

The IRON

Industrial Research Office Newsletter

Summer 2009

Penn State to Compete in Solar Decathlon on National Mall. Page 4

From the Director /
Tech Transfer News
Briefs. 2

Start-up Company
Develops Three
Products at Penn State
Learning Factory. 3

DoD Center Will
Benefit Transportation,
Aerospace, and
Manufacturing
Industries. 5

Ultrasonic Tool
Sets for Health and
Infrastructure. 6

Upcoming Events. 7

Solar Technologies
Available for
Licensing. 8





Welcome to the summer edition of The IRON! Summer in Happy Valley – no better place to be, in my mind. But the summer is going fast and as we gear up for the fall semester and the arrival of students – oh and yes, another football season – we are also preparing for many company visits this fall.

These visits bring company representatives to campus for meetings with faculty members to discuss research collaborations, to attend workshops, to address classes, and also to discuss intellectual property licensing opportunities. It is in the discussions of intellectual property (IP) where the differences between industry and the University are truly evident. One of the benefits of the Industrial Research Office is to narrow the gap between these two cultures. It is easy for us to understand where the industrial representatives are coming from, since all of my staff members were in private industry at some point in their careers. We are your advocate in pursuing changes in policy or developing better methods of doing business with industry.

One important way in which we have improved Penn State's interactions with industry is the use of **master agreements**. This contracting tool allows us to enter into multiple projects through a task order mechanism, after the terms and conditions of the overarching agreement are negotiated. This allows for quick implementation of a project without the lengthy negotiations that can bog down and kill a dynamic research collaboration. We currently have active master agreements with 40 companies, both large and small.

Another example of how we have addressed the comments and concerns from industry to develop a mutually beneficial solution is with our **firm fixed price agreement**. This agreement is utilized when the project is funded with pure IR&D funds, is under \$100K, and when both parties agree that the scope of work and deliverables will not generate IP. This one-page contract is our way of trying to reduce the length of negotiations on IP when it will not even be an issue.

We invite you to contact the IRO and learn more about these contracts and other ways we are making it easy for companies to partner with our faculty researchers. With over \$100 million in industry-sponsored research at Penn State – you will be among good company.

Tanna Pugh, Director, Industrial Research Office • tannapugh@psu.edu, 814-865-9519

TECH TRANSFER NEWS BRIEFS

Penn State Tech Transfer on Social Networking Web Sites



You can now follow the Industrial Research Office and other units of Penn State Tech Transfer on Facebook® and LinkedIn®. These social networking sites will keep you up to date with news and events from our office. We are listed as “**Penn State Industry Research and Tech Transfer**” and direct links are provided on our homepage at www.techtransfer.psu.edu.

Search 315 Penn State Research Centers and Laboratories on IRO Web site

Did you know that the Industrial Research Office manages a database of all research centers, institutes, and laboratories at the University? We now have a collection of 315 centers on our Web site. You can search for a center by College, pre-defined keywords, or your own keywords. From the Acoustic Test Facility to the Vehicle Simulation Research Center, you can find it at www.iro.psu.edu.

155 Penn State Inventions now on iBridge Network

The Intellectual Property Office at Penn State continues to add Penn State technologies that are available for licensing to the iBridge Network. Visit iBridge to search and learn more about the various technologies and view non-confidential disclosures. You can also receive alerts when new inventions are added.

www.ibridgenetwork.org/PSU

Penn State Research Videos Now Featured on IRO Web Site

You can now view several Penn State research videos on our Web site. We currently have 6 videos available on the following topics: Counter Terrorism, Cyber Security, Energy Advancements, Homeland Security, Information Sciences and Technology, and Sensors to Detect Contaminated Fluids.

www.iro.psu.edu/videos

Funding Available for Applied Research in Energy-Related Fields and Clean Technology



Ben Franklin Technology Partners of Central and Northern Pennsylvania is offering research institutions and other non-profit organizations engaged in research related to energy, alternative energy, or clean technology the opportunity to apply for a “matching grant.” Government agencies, for-profit businesses, manufacturing companies, and individuals may participate in the program in partnership with a research institution. However, the primary recipient of the funding must be an organization that fits the term research institution and be located within the 32-county footprint served by the Center.

Funding requests between \$10,000 and \$100,000 will be considered for most projects. Ben Franklin will also consider awards of up to \$250,000 for projects that can demonstrate extraordinary economic or technological impact. **Preliminary applications are due by August 3, 2009.** Full project proposals are due on September 1 and grants will be awarded on October 1. For full details, visit the Ben Franklin Web site:

www.cnp.benfranklin.org



Start-up Company Develops Three Products at The Learning Factory

According to Tim McCorry, president and CEO of Maximus V, LLC, The Learning Factory at Penn State is one of the University's best resources for industry. "It's the type of resource that people in business can tap into, but they might not know it's there," he says.

Maximus V (*Greatest Victory*) is a product development and marketing company that represents, develops, distributes and acquires creative products and technologies with strength, conditioning, sport and fitness applications. The company is based in Wayne, Pennsylvania with an R&D lab in Innovation Park at Penn State.

McCorry connected with Rick Hoover, Small Business Specialist at the Penn State Industrial Research Office. After listening to McCorry's needs and goals, Hoover presented McCorry with Innovation Park's popular Inventor's Commercialization Toolkit written by author Wendy Kennedy, *So what? Who cares? Why you?*[™], and introduced him to Tim Simpson, director of The Learning Factory.

"I wanted to leverage the research opportunities in Pennsylvania universities," McCorry explains. He hoped to utilize the resources found on college campuses to work on product development theory and perhaps move on to prototyping. "Being a start-up company, it takes a lot of capital to research and go through the prototyping stage before you can even think about taking it to design phase."

When he met Simpson, McCorry adds, he was excited by what The Learning Factory had to offer. The Learning Factory is based within the College of Engineering and partners industry with engineering students, allowing the students to get hands-on experience in the design, manufacturing, and business processes.

In January 2008, McCorry decided to give The Learning Factory a try. He displayed his concept for students, and a team was selected to work on his project for the semester. "I was driven when I went into this," he says. "I wanted a product that could be delivered in three months and as close to market-ready as possible."

His first project was called Hand X[™], a hand-held, adjustable weight system to be used while walking for those struggling with osteoporosis or aging. McCorry's interdisciplinary team included students from mechanical and chemical engineering, kinesiology, and the Smeal College of Business. The team won first place in the "Lockheed Martin Design Award" category at the spring 2008 Learning Factory Project Showcase.

"The engineers would come up with a solution to the problem," says McCorry, "and the business students would counter with the costs involved in manufacturing and marketing. It was a neat interaction of all these students, which is what I think Penn State wants."

McCorry and his company used The Learning Factory to work on two other products. During the fall 2008 semester, students won first place in the "Best Overall Engineering Project" category for KARA[™], a knee-alignment product to prevent ACL injuries for athletes. And in spring 2009 semester, students developed the Presh[™] jacket, a weighted garment to aid in the rehabilitation of stroke patients without inhibiting everyday activities.

"I've introduced a lot of disciplines into what I'm trying to do there," explains McCorry. "It's challenging, but I enjoy managing all these different groups of kids."

He's also seeing results from his partnership with The Learning Factory. Two of the products are almost ready to enter the marketplace.

"It's been a great experience for me on a lot of different levels," McCorry says, "and I think it's been a great experience for the students. I found that if you really work with The Learning Factory, there is so much good that can come out of there. I feel like I'm just scratching the surface." ■

www.lf.psu.edu





Penn State to Compete in 2009 Solar Decathlon

For three weeks in October, a team of Penn State students will be part of the world's largest home show.

The students will be competing for the second time in the biennial Solar Decathlon, where their Natural Fusion solar house will be one of 20 on display on the National Mall in Washington, DC. A half million people are expected to tour the houses beginning October 9, but more than one billion will hear about the contest. In 2007, Penn State's debut Solar Decathlon house, MorningStar Pennsylvania, finished in fourth place.

Led by Jeffrey Brownson, assistant professor in the Department of Energy and Mineral Engineering, 16 students serve as project managers and more than 160 students have been involved with Natural Fusion at some point over the past two years.

"The solar house is a great way to develop real-life skills," says Brownson. "In my opinion, this is improperly defined as a student project. It's more along the lines of an enterprise. You have all these different skill sets that are each managing sections of a larger structure, but each section is its own project."

One of the goals of Natural Fusion was to make the project compelling to average citizens. "We want to show them that these technologies are not out of their reach," Brownson says. "They might be on the front end of what's on the market, but everything in the house, from the electronics to the materials, must be commercially available."

Collaboration with industry has been vital for the Natural Fusion project. The first, and perhaps most successful, alliance between the Penn State group and industry was with Bayer MaterialScience, LLC in Pittsburgh. "A team of students went to the company with pitches on the Natural Fusion project, and we met with several of the directors," says Brownson. "They showed us opportunities. They took ideas of ours and amplified them. Over the course of the year it has developed into an incredible relationship, and we're achieving the results we wanted to achieve in terms of energy performance and insulation. And Bayer sees this house as strongly influenced by their products, so it is beneficial for Bayer to promote their involvement during the competition on the National Mall."



In 2007, the Penn State solar home, MorningStar Pennsylvania, finished in fourth place at the Solar Decathlon. (Credit: Kaye Evans-Lutterodt/Solar Decathlon)

Bayer MaterialScience recommended other eco-friendly companies such as Phase Change Energy Solutions, Inc. (PCES) as partners in Natural Fusion. PCES, based in Asheboro, North Carolina, is using residue from biodiesel that is packaged in a way that it can be put behind drywall and act as a thermal storage system.

Professional Building Systems, Inc. in Middleburg provided the module home for the project. "Module home building is a very strong industry in Pennsylvania," says Brownson, "and we wanted to show that sustainable qualities can be brought into a module building." For the Natural Fusion project, using a module home added to the overall green effort because it minimizes the waste and energy used in building a traditional house.

Carlisle Syntec stepped forward with a product that the project team found would work best with their green roofing system. And these are just a sample of the industries that have participated in the Natural Fusion project.

"This project is a great selling point for the bridge between academia and industry," says Brownson. "We find that these industrial relations are also developing into research opportunities. We have a great network on campus to connect these industries with researchers." ■

www.solar.psu.edu



DoD Center Will Benefit Transportation, Aerospace, and Manufacturing Industries

In November 2008, Penn State joined 18 other universities and research organizations to form the Systems Engineering Research Center (SERC), the nation's first Department of Defense (DoD) University Affiliated Research Center focused on systems engineering research. The goal of SERC is to focus on systems engineering issues facing the DoD and related defense industries.

SERC is led by Stevens Institute of Technology, with principal collaboration by the University of Southern California. This fall, Penn State and the other collaborating universities will have an opportunity to present their research to government officials.

SERC will be responsible for identifying, evaluating, creating and integrating methods and tools that support effective systems engineering practice in the acquisition of weapons platforms, major defense systems, network-centric systems, and enterprise systems.

"Penn State's role hasn't been defined yet, but we think we can make a good contribution," says James Nemes, division head in the engineering division at Penn State Great Valley.

While other departments at Penn State such as the Applied Research Lab (ARL) work closely with DoD, what makes SERC different is its emphasis on systems engineering.

"This research center will look at the systems engineering process itself," says Nemes. "It's not targeted to a particular project, but rather to the application of systems engineering principles. It's more geared toward the process and the techniques rather than working with DoD on a particular problem."

Even though DoD has provided the funding for the center, Nemes believes the research that comes out of SERC will have larger implications for systems engineering research. "This research could be applied over a broad range of sectors such as transportation, non-defense aerospace, and manufacturing,"

says Nemes. "There are a number of different places where systems engineering applies, and I think some of this work will be beneficial to those sectors as well."

The opportunity to be part of SERC came through an invitation to ARL. "At the time of the proposal stage, ARL took

the lead and set up the agreement to work with Stevens," says Nemes. Allan Sonstebly, Associate Director of the ARL Communications and Navigation Office and the principal contact for SERC, asked Nemes and his team at Penn State Great Valley to take a lead in getting research work from SERC.

"One of the requirements is to have a program in systems engineering," says Nemes, "and at Great Valley, we offer a master's degree in systems engineering."

"It's a pretty neat opportunity," Sonstebly says. "Government recognized there is a lack of systems engineering research, so they took this approach to bring together university research centers, led by Stevens, which has a very strong systems engineering program."

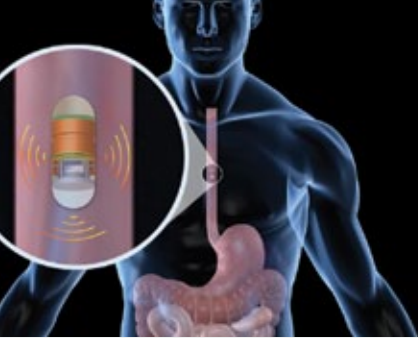
"We have offered to host the research conference to be held in the fall," Nemes adds. "We don't know if we'll get it, but we believe we have a great facility here in a good location. We're anxious to get going."

The other SERC collaborators are Air Force Institute of Technology, Auburn University, Carnegie Mellon University, Fraunhofer Center at the University of Maryland, Massachusetts Institute of Technology, Missouri University of Science and Technology, Naval Postgraduate School, Southern Methodist University, Texas A&M University, Texas Tech University, University of Alabama at Huntsville, University of California at San Diego, University of Maryland, University of Massachusetts at Amherst, University of Virginia, and Wayne State University. ■

"This research could be applied over a broad range of sectors such as transportation, non-defense aerospace, and manufacturing."

~James Nemes, Penn State

www.sercuarc.org



Ultrasonic Toolsets for Health and Infrastructure

Susan Trolier-McKinstry, professor of ceramic science and engineering and director of the W. M. Keck Smart Materials Integration Lab, has submitted a proposal to the National Science Foundation (NSF) to develop an Engineering Research Center (ERC) in the area of ultrasonic toolsets for health and infrastructure.

There are NSF sponsored ERCs at universities across the country. Each is an interdisciplinary center that collaborates with industry to develop new products, technologies, or methodologies. Penn State's proposed ERC would address the need to sense, mitigate, and diagnose flaws in remote areas in biological and man-made infrastructure. Ultrasonic toolsets combine the ability to inspect over orders of magnitude in scale with the possibility of autonomy and versatility.

"We'd like to be able to develop ultrasonic imaging and diagnosis capabilities for situations where we are not currently able to use ultrasound," explains Trolier-McKinstry.

Advanced piezoelectrics, fabrication techniques, electronics, and energy harvesting are required to enable the necessary toolsets in the remote and harsh environments of tomorrow. Penn State has the largest group of piezoelectric materials development researchers in the country. Core strengths at the University include a unique acoustics program, and expertise in guided wave ultrasonic inspection, autonomous navigation of vehicles, and integrated electronics.

Trolier-McKinstry hopes to explore three main test beds: how to pursue the miniaturization of ultrasound systems; how to pursue a physically flexible ultrasound system; and how to pursue making an ultrasound system that could operate under aggressive environmental conditions, such as high temperature or high radiation.

The first area, miniaturization, will investigate how to develop an ultrasound system small enough to fit into a pill that can be swallowed to interrogate the gastrointestinal track. "There are specific applications for this noninvasive pill where there are not good existing capabilities today," Trolier-McKinstry says. "An example is to help diagnose cancer of the esophagus."

The second test bed will investigate how to make an ultrasound system that is conformable. "This would range from health-related applications to infrastructure-related applications," she says. This "ultrasonic blanket" would be able to form over a curved bridge or a wind turbine, allowing for measurements that can probe large volumes of material. A medical application for this technology would include an ultrasound bandage to position over a patient's carotid artery for pulse detection. "This would be especially helpful for EMTs and first responders working in noisy conditions."



Finally, Trolier-McKinstry will look at extending the range of ultrasound systems in extreme environments. "In next generation nuclear power plants, there is a need for methods of continuous monitoring," she explains. The resulting conditions will expose transducers to extremely high temperatures and possibly high radiation. "Right now, the standard materials used for structural health monitoring will not tolerate those temperatures, so we'll look at developing new families of materials that will expand the range of operating conditions for ultrasound systems."

If the ERC is approved by the NSF, Tom ShROUT, professor of materials science and engineering, would act as the Center's industrial liaison. With support from the Penn State Industrial Research Office, ShROUT will identify and meet with potential industry partners to discuss the capabilities and facilities at Penn State, and explain the benefits of joining the ERC. Possible collaborations will include companies in the healthcare and energy development industries. Trolier-McKinstry also sees opportunities for companies that work with wireless data transmission and materials suppliers.

If approved, the ERC will meet twice per year with industry partners to select projects. "Companies will be able to join our center and send representatives to our meetings," ShROUT says. "There is also a lot of mentoring of students," he adds. "Once on board with the ERC, industry will play a leadership role in guiding the research." ■

Susan Trolier-McKinstry, STMckinstry@psu.edu

Nutrition, Genes, and Physical Activity: Understanding Obesity from Conception and Beyond

Penn State University Park ▪ State College, PA ▪ August 11-14, 2009



The 28th Summer Symposium at Penn State will focus on Nutrition, Genes, and Physical Activity: Understanding Obesity from Conception and Beyond. Obesity represents one of the most serious global health issues with over 300 million people presently affected. It develops because of a mismatch between energy intake and expenditure that results from physiology and genetic factors and is influenced by environmental factors and behavior. Although life cycle and genetics cannot be manipulated, obesity can be prevented or treated through altering diet, nutrition, and physical activity or by pharmaceutical intervention.

The model we are putting forward shows obesity being the result of interaction between life cycle, genotype, and environment. There is not one solution for everyone and there are many ways to get to the optimal weight or health. We will explore the intersection of environment (activity, diet, drugs) genetics / physiology, and age in the causation and treatment of this disease.

www.symposium.psu.edu

Penn State Biotechnology Training Programs

Animal Cell Methods and Scale-up Strategies ▪ August 31 - September 4

This introductory course emphasizes cell culture and scale-up theory, as well as an introduction to laboratory techniques utilized in animal cell culture.

Fermentation Methods and Scale-up Strategies ▪ September 29 - October 2

This course emphasizes the theoretical and practical aspects of laboratory microbial fermentation and scale-up.

Separation and Purification Strategies for Biotechnology Products ▪ September 14-18 or October 12-16

Separation and Purification Strategies for Biotechnology Products is an introductory course that helps participants understand and develop strategies for separating and purifying proteins, recombinant DNA products, and monoclonal antibodies.

www.biotech.psu.edu

Solar Decathlon

Washington, DC ▪ National Mall ▪ October 9-13 and 15-18, 2009



For three weeks in October, the U.S. Department of Energy will host the Solar Decathlon—a competition in which 20 teams of college and university students compete to design, build, and operate the most attractive, effective, and energy-efficient solar-powered house. The Solar Decathlon is also an event to which the public is invited to observe the powerful combination of solar energy, energy efficiency, and the best in home design. After a great fourth place finish in the previous Solar Decathlon, Penn State hopes to finish in the top three this year with their new solar home, Natural Fusion.

The teams will compete in ten contests between October 8 and 16. The homes will be open to the public on the National Mall from October 9-13, and 15-18.

www.solardecathlon.org

ETLI 2009: Engineering Technology of 2020

Penn State University Park ▪ Nittany Lion Inn ▪ October 23-24, 2009



Join a discussion with academic leaders, industry executives, and representatives from the U.S. Department of Labor, U.S. Office of Personnel Management, and the National Association of Manufacturers to explore technology education and workforce needs of the future. This Engineering Technology Leadership Institute (ETLI) 2009 conference is sponsored by the Engineering Technology Council of ASEE and is hosted by the College of Engineering and the School of Engineering Design, Technology, and Professional Programs at Penn State. The conference program will include balancing engineering technology portfolios, the future of two-year engineering technology programs, and the technology workforce needs of 2020. For more information, contact Kathy Karchner, conference planner, at 814-863-5100 or 800-PSU-TODAY.

www.ero.psu.edu/events



The IRON

Industrial Research Office Newsletter

Subscribe to the e-Edition of The IRON at www.iro.psu.edu/theiron.

Look for our Fall 2009 issue in October.

Contact Us:

Industrial Research Office
The Pennsylvania State University
119 Technology Center
University Park, PA 16802
814-865-9519
iro@psu.edu
www.iro.psu.edu

Send comments or suggestions for The IRON to:

Gregory Angle, gregangle@psu.edu
Marketing Associate

This publication is available in alternative media on request. The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, gender identity or veteran status. Discrimination or harassment against faculty, staff or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-2801, Tel (814) 865-4700/V, (814) 863-1150/TTY. U.Ed. RES 10-01.

SOLAR

Technologies Available for Licensing



Below is a list of Penn State solar technologies that are available for licensing through the Intellectual Property Office. These inventions are featured on the iBridge Network.

www.ibridgenetwork.org/PSU

Novel Low-Cost, Glazing System to Improve Glass Panel Resistance to Earthquakes and Other Dramatic Displacements

Proof of concept was established by subjecting mock-ups of several invention embodiments to dynamic racking crescendo test conditions in a preliminary laboratory study. Using the invention, even crudely manufactured glass panels with imperfections in the vulnerable corner regions can exceed the performance of glass panels with edge finishing of the highest manufactured quality.

Transparent Sustainable Wall System

This new type of wall system for residential construction is designed to have several sustainable features. The wall system is transparent for maximum daylighting use and employs photovoltaic to generate electricity.

High-Yield Visible Light Photocatalytic Conversion of CO₂ to Hydrocarbons

This invention covers a high rate photocatalytic conversion of carbon dioxide using nanotechnology.

Ordered Arrays of Long Titania Nanotubes

Highly ordered arrays of titania nanotubes are desired for many applications (e.g., dye-sensitized solar cells; the photolysis of water; gas sensing; biofiltration; and drug delivery). The disclosed invention entails the fabrication of highly ordered arrays of titania nanotubes that are up to 100 um long.

Foerster-type Resonance Energy Transfer (FRET) Heterojunction Solar Cells

The subject invention allows for the possibility of inexpensive, heterojunction solar cells to achieve upwards of twenty percent efficiency.

Tandem Hybrid Concentrator Solar System

The disclosed invention proposes hybrid low energy/high energy modules for capturing solar energy by using a variety of module permutations.