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Focus on Collaboration

WiSys organized three collaborative gatherings in recent months to bring together UW System faculty and industry experts. These events, attracting over 100 participants, are part of the continuing focus on fostering inter-campus and industry collaboration for technology development. In addition to the organizations listed below, WiSys, UW System Office of Federal Relations and Whyte Hirschboeck Dudek, S.C. were event co-sponsors.

The Clinical Sciences Collaborative Opportunity Gathering, held on December 1, 2007, at the Health Science Center in La Crosse, brought together experts to discuss ongoing clinical science research programs and identify opportunities for collaborative research among UW System campuses, Gundersen Lutheran, Marshfield Clinic, and industry. Scientists from these organizations provided brief presentations on their research in medical microbiology, medical devices, therapeutic development, biomarker identification, personalized medicine, and bioinformatics. Gundersen Lutheran and UW-La Crosse co-sponsored the event.

UW-Platteville hosted a Nanotechnology Gathering on January 8, 2008. Ongoing nanotechnology programs and opportunities for collaborative research were the focus, in addition to a dialogue on how to effectively link Wisconsin's best and brightest nanotechnology students and their future employers. A number of experts from UW System campuses and industry provided brief presentations on their research, including opportunities for collaboration in synthesis of shaped nanoparticles, nanowires, patterned nanowires and films for applications in sensing, metallurgy, composite materials, and electronic devices.

A gathering of UW System faculty and industry researchers to introduce the Great Lakes Bioenergy Research Center (GLBRC) was hosted and organized by WiSys and UW-Stevens Point on Tuesday, January 15, 2008.

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UW-Platteville and UW-Stevens Point Announce Innovation Scholar Awards

Professor James Hamilton, Philip Streich, and Professor Mike Zach are the proud recipients of the WiSys Innovation Scholar Awards.

Prof. Hamilton, UW-Platteville, and his student, Philip Streich, were awarded for their recent discoveries with carbon nanotubes and graphene, both significant advances in the nanosciences. There is fierce competition among top US companies, such as IBM and Intel, and Ivy League universities to find applications for nanotubes and graphene in the semiconductor, sensor and computer industries, as well as in the fields of biology and medicine. The inability to dissolve these important carbon nanomaterials in solution and the lack of instrumentation to detect their solvation have prevented the development of meaningful applications until now. Prof. Hamilton and Mr. Streich's discoveries have solved both problems.

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Prof. Hamilton, a leading UW System researcher in nanotechnology, has collaborations with US and Foreign Universities, NASA and DOD. Mr. Streich was one of the top three winners of the 2007 Intel Engineering and Science Fair and was featured in the July 23, 2007 issue of Forbes Magazine. Mr. Streich, who is home schooled, is just turning 16!

Prof. Zach, UW-Stevens Point, was awarded for his new method of utilizing patterned ultrananocrystalline diamond (UNCD) electrodes for depositing nanowires. The previous method required a substrate which was extremely expensive as well as rare. UNCD addresses cost issues and will advance electrochemical step edge decoration (ESED) into a technology with commercial applications, including chemical sensing, optical signal processing, and nanoelectronic devices. Prof. Zach is featured in the "Discoveries..." column below.

Sponsored by Quarles & Brady, the WiSys Innovation Scholar Award recognizes UW System faculty, staff, and students who make outstanding discoveries that benefit society. Selection for the award is based on the innovative concept, broad use, value, and industrial application.



Jim Hamilton



Philip Streich



Mike Zach

Discoveries and the People Making Them: Nanotech Sensor No Small Feat for UW-Stevens Point Researcher

By Brian Sweeney

While nanotechnology is often in the news, information about specific applications is more difficult to find. UW-Stevens Point researcher and chemistry professor Michael Zach (pictured above right) first made headlines in the scientific literature (and the cover of the journal *Science*) with his method of creating microscopic nanowires using electrodeposition. Now, he has invented a method for making a simple and effective sensor for hydrogen gas.

Hydrogen has chemical properties such as energy stored in its bonds, thermal conductivity and low density which add to its value. Hydrogen can be used as an energy carrier and to cool rotors at power stations, increase the saturation of fats and oils in margarine, and process fossil fuels. However, because the flammable gas is colorless and odorless, it is imperative to detect a leak before it creates an explosive situation.

In Prof. Zach's graduate studies, he helped discover a way to sense the presence of hydrogen using the metal palladium, but the sensors were difficult and time-consuming to make. Seeing promise in the sensors, he designed a more streamlined manufacturing process that can be adapted for commercial purposes. His sensor uses a coated glass slide with nanoparticle "islands" of palladium.

"Palladium can absorb about 900 times its own volume, and in the process it swells just slightly. In a system where particles of palladium are not quite touching, the particles swell and touch after exposure to hydrogen," Zach said.

Discoveries cont. on pg. 7

Newsletter Questions and Comments

To submit articles, provide feedback, request edits or obtain copies of current or past issues of the WiSys newsletter, please contact Emily Brown at (608) 890-2328 or ebrown@wisys.org. All suggestions are welcome.



Upcoming Events

Wisconsin Science and Technology Symposium - July 17-18, 2008

Designed to encourage networking for interdisciplinary research and entrepreneurship throughout the state, the Wisconsin Science and Technology Symposium (WSTS) will also showcase Wisconsin's innovative research and technology development in biotechnology, nanotechnology, medical science, and clean energy.

WSTS will be held on July 17-18, 2008, at UW-Stout Memorial Student Center in Menomonie, WI. WSTS is organized by WiSys and UW-Stout and sponsored by UW System, UW-River Falls, UW-Stevens Point and Marshfield Clinic. For additional event information, including registration and co-sponsorship/exhibitor opportunities, please visit <http://www.uwstout.edu/outreach/conf/science/index.html>.



For questions or additional information, contact Lisa Murray (lmurray@wisys.org, 608-263-2819) or Susan McClelland (mcclellands@uwstout.edu, 715-232-2694).

Marshfield Clinic Corner

By Marsha Barwick

The Marshfield Clinic system consists of 41 patient care, research and education facilities throughout Wisconsin, making it one of the largest comprehensive medical systems in the United States. The services of more than 728 physicians in 84 medical specialties and sub-specialties are available to patients.

Marshfield Clinic Research Foundation (MCRF) was established to examine and share scientific knowledge that improves human health. MCRF has some 30 Ph.D. and M.D. scientists and over 200 additional staff. There are also 200 physicians throughout Marshfield Clinic's system that have active research projects.

Marshfield Clinic Applied Sciences (MCAS) optimizes growth of services by aligning research projects of potential marketability identified through partnership with WiSys Technology Foundation, a subsidiary of WARF. MCAS supports internal efforts that accelerate medical advancements and intellectual property commercialization for enhanced health care.

For information about services, specialties or research activities, please call 1-800-782-8581 or visit www.marshfieldclinic.org.

Medical Device Gathering - June 5, 2008

A Medical Device Collaborative Gathering will be held at Marshfield Clinic on June 5. The event, organized by Wisconsin Entrepreneurs' Network (WEN), Marshfield Clinic and WiSys, and co-sponsored by UW System Office of Federal Relations and Whyte Hirschboeck Dudek, S.C., will bring together researchers from UW System and Marshfield Clinic in addition to industry representatives from throughout the state. The gathering will provide the opportunity for collaborative conversation and for industry partners to describe their capabilities and interests. A consultant will also be on hand to explain the FDA's process of approving devices, including timelines, pitfalls and expenses. Faculty and industry representatives interested in discussion and networking are encouraged to attend.

Please contact Lisa Murray (lmurray@wisys.org or 608-263-2819) to register.



While providing an opportunity for UW researchers and industry representatives to discuss their current bioenergy-related projects, the event also addressed the GLBRC and Wisconsin Bioenergy initiatives, the UW-Stevens Point Wisconsin Institute for Sustainable Technologies, and the goals, resources, and potential of these programs.

Additional information on these gatherings, including agendas, participant lists, presentations and program links, can be found at wisys.org/forresearchers. For information on the upcoming Medical Devices Gathering and Wisconsin Science and Technology Symposium, please check page 3.

Integrated Solutions Consortium Symposium

The second annual Integrated Solutions Consortium (ISC) Symposium took place on January 11 at UW-River Falls. This year's symposium, entitled "Challenges, Rewards and Successes in Research," provided an opportunity for UW researchers to network and share project ideas, resources, and expertise. To encourage collaboration, the ISC brings together faculty, staff, and students from UW-Stout, UW-Eau Claire, UW-River Falls, Chippewa Valley Technology College, as well as other organizations/individuals with shared research interests. The ISC sponsors this annual symposium, a monthly videoconference seminar series highlighting collaborations among ISC participants, and a periodic news bulletin via the ISC listserv.

For more information about the ISC, contact Tim Lyden, Michael Pickart, or Marcus McEllistrem (timothy.lyden@uwrf.edu, pickartm@uwstout.edu, and mcellimt@uwec.edu) or visit isc.uwstout.edu.

WARF and WiSys: Supporting Research Across the State

By Jill Ladwig

The Wisconsin Alumni Research Foundation (WARF) has been moving technology born of university research into the marketplace since 1925. When it commercialized Dr. Harry Steenbock's discovery for enriching the vitamin D content of foods with ultraviolet radiation, it became the world's first university-based technology transfer office. Today, after patenting more than 1,800 discoveries, WARF has established an unparalleled track record for the industry.

WARF supports research at the UW-Madison by investing the proceeds from its activities back into the university. Since its first grant in 1928, WARF has contributed more than \$900 million to the UW-Madison. These unrestricted grants have been used to support research, build facilities, purchase land and equipment, and fund fellowships for faculty members and graduate students. Because the grant can be used to support highly innovative research for which no other funding sources are available, UW-Madison refers to WARF's annual gift as its "Margin of Excellence" funding.

WARF has processed more than 5,600 invention disclosures developed by UW-Madison faculty and staff, and completed more than 1,500 license agreements with companies around the world. It offers more than 1,000 technologies for licensing and maintains more than 940 active commercial license agreements, including 460 academic and commercial licenses on human embryonic stem cells.

WARF created the WiSys Technology Foundation in 2000 to provide the same services to UW System campuses. Just as WARF's mission is to support research at the UW-Madison by protecting and licensing inventions created by UW-Madison scientists and returning the proceeds to support further research, the mission of WiSys is to patent discoveries made by System faculty and to extend support for research and educational programs to UW System campuses.

To learn more, visit warf.org and wisys.org.



WiSys Activities Update

The tremendous support given to us by System administration, WARF management and individual campuses continue to enable us to reach our goals of initiating new high-potential research projects, facilitating collaborations, and connecting Wisconsin companies with System faculty. Our drive to identify key researchers with high-value project ideas and provide necessary resources for long-term R&D by pooling resources has resulted in the initiation of fifteen projects in 2006-07 for a combined funding of \$726,000 from UW System, WiSys/WARF, campus administrations, and private companies.

The partnership with Marshfield Clinic has been highly successful in generating high-caliber ideas for research and development. Researchers and physicians at Marshfield Clinic bring important clinical challenges, many of which can be addressed by our faculty through R&D. In 2007 we initiated five new collaborative research programs with Marshfield, and many additional projects are at various stages of discussion.

We were able to significantly influence the scientific quality and IP focus of research through the management of the UW System's Applied Research, Prototype Development, and Release Time grant programs and the WiSys Technology Advancement Grant (WiTAG). We continue to successfully leverage the \$1 million gift from WARF to encourage others to pool resources for funding quality long-term research programs. The UW System was able to obtain \$478,000 in the current state biennial budget to match WiTAG. It is expected that the budget allocation will continue in the future, bringing millions more to fund research at System campuses. In 2006-2007, we were involved in screening over 80 grant applications for these programs, of which 40 were selected for funding. A total of \$1.05 million in funding was pooled from various sources.

Making faculty expertise available to benefit Wisconsin small- and medium-sized companies is vitally important to the economic development of the state. We

facilitated five collaborative industry-faculty projects in 2007. OEM Manufacturers (Eau Claire) will partner with Dr. Bertram Ezenwa of UW-Milwaukee to manufacture prototypes of an osteoporosis treatment device. Two River Falls companies are working with Dr. Steven Carlson of UW-River Falls on high-oil corn. Similar arrangements are in place for UW-Stout with Spectrum Industries, UW-Platteville with Photonic Cleaning Technologies, and UW-Eau Claire with Weinbrenner Shoe Company.

WiSys was recognized by UW-Stout and Marshfield Clinic for its efforts in advancing technology development and fostering collaborations. Maliyakal John received the Nelva G. Runnalls Research Support Award from UW-Stout in March 2007 and the Cattails Collaboration Award from Marshfield Clinic in November 2007.

The WiSys team includes Maliyakal John, managing director; Bill Adolfsen, manager; Mindy Dawson, associate; Lisa Murray, administrative coordinator; and Emily Brown, administrative assistant.

New Product Development Opportunities

Dr. Joseph Mazza of Marshfield Clinic is looking for collaboration opportunities on his development idea for home monitoring of peripheral blood counts. Please contact Maliyakal John or Bill Adolfsen (maliyakal@wisys.org and badolfsen@wisys.org) if interested in collaboration on this project.

WiSys is always looking for new products and projects, and we support collaboration across UW campuses and industry. Faculty are encouraged to contact us with ideas on new projects, product development, and partnerships. WiSys can provide funding assistance in some cases.

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System Update: Posters on the Rotunda

The fifth annual Posters in the Rotunda on March 5 was a great success. The event celebrated the many benefits of undergraduate research to our students, faculty, institutions, and state, especially as it relates to innovation and economic development. Nancy Hensel, the Executive Director of the Council of Undergraduate Research, was keynote speaker for a Legislative Symposium, which focused on the value of undergraduate research at the national, state, and local level.

Hensel highlighted the benefits of undergraduate research for students: "Studies indicate that students who engage in undergraduate research develop higher levels of curiosity and critical thinking skills, both characteristics that can lead to a spirit of innovation and entrepreneurship."

Faculty and institutions also gain from students' work: ". . . Undergraduate research leads to higher retention rates both to the institution and to the discipline. In addition, valuing faculty and student research can play a major role in recruitment of outstanding faculty committed to both teaching and research."

Hensel tied the importance of strong faculty and students to state goals: "A recent Wisconsin report, The Economic Value of Academic Research and Development in Wisconsin, suggests, 'Without a vibrant foundation in academic research, Wisconsin will find it difficult, if not impossible, to grow a high-tech knowledge-based economy in the 21st Century.'"

Thank you to all who participated in Posters in the Rotunda and for your exceptional work on behalf of the UW System and our 170,000 students.



CORNER
By Kris Andrews

WEN Update: INOV8 Helps Wisconsin Restaurants Go Green

By Leah Call

As more and more Wisconsin businesses go green, Wisconsin entrepreneurs are giving them the innovations they need. Harry Foust patented a method for auto service garages to use waste oil to heat their buildings and launched INOV8 in La Crosse in 1990.

Today Foust's daughter, Rebecca Faas, is in charge, and INOV8 has taken its technology beyond garages and into restaurants with a device that burns used vegetable oils to produce heat and hot water. The company is currently involved in a pilot installation with a Culver's Restaurant near Kenosha. The pilot has helped INOV8 improve its product and make it more user-friendly for a restaurant setting.

This small, family-owned business has a large market for its latest innovation. A recent study shows that three fourths of the approximately one million restaurants in the U.S. use at least 40 gallons of fryer oil per week, which is the cut off for a decent payback on the investment. In the Culver's test, cost recovery is projected to be just over two years.

Helping INOV8 to commercialize its latest environmentally responsible innovation is Jan Gallagher, director of the Small Business Development Center (SBDC) at the University of Wisconsin-La Crosse. Faas speaks highly of Gallagher: "She is an incredible resource. She is always thinking of different connections and introductions for relationships that might benefit our company."

The UW-La Crosse SBDC is part of the Wisconsin Entrepreneurs' Network (WEN), which allows Gallagher to put Faas in touch with expertise and resources throughout the state, such as WEN regional directors David Linz and Pat Dillon, WARF, WISC and the Department of Commerce.

Gallagher also facilitated a meeting between INOV8 and Maliyakal John to discuss potential collaboration opportunities with UW System. WiSys helped to bring a business consultant to INOV8 to discuss business strategy.



Discoveries continued

"In this way you can detect hydrogen gas by means of conductivity with something as simple as a watch battery and an LED [light-emitting diode]."

The sensor is extremely sensitive, detecting hydrogen in concentrations as low as 25 parts per million, which is below the flammable limit of the gas. The sensor also improves on old technology in the speed of detection. In fact, it is the fastest commercially viable hydrogen sensor in the world.

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"You can detect a two percent hydrogen concentration in about seven milliseconds, as compared to current commercial sensors that take on the order of a minute to 10 minutes to do that," Zach said.

With hydrogen as a contender in the race to replace nonrenewable energy sources, this sensor could be implemented in the automotive industry. For now, the sensor's best use may be surprising to some.

"Battery charging is a more important and immediate application for hydrogen sensing," he said. "Overcharge a battery and hydrogen evolves, which can lead to a dangerous situation."

Prof. Zach's hydrogen sensor earned him a prestigious 2006 R&D 100 Award and a Micro/Nano 25 Award from R&D Magazine. Both awards recognize the year's top commercially marketable technologies.

Prof. Zach plans to continue research and to develop the future innovators of technology at UW-Stevens Point by training undergraduate students to use the school's new scanning electron microscope, atomic force microscope and other tools for nanotechnology research.

"We're definitely pursuing work on nanowires. I have several grant applications pending and a group of exceptionally bright students working on making nanowires, sensors and other exciting projects" Zach said. "We just hired Dave Seley from Colorado State University to be our new Nanotechnology Postdoctoral Researcher/Research Techniques Educator as well, which will be a huge help."

UW-Madison Nanotechnology Resources Available for System Faculty

By Jon J. McCarthy, Director COE User Facilities

The College of Engineering at UW-Madison currently supports four major nanotechnology facilities: the Materials Science Center (MSC), the Wisconsin Center for Applied Microelectronics (WCAM), and the Center for Nanotechnology (CNTech). These state-of-the-art facilities are accessible for researchers from UW-Madison, System campuses, and Wisconsin industry.

The Materials Science Center, on the engineering campus, is a shared core facility designed to provide user-friendly access to instruments for characterization of micro- and nano-scale samples. The facility also includes major electron microscopy, microanalysis, X-ray diffraction tools that provide an extensive range diffraction capability (the Bruker system, the PANalytical X'Pert Pro MRD, and the Stoe Stadi P system), surface analysis equipment, and optical instruments. A state-of-the-art, aberration-corrected, atomic resolution field emission STEM with EDS, GIF, and CCD camera will be installed mid-2008 (FEI Titan).

Current characterization equipment includes: two field emission SEMs, three TEMs, an AFM for hard and soft materials, a Zygo optical interferometer for surface roughness studies, a Perkin-Elmer/Phi Auger, a Phi ESCA system, and a LEO 1540 cross beam FIB system. (See photo.)

Recent additions include a JY LabRAM ARIMAS micro-Raman spectroscopy system and a Rigaku S-MAX 3000, a small-angle x-ray scattering system. Further description of these instruments can be found at <http://msc.engr.wisc.edu/instruments.html>.

More information on the facilities and fees can be obtained from the director at jjmccarthy@wisc.edu.