favorite aspect of lab-work? How do you like your new space in the Kim Building?

Betz: I am working on osteogenic differentiation of mesenchymal stem cells using polymeric scaffolds. My favorite thing about lab-work is figuring out how to do everything. Most things don't work on the first attempt, and it's very satisfying when you are successful. Furthermore, lab-work in general is very challenging and it's fun to try to do things that no one has done before.

Our new space in the Kim Building

facultyNEWS

Recent Appointments and Promotions

Professor Mohamad Al-Sheikhly, a member of the BIOE faculty, was recently promoted to the rank of Full Professor in the Department of Materials Science and Engineering. Congratulations Mohamad!

Welcome
Professor Helim Aranda-Espinoza!

Professor Aranda-Espinoza comes to us from the University of Pennsylvania, where he had been working as a postdoctoral fellow in the Bioengineering Department under Professor Daniel Hammer since 2003. Prior to the University of Pennsylvania, Aranda-Espinoza had been at the University of Delaware. He earned his Ph.D. in Physics from the Universidad de San Luis Potosi, Mexico in 1998.

Aranda-Espinoza's research interests lie in the application of the theoretical and experimental machinery of physics



New BIOE faculty member Helim Aranda-Espinoza

and engineering to obtain a quantitative understanding of specific problems inspired by biological systems. His long term aims are to develop a fundamental understanding on cell mechanics and the mechanisms by which motile cells adhere, spread, and crawl over adhesive substrata with a primary focus on cells involved in cardiovascular disease.

Dr. Martha Connolly, Director of the Maryland Industrial Partnerships (MIPS) program at the Clark School's Maryland Technology Enterprise Institute (MTECH), joined the BIOE faculty this past summer. Dr. Connolly earned her Ph.D. in Biomedical Engineering from John's Hopkins University and has extensive experience in academia and in the biotechnology industrial sector. Prior to coming to UMD, Dr. Connolly oversaw the business development activities at EntreMed Inc., a publicly-traded biopharmaceuticals company. She also co-founded the start-up technology development/commercialization firm Clairus Technologies Inc.

is great. We are incredibly lucky to be here. Our new lab is great and big enough to hold our expanding group. Hopefully we'll be able to get a lot of work done here.

B: What do you hope to do after graduate school? Why?

Betz: I'm still not sure what I'm going to

do after I graduate, but I still have plenty of time to decide! As an undergraduate I had quite a few internships in industry and enjoyed all of them. I think I will probably work at a biotechnology company, but who knows?

Professor Jose Contreras-Vidal comes to the BIOE Program from the Department of Kinesiology in the College of Health and Human Performance. His research program integrates behavioral and computational neuroscience methods to study the neural mechanisms and computational principles underlying adaptive sensory-motor control in humans during normal and neurological conditions. Professor Contreras-Vidal is supervising the research of second year BIOE student Trent Bradberry.

Professor James Culver is the second faculty member from UMBI to join the BIOE Program faculty. Culver is a member of UMBI's Center for Biosystems Research (CBR) and his research interests include pathology of programmed cell death, plant defense and stress responses, and virus templates for nanocircuit construction.

Professor Philip DeShong is a Professor in the Department of Chemistry and Biochemistry. His research interests include the synthesis of heterocyclic natural products, developing methodology for organic synthesis, mechanistic organomanganese chemistry, organic/organometallic reactions at high pressure, the chemistry of carbohydrate, hypervalent silicon derivatives, and developing new methods for the synthesis of combinatorial libraries.

Professor Wolfgang Losert joined the BIOE faculty in Spring 2005. An Assistant Professor in the Physics Department, Losert's research uses the tools of nonlinear dynamics and statistical physics to understand and control the properties of "soft" materials. His lab studies granular flows, crystal patterns, and self-assembled biomaterial structures such as actin fiber, collagen networks, and model cells. He uses high speed imaging, two photon confocal microscopy and holographic laser tweezer techniques in his investigations.

Dr. Adrian Park, an internationally recognized expert in laparoscopic surgery, joined the BIOE faculty last summer. Dr.



Dr. Adrian Park of the BIOE Program and the University of Maryland School of Medicine

Park, the Chief of General Surgery at the University of Maryland Medical Center, was instrumental in organizing the BIOE Program's visit to the Medical Center last year.

David Ryan

joins BIOE as a laboratory technician in Professor Adam Hsieh's Orthopaedic Mechanobiology lab. David graduated in May 2005 from the University of Vermont with a B.S. in Mechanical Engineering with a concentration in Biomedical Engineering. As an undergraduate, David spent time in a biomechanics lab where his greatest interest was in the study of soft tissue, specifically the effect that mechanical loading has on the material properties of intervertebral disc tissue. In the Hsieh lab, David will focus on the relationship between mechanical loading and the biological response of intervertebral disc tissue.

Nanomedicine and Cellular delivery continued from page 3

and Cellular Delivery (CNDC.) The center was officially chartered in March 2005. BIOE and School of Pharmacy faculty member **Hamid Ghandehari** serves as Director of the CNDC.

The center's vision is to improve health by enhancing the efficacy and safety of new and existing therapeutic and diagnostic agents through the discovery and application of innovative nanosystems and devices. CNDC faculty members plan to create a multidisciplinary research environment that will provide expertise

Faculty Honors and Awards

Professor John Fisher received the prestigious National Science Foundation Faculty Early CAREER Award in early 2005. The National Science Foundation CAREER program fosters the careers of outstanding junior faculty, combining the support of research and education of the highest quality in the broadest sense. Fisher was recognized for his proposal, "Enhancing Cell Signaling in Heterogeneous Cell Populations." He plans to use the award to explore the fundamental relationship between the properties of synthetic matrices and encapsulated cell signaling.

Professor Arthur Johnson was recently named a Fellow of the Biomedical Engineering Society and also of the American Industrial Hygiene Association. Professor Johnson is also the President of the International Society for Respiratory protection and Secretary of the Biomedical Engineering Society.

and foster collaborations for the design, development and translation into clinic of nanosystems for use as therapeutic and diagnostic purposes. The center has over 20 UMD faculty members affiliated with it, including five BIOE faculty (**Professors DeShong, Ehrman, Ghandehari, Kofinas, and Raghavan.**) To learn more about the Center for Nanomedicine and Cellular Delivery, please visit their website at <http://www.pharmacy.umaryland.edu/nanomedicine/default.htm>.

BIOE Faculty Awarded Grants



Professor Peter Kofinas with students at work in Functional Macromolecular Lab

Professor Peter Kofinas, in collaboration with **Professors Bill Bentley** and **James Culver**, was recently awarded a grant by the USDA. The grant, entitled “Molecularly Imprinted Polymers for Virus Recognition,” provides funding for work that will elucidate the mechanism of virus recognition in molecularly imprinted polymers (MIP), using techniques already developed in Kofinas’ laboratory. The development of a virus imprinted MIP would apply to the identification, classification, and removal of viruses. Professor Kofinas says this is currently a very difficult task, but the need is widespread in diverse sectors, including gene therapy, homeland security, human and animal health, crop protection, and biologics production. The removal of viruses could potentially impact a wide range of diseases.

Professor Hamid Ghandehari was recently awarded a grant by the National Cancer Institute (NCI) of National Institutes of Health (NIH) for a project entitled “Engineering Polymers for Gene Therapy of Head and Neck Cancer.” This study aims at the localized matrix-mediated delivery of adenoviral particles using protein based polymers for the treatment of head and neck cancer.

Ghandehari was also awarded funding for the Third Annual Symposium on Nanomedicine and Drug Delivery. This proposal supported the organization of the above-mentioned conference that

was held at the University of Maryland, Baltimore in September 2005. The focus of this symposium was recent advances in nanomedicine with emphasis in the delivery of bioactive agents for therapeutic and diagnostic purposes. The National Institute for Biomedical Imaging and Bioengineering (NIBIB) at the NIH was the funding agency.

Students at work in Dr. Fisher’s Biomaterials Lab in the Kim Engineering Building



BIOFEEDBACK is published annually for friends of the Bioengineering Program at the A. James Clark School of Engineering. Your news and comments are welcome; please send them to:

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