The recipients of the 2008 UMMS-WPI Pilot Research Initiative were announced in September. The grant program, funded jointly by WPI and the University of Massachusetts Medical School (UMMS), was created to encourage collaboration in translational research between the two institutions. Two grants were funded this year, one of which was awarded to WPI Biomedical Engineering faculty members Marsha Rolle, PhD and George Pins, PhD, and their collaborator John Keaney, Jr., MD, Chief of the Division of Cardiovascular Medicine at UMMS. The project integrates technology and expertise in engineering design, vascular cell biology, and genetic engineering to create a novel in vitro model of human vascular tissue to evaluate endothelial cell (EC)-smooth muscle cell (SMC) interactions in the artery wall. The ultimate goal is to establish a system that can be broadly applied as a platform technology to model EC-SMC interactions in bioartificial vascular grafts, normal blood vessels, and in pathological states such as atherosclerosis. This system will be used to establish design parameters to improve vascular tissue engineering and test the effects of SMC-derived factors on EC attachment and function. Another important goal is to strengthen the existing connections between clinical researchers at UMMS and biomedical engineers at WPI to build sustainable collaborations in cardiovascular medicine and engineering.

This is the second year that the UMMS-WPI Pilot Research Initiative proposals have been solicited. Last year’s recipient was WPI BME faculty member Prof. Christopher Sotak and his colleagues at UMMS: Mitchell S. Albert, professor of radiology and director of MRI research at the UMass Medical School; and Marc Fisher, professor of neurology and vice chairman of the Department of Neurology at UMass.

From the press release posted to the WPI home page on September 11, 2008 by Michael Cohen:

“We created this program to encourage more collaboration between our institutions, so we can leverage the strengths of each to accelerate translational research,” said Grant W. McGimpsey, PhD, associate provost for Research and Graduate Studies, ad interim, at WPI, and co-director of the UMMS-WPI grant program. “I think the two projects funded this year are not only meritorious scientifically, but they are great examples of the synergies we can achieve by working together.”

Stephen Doxsey, PhD, professor of molecular medicine at UMMS and co-director of the grant program, agreed, noting that “this program was conceived from conversations between investigators at both institutions focused on bringing more rigor to basic biological and clinical studies through the Continued on page 3)
I also am grateful for the diversity of material taught as part of the BME curriculum.

In Her Own Words

Shruti Pai ‘04, MS ‘05

Those of us with healthy, fully functional feet may ask, why study feet? Well, there are a lot of people who have foot deformities, diseases, or have experienced trauma that affect the functionality of their lower limbs. In pursuing a PhD in Mechanical Engineering at the University of Washington, I have elected to conduct my research on feet at the Center of Excellence for Limb Loss Prevention and Prosthetic Engineering at Seattle’s Veterans Affairs Hospital (VA Puget Sound). The Center is a collaborative community of clinicians, scientists, and engineers working towards the shared goal of reducing amputations, preserving the lower limb and its functions and, in the event that amputation is necessary, improving the design of available prosthetics for amputees.

My work is more on the preventative side of amputation. The goal of my research is to model the material properties of plantar soft tissue in diabetic patients. There is an increasingly high prevalence of patients with diabetes worldwide, and it is estimated that 20.8 million people in the U.S. alone have diabetes. The significance of these statistics is seen in the fact that 60% of non-traumatic lower-limb amputations in the U.S occur in people with diabetes. In most cases, as a result of elevated plantar pressures and sensory neuropathy (loss of sensation), foot ulceration develops into chronic wounds and if not treated immediately, could lead to amputation of the affected foot. Current preventative measures to reduce the risk of ulcers developing are having patients check their feet routinely and wear orthoses or shoe insoles to reduce the high plantar pressures. In order to help improve orthoses and develop advanced treatments for reducing ulceration risk, a better understanding of the afflicted tissues is essential. Thus, my job is to conduct material tests on undiseased and diabetic cadaveric tissues and use my engineering knowledge to model the material property differences between both populates. The data I obtain from these tests can then be applied to a finite element model of the foot to simulate different loading conditions that would provide insight into improving current orthoses.

Tying my current work to WPI is easy. My MQP and my Masters taught me the power of collaboration from working with professors, surgeons, and other engineers, skills I certainly use now. Both my MQP and my Masters thesis gave me a strong sense of what is needed to develop a project from conception to publishable data. They helped me hone my literature review skills and project planning and also boosted my confidence to just dig into the hands-on aspect of engineering research. People get overwhelmed upon hearing I dissect cadaver feet, but compared to the live animal surgeries that I performed during my undergraduate coursework and thesis, I feel more than prepared. I also am grateful for the diversity of material taught as part of the BME curriculum; even if the material was not covered in detail, I am finding that what I did learn was helpful enough to get me started even years later. Most of all, as cheesy as it may sound, I find that the bonds I made with my BME peers and professors at WPI, connections I still maintain today, are what have helped me grow both as a person and a professional to date.
applied research, with the basic and clinical science excellence at UMass, is a logical fit,” McGimpsey said. “Early seed money for research like this is critical for testing ideas, seeing what works, and gathering data that can then be used to launch major research and development efforts with external funding. That’s the hope for our collaboration with UMass.”

With the second round of grants now awarded, Doxsey said he hopes the WPI-UMMS program will continue to grow and foster important translational research. “There is great excitement about the potential of the joint research endeavors established through the UMMS-WPI funding initiative,” Doxsey said. “Not only does this financial support provide opportunities to establish new institutional and individual partnerships, and to develop new marketable lead products for industry, but there is hope that these efforts will help crack difficult problems in biology and disease, and facilitate translation of those successes into the clinic.”

Professor Robert E. Peura Retiring

Please join the entire BME Department in wishing our colleague Prof. Robert A. Peura a well-deserved, relaxing, and joyful retirement after 40 years of dedicated and accomplished service at WPI. A reception in recognition of Bob’s long-time service to the Department and WPI will be held on Thursday, October 30th, from 3:00 to 5:00 pm in the Higgins House Great Hall.

2008 BMES Annual Fall Meeting

Several students and faculty members recently attended the 2008 BMES Fall Meeting, Gateway to Innovation, which was held October 2-4, 2008 at the Renaissance Grand Hotel, St. Louis, Missouri. The hosts of this year’s meeting were Washington University and Saint Louis University.

Jason Hu ’09 gave a platform presentation in the Undergraduate Technical Session, which included 18 platform presentations and 90 poster presentations. The title of Jason’s presentation was “A Model System for Rapid Generation of Cell-Derived Vascular Tissue.” Co-authors included Alex Christakis (BME ’09), Jeremey Skorinko (MS student, BME), Tracy Gwyther (PhD candidate, BME), and Prof. Kris Billiar.

Megan Murphy BS ’07, MS 08, presented a poster entitled “Fibrin Microthreads Promote Stem Cell Growth for Localized Delivery in Regenerative Therapy.” The poster summarized Megan’s thesis work, which investigated the potential of fibrin microthread scaffolds to improve delivery of human mesenchymal stem cells to injured tissues for regeneration. Co-authors included Lisa Marie DiTroia ’08, Shawn Carey, ’09, Craig M. Jones ’10, Prof. Marsha Rolle, Prof. George Pins, and Prof. Glenn Gaudette.

PhD candidate Angie Throm also presented a poster entitled: ‘Effect of Environmental Stiffness on VIC Phenotype’

Professors Kris Billiar, George Pins and Marsha Rolle also attended the conference.
Spotlight on Awards & Presentations

Awards

Prof. Glenn Gaudette was recently awarded an additional $16,488 from Synovis Life Technologies, Inc. for his ongoing research project “The Use of Veritas as a Cardiac Patch.” Prof. Gaudette has been working with Synovis Life Technologies, Inc. for the past 4 years to develop treatments for cardiac disease.

Prof. Glenn Gaudette is part of a Planning Grant for Emerging Opportunities and Consortia Development for Stem Cell Research funded through New York State’s Empire State Stem Cell Trust Fund. This award, for $118,800, seeks to develop collaborations to establish a comprehensive infrastructure for the stem cell research community between the lead institution, SUNY – Stony Brook, and the collaboration institutions, WPI and Technion (in Israel). WPI will likely play an essential role in evaluating the mechanical function resulting from various cell therapies to treat cardiac diseases. In addition, WPI’s expertise in biomaterials will also be useful for the successful development of cell therapy for the heart. If successful, this planning grant is likely to lead to a $19M proposal to NY State to fund this work.

Conference Proceedings


Conference Proceedings (continued)


Presentations

Mended Hearts Talk

On October 15th, Prof. Glenn Gaudette gave a talk to the Greater Hartford Chapter of the Mended Hearts organization. The Mended Heart organization offers help, support and encouragement to heart disease patients and their families. They provide educational programs for heart disease patients. Prof Gaudette spoke about his work on adult stem cells and provided the group with an update on the potential to treat heart disease.

Publications

Controlled Aggregation of Ferritin to Modulate MRI Relaxivity, Kevin M. Bennett, Erik M. Shapiro, Christopher H. Sotak, and Alan P. Koretsky, Biophys. J. 95, 342-351 (2008).


Glenn Gaudette and Ira S. Cohen (Department of Physiology, SUNY)— have signed a contract to edit a book on stem cells and cardiac regeneration. The book, to be entitled “Regenerating the Heart: Stem Cells and the Cardiovascular System”, will be published by Springer Science and is expected out in December of 2009. The work will feature sections on embryonic stem cells, bone marrow derived stem cells, and inducible pluripotent stem cells, written by experts in the field. The ability of these sources to regenerate mechanical and electrical function in the heart and their future potential as therapeutics to treat heart disease will be an important part of the book.

Congratulations

Shawn Carey ’09 recently attended the Biomedical Engineering Society (BMES) Annual Fall Meeting in St. Louis, MO, where he received the charter for the newly formed WPI chapter of Alpha Eta Mu Beta (AEMB), the National Biomedical Engineering Honor Society. At this meeting, Shawn was also elected to a two-year term as the national student treasurer of AEMB. Congratulations Shawn.