

MINIMALLY Invasive

Newsletter of the Department
of Biomedical Engineering

Inside this edition:

Biomed teams win big . . .page 2

Alumni Updatespage 4

New Facultypage 6

Chili Challenge Victory

The Fourth Annual Chili Challenge was held on Friday, August 3 during the Alumni Reunion. All campus departments were invited to enter and cook up their favorite recipe. The BME graduate students, headed by Greg Anthon and assisted by Laura Walz and Meghan McGee, beat out the Graduate School and the School of Forest Resources and Environmental Science for the top prize.



Laura Walz, Meghan McGee '05, and Greg Anthon '06

Letter from the Chair

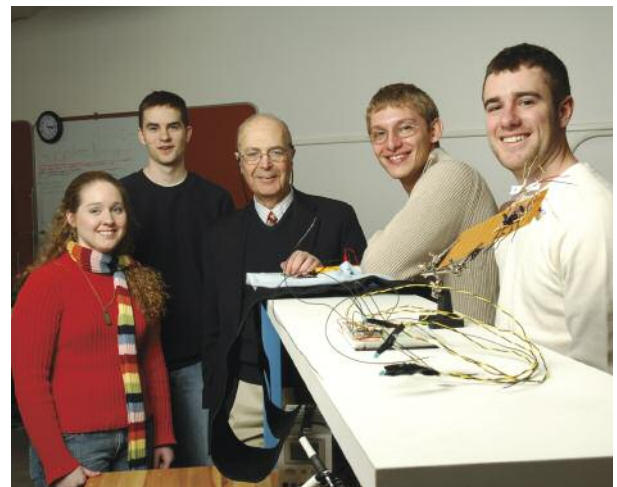
We are pleased to send you this copy of our first newsletter from the Department of Biomedical Engineering at Michigan Technological University. We want to share with you our growth within the College of Engineering, as well as the contributions our faculty are making to the education of young biomedical engineers, and to our understanding of the life sciences and clinical applications through our active research program.

We currently have 229 undergraduate students, and nine graduate students in our newly established PhD program. I am particularly proud of two of our PhD students, Meghan McGee and Matt Barron, who have received prestigious National Science Foundation Graduate Fellowships. We also welcomed two new faculty members in the 2006-2007 academic year—Keat Ghee Ong and Rupak Rajachar—who have already established active laboratories. This year Megan Frost joined our faculty as well.

A very special aspect of our undergraduate education is the opportunity for students to actively participate in cutting-edge research with our faculty and graduate students. Last summer we had twenty-two undergraduate students working in various laboratories. This work has resulted in their coauthorship of several presentations and submitted publications. Many of these students continue to participate in research efforts during the academic year.

Our students are active in two student chapters of biomedical engineering professional societies—the Biomedical Engineering Society and the Society for Biomaterials. The latter group is continuing and expanding their “Slime Time” program to area middle and secondary schools, where they share their enthusiasm for our profession and help local students learn about our growing field.

So you see that many things are happening in the Department of Biomedical Engineering as we continue to grow. We hope that this newsletter will give you a better idea of what is new, and we would like to hear from you to know what you are doing and what is new for you professionally and personally. Do contact us either individually through a faculty member, or through our departmental email address: biomed@mtu.edu. We will publish brief summaries of what you send in subsequent newsletters, and put the full information including pictures in a special section of our web page at www.biomed.mtu.edu. All of us in the Department of Biomedical Engineering are looking forward to hearing from you.



BME Department Chair Mike Neuman, center, with members of the wearable heating pad senior design team.

Mike

Michael R. Neuman, PhD, MD
Professor and Chair
mneuman@mtu.edu

BIOMED TEAMS WIN BIG

at the 2007 Undergraduate Expo

Senior Design

First Place Award

Design and Development of a CPR Mattress

Advisor:

Dr. Ryan Gilbert

Sponsor:

Portage Health

Team Members:

Andrew Delvaux,
Josh Dykla, Chris
Rivet, Matt Trombley

Project summary: A hospital bed mattress that can become rigid at the push of a button was developed for use with patients who may go into cardiac arrest and require cardiopulmonary resuscitation (CPR). The team demonstrated that their design yielded better compression depths than the current practice of using the headboard from the bed under the patient to provide a rigid surface for CPR.



Third Place Award

Effects of Stent Occlusions on a Coronary Arterial Side Branch

Advisor:

Dr. Jeremy Goldman

Sponsor:

Boston Scientific

Team Members:

Danielle McCabe,
Paul Jermihov,
Erik Rice,
Jennifer Arnott

Project summary: A physical model to study vascular stents that are commonly used to open occluded coronary arteries and increase blood flow to the heart muscle was designed and evaluated. This model shows how flow in arterial side branches at the stent location is affected by the stent.



Undergraduate Research

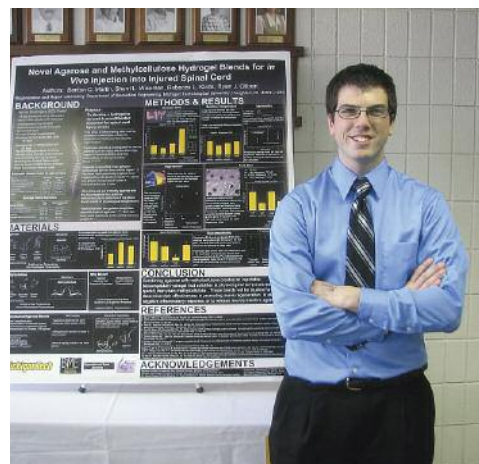
Second Place Award

Development of Novel Agarose and Methylcellulose Hydrogel Blends for Nerve Regeneration

Advisor: Dr. Ryan Gilbert

Student Researchers:

Benton Martin, Sherri Wiseman,
Rebecca Klank



Abstract: Hydrogel blends of agarose and methylcellulose that solidify more rapidly than the individual components when injected into injured areas of the central nervous system have been developed. These new materials can serve as scaffolds and drug delivery agents to promote nerve regeneration in the spinal cord that could ultimately lead to reduction of physical impairment due to spinal cord injury.

BME researchers study signal processing in cells



Biological cells “talk” to one another in ways that Michigan Tech biomedical engineers are trying to understand. Actually, the engineers want to modify the message in an effort to get the cells to change what they do.

Assistant Professor Jeremy Goldman has found that fluid shear stress on cells that line the inner surface of vein grafts used in coronary bypass surgery send a message to cells deeper in the vessel wall, telling them to not multiply too much. If the shear stress becomes too low, the message changes and cells can multiply enough to seriously block the graft. Dr. Goldman’s strategy to keep grafts open is to keep the shear stress high or to interfere with this message when shear stress is low.

Associate Professor Seth Donahue finds that fluid shear stress on bone cells known as osteocytes causes them to send a message to other bone cells, osteoblasts, telling them to build stronger bone. In this case, the message is a helpful one, especially for people with bone loss, osteoporosis or weightless astronauts in space. Dr. Donahue is developing ways to send this message so that bones are strengthened even when shear stress is low.



By deciphering certain types of cellular signaling, these faculty members and their students hope to find ways to prolong coronary bypass grafts and strengthen bone.

BME kicks off new Graduate Seminar Series

Starting in the fall of 2006, the BME department hosted seminars for the Michigan Tech community on biomedical engineering-related topics. Nerve regeneration after spinal cord injury, case investigations surrounding patient injury or death caused by failures in technology, and the value of using a statistician in research projects were among the topics discussed. The seminars were given by members of the Michigan Tech faculty as well as invited guests from New York and Wisconsin. To increase the awareness of biomedical engineering on campus and to expand our students’ knowledge of the field, we will expand the program for the 2007-2008 academic year to involve more guest speakers from outside the University.



These BME team boats were secured using no less than \$60 worth of duct tape.

Another rite of summer passed through the Keweenaw in June. Bridgefest is the annual celebration of that engineering marvel that joins Houghton and Hancock: the Portage Lake Lift Bridge. Bridgefest is held in conjunction with the Seafood Fest, which takes place at the Houghton Beach area. The smell of lobster and shrimp was mixed with music, games, a triathlon, and other events that echoed across the Keweenaw Waterway all weekend long.

In one of the events, the “Pirates of the Keweenaw” cardboard boat races, the BME teams fared brilliantly. In particular, Meghan McGee helped paddle the “SS JMP” to victory, along with Christian Fenton and Sherri Wiseman. The trio won its first race and completed three heats.

The boat’s name refers to a statistical software package the students used in their Statistics for Biomedical Engineers class. The students named the boat in honor of Martyn Smith, their professor of statistics as well as boat-building mentor and supporter.

ALUMNI UPDATES

2001

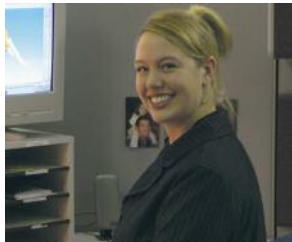
Emily Downs

After graduation I spent nearly three months traveling the east coast of Australia with a backpack and a bus pass. I then spent three years working as an engineer for B. H. Barkalow, Inc., a biomedical engineering consulting firm in Newaygo, Michigan. I am currently at Stryker Orthopaedics in Mahwah, New Jersey as a project engineer in the Concept Development Department.

Jamie (Beers) Mayo

I was married to Michael Mayo in 2001 and we had our son, Nathan Mayo, in June 2005. I received my master's degree in Biomedical Engineering from the University of Michigan in 2003. I am working in the Department of Physical Medicine and Rehabilitation at the University of Michigan Hospital.

Kathrine (Johnson) Oxford



I am currently working at Micromedics, Inc., in Eagan, Minnesota. The core products are ENT, the EarPopper, Biomaterial Applicators, and sterilization trays. I was married on July 26, 2002, to Brian Oxford (a May 2001 Michigan Tech graduate in electrical engineering). We got

married in Las Vegas at the Bellagio...it was so fun! We have one daughter, Audrey Oxford, born on December 2, 2003.

Jeff Klein and Shanna (Marks) Klein



After being together since early in our freshman year at Michigan Tech, we got married on the island of Maui in April 2004. We currently live in Columbia Heights, Minnesota, and our first child, daughter Melia Jaclynn, was born in January. We spend our summers riding off-road

motorcycles and competing in timed enduro races. Other hobbies include kayaking local lakes and streams, hiking/camping on Isle Royale, and downhill skiing.

Aaron Chalekian

I've been married now for three years to my wife Maren—no kids yet, though Maren seems to think our dog, Tess, is her child. I went to the University of Wisconsin-Madison for graduate school in mechanical engineering. After graduate school we moved to St. Paul, Minnesota where I worked as a design engineer for OakRiver Technology. I was there for a little over a year before going to work for Boston Scientific. Note: Michigan Tech gave me a great foundation in engineering to go on to higher education and a challenging career in medical devices. I couldn't have picked a better place to go into engineering. Michigan Tech is a 10 on my list!

Melissa (Brown) Roberts

After working several years in Chicago, I returned to Michigan Tech and am currently a PhD student working with Dr. Jeremy Goldman with a research focus on lymphatic microcirculation. The faculty in the BME department inspired me to pursue a career in academia and I lecture for Tech's Department of Engineering Fundamentals. I live with my husband in our home in South Range.

Ed Bergeron

I graduated from med school at Wayne State University School of Medicine and am currently in my second year of residency in downtown Detroit at the Wayne State/Detroit Medical Center residency program. I'm trying to determine what kind of doctor I want to end up being and how much specialization I want. I would love to do thoracic surgery, however I'm not sure about the seven more years of residency and training that I'd need to do.

2002

Lisa (Winniki) Neuendorff

I married Jonathan Neuendorff, Michigan Tech Forestry class of 2002 (BS) and 2004 (MS), on August 16, 2003, at Horseshoe Harbor, Keweenaw County, Michigan. No kids, no pets. I earned a master's in Biomedical Engineering at Ohio State University in 2004, and now work for the US Army as a civilian test engineer. I'm the joint program manager, Nuclear Biological Chemical Contamination Avoidance, in the Aberdeen Proving Ground, Maryland.

Bryan Howard

I am currently pursuing a PhD in mechanical engineering, applied biomechanics at the University of Utah. Married Becky in 2000.

2003

Wade DePas

I have just recently moved back to the UP to work for Pioneer Laboratories, Inc., in Marquette, Michigan. Previously, I worked for DSI, A Division of Transoma Medical, in technical services. DSI makes biological sensors that are used to collect data from humans and animals, as well as the associated hardware and software.

Rachel (Haner) Bareither

I went directly to graduate school for BME at Rutgers University. I received my master's degree at the New Jersey Center for Biomaterials. After graduating, I worked at the Massachusetts General Hospital System on a project for eight months and am currently working at Merck and Co., Inc., as a biochemical engineer. I live in New Jersey and married Chad Bareither, Michigan Tech alumnus (mechanical engineering '03) on August 20, 2005. We have a dog, Oscar. We enjoy spending time in New York City.

Want to know what your former classmates are doing now? Check out the full scoop on the BME department web site. While you're there, please update your alumni profile or tell us your story. We'd love to hear from you. www.biomed.mtu.edu

Melissa Hasenbank

I am now a graduate student at the University of Washington in Seattle, pursuing a PhD in bioengineering. Outside of the laboratory, I enjoy running, hiking, and exploring the Pacific Northwest.

Matthew Barron

After graduation, I went to work for Kimberly-Clark in Neenah, Wisconsin, in their Skin Science Research Department. In Fall of 2006, I entered the PhD program in biomedical engineering at Michigan Tech, working with Drs. Seth Donahue and Jeremy Goldman. On October 6, I married Katie Stream ('03) in Ishpeming, Michigan.

Jessica Swanson

I started working for DSI, a division of Transoma Medical in Technical Services in November 2003, and accepted a sales position in 2005. I am the rep for the US Plains States and Canada in the research division (animal products).

2004

Lianne Miller

I earned my master's in ME and worked with Dr. Jeremy Goldman. I'm continuing to pursue my double life of engineering and bike racing. I've landed in Colorado Springs and am working as a test engineer at Schlage Lock. In my spare time, I'm training and riding my mountain bike.

2005

Jason Prudom

I was married in August of 2006 on Martha's Vineyard. My wife, Alina, is from Krasnoyarsk, Russia, and we're living here in Boston, Massachusetts. I've been working at Serica Technologies (formerly Tissue Regeneration, Inc.) for a year now as an R&D engineer. I'm in the process of applying to post-bac programs out here so that I can finish the required courses to enter medical school.

Mark Griep



I graduated with my biomedical engineering BS degree in May 2005 and a week later started my PhD work with Dr. Friedrich in the Department of Mechanical Engineering. My work focuses on the creation of a bionanosensor system, and, as such, has major

components in microbiology and electrical engineering. I've been told by our DARPA contacts that they are impressed with how ME students can work so well in these diverse fields, but I had to tell them it was my biomed background that allowed for the smooth transition into this multidisciplinary project.

Apart from my PhD, I've mainly been building a small vacation cabin out on Rice Lake and trying to learn Mandarin Chinese. Then, after all this is done, I'll probably head out to get a job and finally join the real world!

Meghan McGee

"Meghan received her bachelor's degree in 2005, and is now starting the third year of her PhD, studying the effects of hibernation on bone structure and strength. Since her advisor (Dr. Seth Donahue) is on sabbatical this year, Meghan currently spends most of her time sleeping at her desk...um... I mean...working tirelessly with boundless enthusiasm..."

Emily Haglund

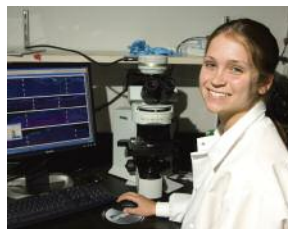
I am currently pursuing a master's in biomedical engineering at Purdue University. My focus is on development of a nanomedical system for specific cell targeting and therapeutic gene delivery. Currently, my focus is on ex vivo diagnostics for breast cancer.

2006

Greg Anthon

I am here at Michigan Tech, obtaining a master's in electrical engineering, and working with Dr. Michael Neuman.

Dona Bondy



A few weeks after graduation, I started working as a product analysis engineer with Boston Scientific in Maple Grove, Minnesota, a medical device manufacturer that specializes in "less-invasive" medical devices. My current position is in the Complaint Investigation Group.

My group receives returned products from the field that have failed. I analyze the failure mode and drive investigations in order to determine the root cause.

Interestingly enough, a month after I began working for Boston Scientific, my father had a massive heart attack and is alive today because of the devices that my company designs and manufactures. The products that I work with every day literally saved my dad's life. It really makes me realize how important and rewarding my job is.

Eric Minner

I am now earning my PhD in biomedical engineering at Michigan Tech, working with Dr. Ryan Gilbert.

2007

Matt Nielsen

I am currently pursuing a PhD in biomedical engineering and will begin working with Dr. Megan Frost in 2008. I was married to Shaye Miller in August 2006 in Commerce Township, Michigan. We toured Ontario, Canada before coming up to Michigan Tech. ♦

New Faculty



RYAN GILBERT joined the faculty of the Department of Biomedical Engineering as an assistant professor in November of 2005. He comes to Michigan Tech from the Georgia Institute of Technology. He holds a PhD in biomedical engineering from Case Western Reserve University and a BSE in chemical engineering from the University of Michigan. His research interests involve designing biomaterials that promote nerve

regeneration following spinal cord injury, biomaterials that improve electrode integration into the nervous system and biomaterials that lessen arthritic environments within cartilage.

Dr. Gilbert grew up on a farm in Lower Michigan and is currently looking for his ten acres here in the UP. He has one PhD student (Eric Minner '06) and had eight undergraduate students working in his lab last summer.



KEAT GHEE ONG joined the faculty of the Department of Biomedical Engineering as an assistant professor in the fall of 2006. He came to Michigan Tech from KMG2 Sensors Corporation in State College, Pennsylvania. He holds a PhD, an MSE, and a BSE in electrical engineering from the University of Kentucky. He worked for KMG2 Sensor Corporation as a chief scientist for four years. He was

also employed at Pennsylvania State University as a postdoctoral researcher and at the University of Kentucky as a postdoctoral researcher and research engineering assistant.

Dr. Ong, his wife Tina, and baby daughter Cecilia live in Houghton. He has one PhD student (Ee Lim Tan, '06) and four undergraduates currently working on sensor development in his lab.



RUPAK M. RAJACHAR also joined the BME faculty in the fall of 2006 as an assistant professor. He comes to Michigan Tech from a cardiovascular research fellowship at the University of Washington in Seattle. He holds a PhD and an MSE in biomedical engineering and a BSE in materials science and engineering from the University of Michigan, Ann Arbor. His research interests focus on the design of

biomaterials as well as targeted cellular and animal models to understand the physical and chemical mechanisms guiding biomineralization in vascular and bone-related cell types and tissues, and

how perturbations to these systems influence cellular and tissue behavior. Insight gained from these contextual studies will complement and provide the rationale for experiments addressing questions of therapeutic tissue regeneration.

Dr. Rajachar enjoys the outdoors and lives in Houghton with his cat, Winnie. He currently is looking for a PhD student and has three undergraduates working on research.



MEGAN C. FROST joined the faculty of the Department of Biomedical Engineering as an assistant professor in August 2007. She comes to Michigan Tech from a postdoctoral position at the University of Michigan. She holds a PhD in analytical chemistry from the University of Michigan, an MS in analytical chemistry from Purdue University-Indianapolis and a BS in biological sciences from the University

of Notre Dame. Her research interests involve designing nitric oxide releasing polymeric materials that exhibit reduced biological response when implanted in the body and the development of intravascular and subcutaneous sensors with these nitric oxide releasing materials that show improved in vivo performance.

Dr. Frost lives in Hancock with her husband John and two children, Maggie and Jack. She is currently looking for a PhD student and has one undergraduate student working in the laboratory.



MARTYN SMITH joined the Department of Biomedical Engineering as a part-time adjunct professor in 2005 in addition to serving as the director of distance learning and summer programs. Dr. Smith has been a member of the Michigan Tech faculty in the Department of Mathematical Sciences, serving six years as head of that department. He also was a professor in the Department of Mathematics and Statistics at Winona

State University in Minnesota and a member of the faculty of the Mayo School of Health Related Sciences in Rochester, Minnesota. Prior to joining the BME department he was interim dean of the Michigan Tech Graduate School. He has a master's degree and PhD from Yale and a bachelor's degree from Montclair State in New Jersey.

Dr. Smith has three daughters and lives in Houghton with his wife, Diane, youngest daughter Anna, and their dog, Laika. For the last two summers he has overseen the building of the biomedical engineering cardboard boats for Bridgefest. See article on page three.

On the Move

Here's wishing our faculty who have moved to other positions all the best of luck in their future endeavors.

DAVID NELSON, the founding chair of the biomedical engineering department is now chairman of the Department of Mechanical Engineering at the University of South Alabama in Mobile.

DEBORAH WRIGHT CHARLESWORTH has become the assistant to the Dean of the Graduate School at Michigan Tech.

DANIEL CLUPPER left Houghton in May for Washington, DC to take a new position with the Food and Drug Administration.

Want to help support the BME seminar series?

If you would like to help with travel and honorarium expenses for our seminar series guest speakers (see page 3) and ensure that 100 percent of your donation goes directly to the department, please specify MTF Account #1481-BME Seminar Series. Please use Michigan Tech's online gift form at www.mtf.mtu.edu/giving, or call the Michigan Tech Fund at 906-487-2310.

Many, many thanks!



Eleven Michigan Tech department teams played softball throughout June and July. Our team, "The Implants," were five and five.



BME launches new PhD program

Now in its third year, our new PhD program has nine graduate students, with women leading the pack five to four. Areas of concentration include biomaterials, tissue engineering, and physiological measurements. Students with a BS or MS degree in engineering, mathematical sciences, the physical sciences, and/or the biological sciences from an accredited college or university are eligible for admission.

Need more info? Check out
www.biomed.mtu.edu/graduate/index.html.



Top row l to r: Eric Minner '06, Matt Barron '03, Meghan McGee '05, Laura Walz. Bottom row l to r: Ee Lim Tan '06, Melissa (Brown) Roberts '01, Rachel Bradford, Megan Killian '05. Not shown, Matt Nielsen, '07



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