



WPI

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Biomedical Engineering

Participates in K12 Outreach Program

Prof. Kris Billiar along with Prof. Terri Camesano, Associate Professor of Chemical Engineering, recently received a NSF award that was designed to aid middle school teachers in developing bioengineering design projects to teach difficult science, technology, engineering and math (STEM) concepts. The award entitled *“Inquiry-based Bioengineering Research and Design Experiences for Middle-School Teachers”* is part of a NSF Research Experiences for Teachers (RET) program.

The long-term goals of WPI's RET in Engineering Site program are to motivate and improve middle school student-learning in engineering and establish a collaborative partnership between the Worcester middle-school teachers and WPI engineering faculty through inquiry-based experiences in bioengineering.

The first phase of the program began during the summer of 2008 with six middle school teachers participating in a six week long intensive

research experience in the Life Sciences and Bioengineering Center at Gateway Park. These teachers worked alongside BME Faculty members, Prof. Glenn Gaudette, Marsha Rolle, George Pins and



graduate students participating in high-level research projects in fields such as tissue engineering, regenerative medicine and infection control on biomaterials. It was critical that all projects present authentic design challenges with realistic constraints to engage the students fully.

As a result of this program, all teachers reported an increase in confidence in teaching engineering concepts, as well as, a renewed enthusiasm for teaching these topics. The teachers also reported that their students were eager to get into the lab to construct and test their prototypes. It

appears that engineering design projects related to bio-mechanics both motivated student learning and reinvigorated the teaching of difficult science and engineering topics.

WPI is now in the process of recruiting a total of 21 middle school science teachers (7 per year) primarily from Worcester Public Schools to participate in the six week long intensive summer research experience. For more information regarding this program, please visit our web site at: <http://www.wpi.edu/Academics/Depts/BME/RET/>.



Pictured above: (L-R) Robin Belisle, Tantasqua Regional; Mary Fusco, Pathfinder Regional Vocational Technical High School; Tanea Cezar, Fuller School, Framingham; Tom Olivia, Forest Grove Middle School, Worcester; Cecilia Gray, Midland St. School, Worcester; and, Veronica Tate, Worcester East Middle School.



“Yet the most important lessons I learned while studying at WPI were often times well outside of a classroom.”



Lisette Manrique '03

I am currently working as a Research & Development Engineer for the Sports Surgery division of Covidien. My focus is on new product development & design for sports surgery devices, particularly those used in performing ACL (Anterior Cruciate Ligament) repair.

The benefit of working in new product development is that I am able to be involved in all steps of the design process. This involves understanding what the customer needs to providing a finished product in the surgeon's hand; and everything in between. A typical day can include any of the following activities: brainstorming conceptual design solutions, pro-

In Her Own Words

totyping new designs, observing surgery and meeting with surgeons to gain voice of the customer, or performing evaluations at animal or human cadaver labs to ensure the safety & efficacy of our products. My academic experience at WPI prepared me well to undertake these types of tasks. When I completed my Bachelor's degree in Biomedical Engineering, I certainly did not feel ready to transition into industry immediately. Little did I know at the time that all of the exercises which I had completed in my engineering design, biomaterials interactions, and CAD courses would directly correlate to many of my daily tasks in Research & Development. Aside from course content, the WPI philosophy of teamwork & collaboration has also instilled in me the importance of the ability to function dynamically within a group; which is an integral part of performing on a R&D team.

Yet the most important les-

sons I learned while studying at WPI were often times well outside of a classroom. I recall my Godfather (a college professor and high school teacher himself) impressing upon me the disappointing notion that many educational institutions focus solely on teaching their students how to make a living, but not how to make a life. Perhaps it was not the original intention of the WPI Plan (or curriculum) but WPI has ever-so-generously imparted the knowledge upon me of how to make a life. While I'm sure that I could have learned how to make a living at any comparable engineering university, WPI has offered a unique environment teaming with mentors and friends whom are eager to help their students succeed in every aspect of life. It is not just the faculty who would make a habit of this, but also the staff and students who enrich the culture on campus with their open-mindedness and approachability.



Professor Robert E. Peura Retires

In recognition of Professor Peura's long-time service to the Biomedical Engineering Department and to WPI a reception was held in his honor on Thursday, October 30th, 2008 where many of his colleagues and friends had the opportunity to congratulate him.

While Bob is still advising students, he now has more time to devote to his company, Grove Instruments, located in Worcester, MA. **Congratulations Dr. Peura!**

2009 Central MA Start! Heart Walk

WPI's Biomedical Engineering Department will be heavily involved again this year in the American Heart Association's **2009 Central MA Start! Heart Walk**. Prof. Glenn Gaudette, Co-chair of the event, and Prof. Marsha Rolle, member of the Executive Leadership Team, will participate in the walk on May 2, 2009 starting at Cristoforo Columbus Park in Worcester. Heart disease is our nation's leading causes of death and disability. Funds raised through events like the Heart Walk help lead the fight against heart disease and stroke in part by funding research.



Team WPI BME
Worcester Heart Walk 2008

Prof. Kristen Billiar and Glenn Gaudette are both recipients of Scientist Development Grants from the American Heart Association. These prestigious awards help fund graduate students and research at the Life Sciences and Bioengineering Center at Gateway Park. Last summer, BME graduate student Megan Murphy BS'07 & MS'08, under the guidance of Prof. Gaudette, received an American Heart Association Student Scholarship in Cardiovascular Disease and Stroke to fund her research on a new developing a novel method to deliver adult stem cells to the heart.

If you are interested in joining or sponsoring the WPI BME team at this year's Heart Walk, visit the team page at www.worcesterheartwalk.org, then click on "More" in the company ranking box.

First Annual Turkey Bowl

Despite game time temperatures in the 20's, things heated up quickly on Saturday, November 22, when the faculty/graduate students took on the undergraduate (UG) students in flag football. The UGs quickly took a 7-0 lead with an opening drive touchdown in 4 plays. The UG's defense let the faculty and graduate students know they were for real by sacking QB Prof. George Pins at the 1-yard line, ending the series and setting up another easy touchdown by the UGs.

The faculty and grads tried to make a game of it in the second

half, with Prof. Kris Billiar pounding in a 2-yard TD run. But once again, the UG students responded efficiently. With the rest of the defense retreating to protect against the long pass, this play isolated Pins on the UGs' quarterback, who took advantage of the situation for a 30 yard gain. After several key passes, it looked like the UG students were about to put the game out of reach until Prof. Glenn Gaudette intercepted a pass on the 10-yard line. Back under center, Pins completed passes to his colleagues before an offensive miscue allowed the de-

fense to sniff out and intercept a pass. The UGs picked up 60 yards primarily through their air attack en route to another score. The faculty and grad students responded, engineering a scoring drive of their own, punctuated by a long touchdown pass from Pins to Billiar, to cut the deficit to 21-14. Approaching the two-minute warning, the UG offense experienced its first 4-and-out of the day, leaving the pressure on the defense. The UGs' defense responded: on a trick play, the ball was tipped at the line of scrimmage, and a shoestring interception gave the ball back to the UG offense.

Playing conservatively to protect their lead, the UGs completed several screen passes, capped by a 30-yard catch-and-run for a touchdown as time expired.

With the first annual BMES Turkey Bowl going to the UG students by a score of 28-14, the faculty has already called for a rematch. Perhaps the faculty will have better luck in the Spring Chicken Bowl!



Graduate Research Achievement Day 2009

The Fourth Annual Graduate Research Achievement Day (GRAD 2009) will be held on Wednesday, April 1, 2009 in the Campus Center Odeum. GRAD 2009 will celebrate the research activities of our graduate students with a poster-style symposium. This event provides graduate students with the opportunity to present their research to peers, faculty, the WPI community and their guests, and to facilitate the exchange of information and ideas across a wide variety of disciplines.

The session is open to the public from 1:00 to 3:30 pm.



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“Theory and Practice”

Publications & Presentations

Publications

Throm, A., Liu, W., Lock, C., and Billiar, K.L., “Development of a cell-derived biomaterial in a chemically defined culture system: Effects of epidermal growth factor,” *Journal of Biomedical Material Research, Part A*. In Press

Balestrini, J., Billiar, K., “Magnitude and duty cycle of equibiaxial stretch modulates fibroblast remodeling of fibrin gel tissue equivalents,” *Journal of Biomechanical Engineering*. In Press

Tang, D., Yang, C., Kobayashi, S., Zheng, J., Woodard, P., Teng, Z., Billiar, K., Bach, R., Ku, D., “3D MRI-Based Anisotropic FSI Models with Cyclic Bending for Human Coronary Atherosclerotic Plaque Mechanical Analysis,” *Journal of Biomechanical Engineering*, in Press.

“Enhanced recovery of mechanical function in the canine heart by seeding an extracellular matrix patch with mesenchymal stem cells committed to a cardiac lineage.” Potapova IA, Doronin SV, Kelly DJ, Rosen AB, Schuldt AJ, Lu Z, Kochupura PV, Robinson RB, Rosen MR, Brink PR, Gaudette GR, Cohen IS. *AM J Physiol Heart Circ. Physiol.* 2008 Dec; 295 (6): H2257-63 Epub 2008 Oct 3.

Presentations

Bright, L., L. Sturgis, J. Thibideau, R. Dunn, K. Billiar, “Design of a New Rotational Interface Between Microvascular Clips and Their Applying Forceps,” presented at the 34th Northeast Bioengineering Conference, Providence, R.I., April 2008.

Ebner, T., L. Bitner, H. Deitelbaum, J. Sribnoska, B. S. Balestrini, M. Rolle, and K. Billiar, “Design of Biaxial Device for Measuring Cell Contractile Forces,” presented at the 34th Northeast Bioengineering Conference, Providence, R.I., April 2008.

Presentations (Continued)

Kan, V., I. Malek, S. McDermott, L. Worobey, M. Rolle, and K. Billiar, K. “Design of Device to Measure the Stiffness of Suspended Collagen Gels,” presented at the 34th Northeast Bioengineering Conference, Providence, R.I., April 2008.

John, J., and K. L. Billiar, “Boundary Stiffness Regulates Fibroblast Behavior in Collagen Gels,” ASME Summer Bioengineering Conference, Marco Island, Fla., June 2008.

McCormick J. J., D. Weiss, R. Lavado, K. Billiar, and J. J. Wixted, “Biomechanical Investigation of a Novel Arthrodesis Nail,” American Orthopaedic Foot and Ankle Society: 24th Annual Summer Meeting, Denver, Colo., June 2008

Throm, A. M., J. John, K. B. Billiar, “Effects of Environment Stiffness on VIC Phenotype,” Biomedical Engineering Society Annual Fall Meeting, St. Louis, Mo., Oct. 1-4, 2008.

“Paramagnetic Substrate for Molecular MR Imaging of EGF Receptor in Human Glioma Model Using Targeted Antibody-Conjugate Enzymatic System,” A. A. Bogdanov, M. DeLeo III, M. Shazeeb, H.-W. Kang, C. H. Sotak, Abstract, Poster Presentation at the 2008 World Molecular Imaging Congress (WMIC 2008), Nice, France, September, 2008.

Prof. Kristen Billiar and Prof. Glenn Gaudette, both recipients of Scientist Development Grants (SDG) from the American Heart Association (AHA), attended the AHA’s 2008 Scientific Sessions, which was held in New Orleans, LA from November 8-12th. Prof. Billiar presented results from his four-year AHA grant regarding the effects of mechanical cues on the biology of interstitial cells that repair and can also cause disease of the aortic valve. The meeting was attended by over 25,000 biomedical engineers, clinicians, basic scientist and other cardiovascular specialists.

Upcoming Conference

The 35th Northeast Bioengineering Conference will take place April 3-5, 2009 at The Joseph B. Martin Conference Center at Harvard Medical School, 77 Avenue Louis Pasteur, Boston, MA. For more information please visit nebec.org.

Students in the News

Congratulations



Gregory Lucini '10 was elected as Treasurer of the Student Government Association for the 2009 calendar year. Greg has been involved in the SGA since C-term of his freshman year, serving on a wide range of SGA and faculty committees. He is majoring in Biomedical Engineering, with a minor in Law and Technology. After graduation, he hope to attend law school. His goal is to blend the two fields of biomedical engineering and law together through a career in patent law, public policy, or corporate council to biomedical companies.