



## Mechanical and Industrial Engineering Department Points of Pride Newsletter Fall 2011



### MESSAGE FROM DONALD FISHER

I hope that all of you have had a wonderful summer and are re-energized, either as students to begin the new academic year or as alumni ready to take on whatever projects in the fall await your attention.

It has been an extraordinary year for the Mechanical and Industrial Engineering (MIE) Department! Thanks to the generous support of our alumni, we now have a space where students can work on projects together, hear talks by visiting alumni, or just spread out and relax. I encourage all of you to visit the Exploratorium in Elab. And, again, thanks to our alumni, we are already part way through the next project designed to benefit our students. Professor Frank Sup and machinist Rick Winn are taking the lead on this project, refashioning the old machine shop into a new Innovation Space.

Much has been done over the summer, but much still needs to be accomplished. In conclusion, I want to thank faculty, staff, students, and alumni for all of your help with the many projects over last year we took on as a department. I look forward to the fall!



### NEW TECHNOLOGY DESIGNED TO BOOST HEALTH AND CUT DEATHS IN DIABETICS

They call it the “White Coat Syndrome.” Many people get stressed out when they visit their doctors, which makes their blood pressure readings go sky-high. The White Coat Syndrome is only one factor contributing to why the care for diabetics with high blood pressure is described as “woefully inadequate” – especially since two-thirds of diabetics suffer from high blood pressure, and their medication is based on intermittent office visits. To address this dangerous problem, faculty member Jenna Marquard is a key researcher in an almost \$2-million project. Her research is studying the effectiveness of a low-cost technology that allows diabetics to test their blood pressure in the comfort of home and then send those readings automatically to nurses so their medication can be adjusted as frequently as needed.

“They just have to plug it in,” says Marquard about using a simple blood pressure instrument for reporting readings to nurses.



### TEAM ZOOMMASS BEATS BLUSTERY WEATHER AND BAD LUCK

Team ZoomMass overcame blustery winds, severe thunderstorms, and overwhelming odds to finish with a gritty, Rocky-like performance, beaten up but upbeat, at the Society of Automotive Engineers (SAE) Supermileage Competition in Michigan. “When we got on the track the wind was howling,” says Jonathan Rothstein, the team’s faculty advisor. “It was so bad it blew the windshield off the car, which promptly got stuck in the front wheel, causing the car to spin around and the front wheel to shear off as it slid sideways. It took us half the day to put the car back together and persevere through a number of other problems, like flat tires and thunderstorms.”

Faced with the nightmarish weather, the friction and wind resistance from all these mechanical damages, and other problems beyond their control, team members worked through it all to see their spunky little vehicle complete the course, make almost 400 mpg, and finish a credible 12th place in the competition, which annually attracts more than 30 teams.



### MIE GRAD STUDENT EARNS NASA FELLOWSHIP

Graduate student Briana Tomboulian has been awarded a highly prestigious fellowship from NASA's Office of the Chief Technologist. The NASA 2011 Space Technology Research Fellowship is valued at as much as \$66,000 per year for up to four years. The fellowship supports a stipend for the student and the student's laboratory work, health insurance, tuition, fees, and an extended visit to a NASA center to work on the project. Tomboulian's successful proposal is entitled "Damage-Tolerant, Lightweight, High-Temperature Radiator for Nuclear Powered Spacecraft."

### THE ANSWER, MY FRIEND, IS BLOWING IN THE WIND

Faculty member Matthew Lackner is working on the cutting edge of floating wind turbines, a technology that, according to MIT's prestigious Technology Review, "could hold the key to exploiting" the powerful offshore winds blowing steadily off the Northeastern coast. In order to turn that "key," Lackner has been working on clever, innovative devices such as "smart rotors" and "tuned vibration absorbers," which reduce the severe stress placed on working parts of floating turbines and could go a long way toward making them economically feasible.



### FIRST YEAR MIE STUDENT WORKS TO STRENGTHEN SAFETY LANYARDS

First year undergraduate Bekah Perlin did a summer internship to test and improve lanyards. No, not those kinds of lanyards! They are not the ones that have become infamous in summer camps all over the world as woven in arts-and-crafts classes by bored campers, who wear them around their neck to hold whistles or keys. These are fall-protection lanyards, which are life-saving devices for personnel working on roofs, skyscrapers, and other high sites. A fall-protection lanyard is a cord, cable, rope, or webbing attached on one end to a snug safety harness worn by the worker and on the other end to a secure anchor point.

### ALUMS MARKET "PORTABLE HUG" FOR AUTISTIC CHILDREN

Therapeutic Systems, a company started by MIE alumnus Brian Mullen when he was a doctoral student in 2008, is producing an inflatable vest that offers a "portable hug" to help calm and soothe children with autism and other disorders. Mullen started the company with his partner Chris Leidel when the two put together a successful business plan to win the \$50,000 University of Massachusetts Innovation Challenge. They work out of the Amherst Center for Entrepreneurship, a business incubator for UMass Amherst start-up businesses.



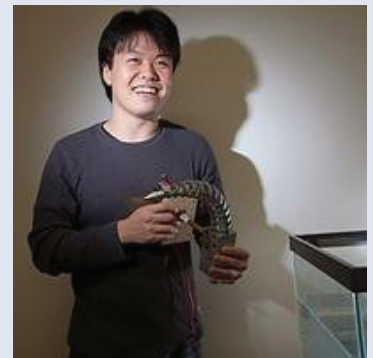


### NEW STUDENT ORGANIZATION SAYS, “LET’S GO DESIGN!”

Sophomore Greg Margolis, the president of a new student organization called Let’s Go Design, was an engineer both by nature and nurture. His father was an engineer, so the genes are all in the family. And by the time Greg was a three-year-old wunderkind in San Antonio, Texas, he was busy taking apart his bathroom. It’s not too surprising, then, that by the time he reached the College of Engineering, he was itching to do some hands-on engineering. So he founded Let’s Go Design, a student organization that currently brings together some 40 student members from different majors who use their technical, intellectual, and personal skills to design and manufacture useful, beneficial, and ingenious inventions of their choice.

### UNDERGRAD BUILDS ROBOTIC FISH

When a pike is attacked, the fish escapes by performing a lightning-fast jackknife, which generates a remarkable 25 Gs of acceleration for a tenth of a second – more than three times the acceleration of an Apollo launch and faster than any vehicle that can be constructed today. In order to study this amazing reflex action, senior Chengcheng “Charlie” Feng used his summer research in the Research Experience for Undergraduates program to build a robotic fish, which can accurately mimic the escape mechanism of a pike. Feng built the fish under the direction of his faculty mentor, Dr. Yahya Modarres-Sadeghi.

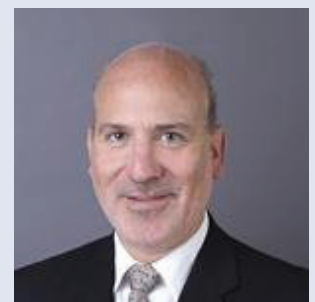


### IN SEARCH OF AN OPTIMAL CLIMATE CHANGE POLICY

A crucial step for establishing a national climate change policy, one of the biggest policy decisions facing this country and the world, is deciding which developing energy technologies will best maintain that policy once it’s in place. The next step is calculating exactly how much money to invest in R&D for each of those chosen technologies. These critical steps, in fact, describe the ongoing research of faculty member Erin Baker. Her research employs interviews with experts combined with sophisticated mathematical modeling techniques to inform government policy makers about what makes a good “technology R&D portfolio” for cutting greenhouse emissions cost-effectively in the future.

### ENGINEERS STUDY DRUG DOSAGE PROTOCOL FOR DIALYSIS PATIENTS

Anyone on dialysis knows the ravages of uncontrolled anemia: severe fatigue, hospitalization, and, in extreme cases, death. Now a team led by faculty member Yossi Chait is collaborating with a leading kidney specialist at Baystate Medical Center in Springfield to design more effective protocols for dosing a key drug used for controlling anemia in dialysis patients.





### “WEARABLE ROBOTICS” REPLACE AMPUTATED LIMBS

Faculty member Frank Sup has spent the past five years developing a next generation lower-limb prosthesis. The device is an example of "wearable robotics," in which the knee and ankle joints are battery powered and guided by sensors that help the device adjust continually to terrains, slopes, and steps. It has been tested both in the field and in the lab by amputees for the past two and a half years.

“What I have been working on is actually to restore power to the lost lower limb, giving the prosthetic knee and ankle the capability of supplying torques and power,” explains Sup. “The device has the power to push off actively with each stride. We’ve made something that’s intelligent, light-weight, and powerful. We basically built a two-joint robot that’s rigidly attached to someone and provides mobility by sensing how he or she physically interacts with it.”

### DRIVING LAB RENAMED FOR ARBELLA INSURANCE GROUP

On Friday, December 10, the department hosted a ribbon-cutting ceremony for the newly named Arbella Insurance Human Performance Laboratory, a driving research facility. The human performance laboratory’s new name celebrates a recent \$150,000 gift from the Arbella Insurance Group Charitable Foundation, the philanthropic branch of the Arbella Insurance Group. The laboratory team, led by Professor Donald Fisher, head of the MIE department, studies the factors that increase the crash risk of novice and older drivers and also develops simulation programs that train users how to avoid risky driving behaviors.

Among the media that covered the ribbon-cutting ceremony for the newly named Arbella Insurance Group Human Performance Laboratory were the Springfield Republican, TV stations WSHM-TV 3 and WWLP-TV 22, and radio stations WFCR and WAMC.

Arbella has long sponsored research in the area of distracted driving to further Dr. Fisher’s existing study of the topic. Fisher’s team created the simulations used in Arbella’s groundbreaking “Distractology 101” mobile driving simulator program, which teaches young drivers the perils of texting and using cell phones while driving. The touring, 36-foot, Distractology 101 trailer has been covered by media all over the Northeast, including the Boston Globe, the Today Show, Channel WCVB 5 in Boston, and many newspapers and TV station throughout the commonwealth.



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