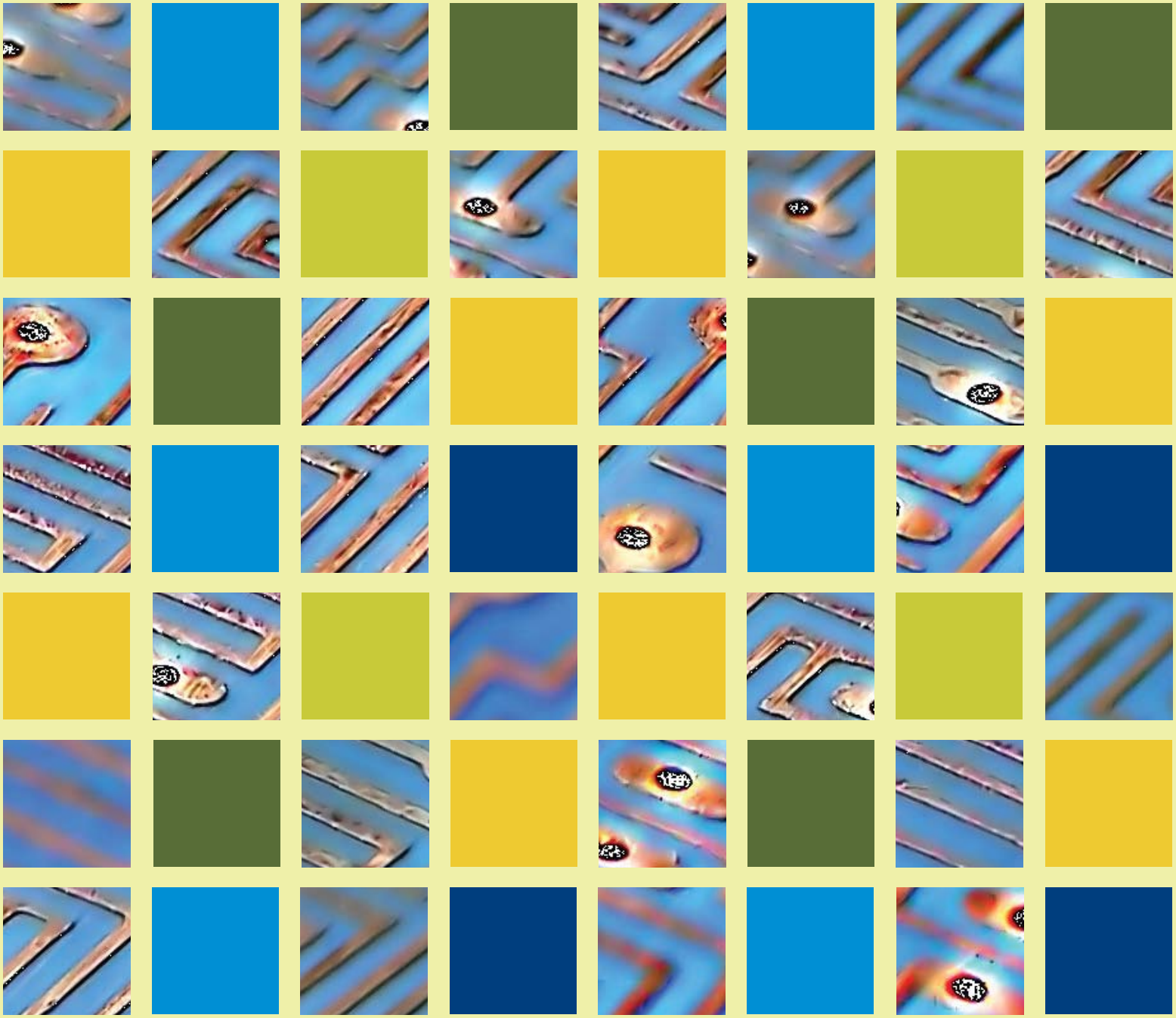

July 21-22, 2014

7th Annual

Wisconsin Science & Technology Symposium

Sharing, Collaborating, Commercializing

Welcome

The University of Wisconsin System is a leader in providing world-class educational opportunities. The seventh annual Wisconsin Science and Technology Symposium is a reflection of the UW System's continuing commitment to excellence in education, research, and technology advancement, each contributing to statewide economic growth. This symposium is an opportunity to form productive collaborations with colleagues from UW System campuses, as well as other research institutions around the state.

~ Ray Cross, President
University of Wisconsin System

I extend my congratulations to the UW System for its effort in advancing technology development and transfer in Wisconsin. The Seventh Annual Wisconsin Science and Technology Symposium provides the opportunity for networking and collaboration within the science and business communities, fostering innovation and entrepreneurship. Research is crucial in order to contribute to the growth of the state's knowledge-based science and technology commercialization. I wish every participant a successful and productive gathering.

~ Tom Still, President
Wisconsin Technology Council

I am pleased to welcome you to the Seventh Annual Wisconsin Science & Technology Symposium. The UW campuses have made tremendous progress in increasing research capacity, leading to increases in intellectual property and economic benefit from the state. As we go forward, the Wisconsin Alumni Research Foundation is pleased to collaborate with WiSys to support UW campus researchers achieve even greater success.

~ Carl Gulbrandsen, Managing Director
Wisconsin Alumni Research Foundation

Clinical research and innovation are vital to our purpose of helping people live well. WiSys has assisted us in making our vision for VibeTech a reality, and I look forward to hearing about other innovation that is taking place in Wisconsin. The Seventh Annual Wisconsin Science and Technology Symposium showcases what is possible when health care professionals and academic institutions join forces to advance patient care through medical innovation and entrepreneurship.

~ Jeff Leismer, Founder and CTO
VibeTech, Inc.

Welcome

It is a pleasure to welcome the Seventh Annual Wisconsin Science & Technology Symposium participants to the UW-Eau Claire campus. The university has a commitment to partnering with local businesses and the community to advance the economic development goals of the region. UW-Eau Claire and the WiSys Technology Foundation organized this event as an opportunity to connect Wisconsin's many accomplished researchers. I encourage you to make the best of this opportunity to build your network and advance scientific research for the state.

~ James C. Schmidt, Chancellor
University of Wisconsin - Eau Claire

Innovative research and technology development is key for economic growth. This event highlights several exciting projects occurring around the state and showcases productive collaborations among researchers, medical professionals, and business leaders. These partnerships enhance the opportunity for success, economically and scientifically, and can change the business climate of our state. I applaud WiSys Technology Foundation and UW-Eau Claire for hosting such an important event.

~ Reed Hall, CEO & Secretary
Wisconsin Economic Development Corporation (WEDC)

Baraboo Barron County Eau Claire Fond du Lac Fox Valley Green Bay
La Crosse Madison Manitowoc Marathon County Marinette Marshfield Milwaukee
Oshkosh Parkside Platteville Richland River Falls Rock County Sheboygan
Stevens Point Stout Superior Washington County Waukesha Whitewater

It is a pleasure working alongside the incredibly talented group of students, faculty and staff from the UW campuses. We at WiSys are proud of the progress the campuses have made in increasing research funding, entrepreneurship resources, and technology transfer. WiSys plays a critical role in advancing the state's awareness of the intellectual potential residing in our campuses and the benefits the state can reap by modest investment in technology development. It is my hope that all in attendance will enjoy learning first-hand about the scientific discoveries and entrepreneurship taking place in Wisconsin.

~ Arjun Sanga, Executive Director
WiSys Technology Foundation

Monday, July 21

8:00 - 9:00 am	**Registration & Breakfast**
9:00 - 10:00 am	**Welcome and Public Session: Session 1** James Schmidt, *UW-Eau Claire* Ray Cross, *UW System* Zach Halmstad, *JAMF Software*
10:00 - 10:30 am	**Break**
10:30 - 11:45 am	**Scientific Presentations: Session 2** Lisa Johnson, *Moderator* Jennifer Dahl, *UW-Eau Claire* Charles Cornett, *UW-Platteville* Seth King, *UW-La Crosse* Roland Gong, *UW-Stevens Point*
11:45 - 1:00 pm	**Luncheon and Networking**
1:00 - 2:00 pm	**WiSys Session: Session 3** David Ward, *WiSys Board of Trustees* Dean Van Galen, *WiSys Advisory Committee* Arjun Sanga, *WiSys Technology Fdn.* Justin Anderson, *WARF*
2:00 - 3:30 pm	**Poster Competition and Networking**
3:30 - 4:45 pm	**Scientific Presentations: Session 4** Bryan Renk, *Moderator* Mike Carney, *UW-Eau Claire* Nick Robertson, *Northland College* Cheng-Chen Huang, *UW-River Falls* Franklin Chen, *UW-Green Bay* Dan McGuire, *UW-Whitewater* Eric Hellstrom, *Florida State University*
4:45 - 5:30 pm	**Trivia Contest**
6:00 - 9:00 pm	**Evening Reception** High Shores Supper Club (Bus Transportation Available)

Tuesday, July 22

7:30 - 8:30 am	**WiSys Board of Trustees Meeting** (Closed Meeting)
8:00 - 9:00 am	**Breakfast**
9:00 - 10:30 am	**Scientific Presentations: Session 5** Neil Lerner, *Moderator* Elizabeth Glogowski, *UW-Eau Claire* Alex Rajangam, *UW-Stevens Point* Michelle Farner, *UW-River Falls* Wei Zheng, *UW-Stout*
10:30 - 11:00 am	**Break**
11:00 - 12:00 pm	**Start-Up Presentations: Session 6** Greg Robinson, *Moderator* Marlo Vasquez, *VibeTech* Allen Clauss, *Xolve* Susan Gallagher-Lepak, *UW-Green Bay* T. Heather Herdman, *NANDA* Robert Meyer, *OptSolv* Annamalai Karthikeyan, *Microionic Systems*
12:00 - 1:15 pm	**Luncheon and Networking**
1:15 - 2:30 pm	**Entrepreneurship Panel: Session 7** Jon Cook, *Moderator* Idella Yamben, *Ideadvance* David Eckmann, *UW-Stevens Point* Neil Lerner, *Wisconsin SBDC* Aaron Hagar, *WEDC* Denise Ehlen, *UW-Whitewater*
2:30 pm	**Closing Remarks** Patricia Kleine, *UW-Eau Claire*

Research and technology development are vital to the economic growth of Wisconsin. To encourage interdisciplinary research in the state, WiSys Technology Foundation and UW-Eau Claire have jointly organized the Seventh Annual Wisconsin Science & Technology Symposium to bring together innovative researchers from the University of Wisconsin System and other public and private organizations.

It is our hope that this symposium will provide the opportunity for critical networking and the formation of partnerships to help further innovative ideas in Wisconsin. Thank you for your participation in WSTS 2014.

General Information

Information
For information and answers to any questions you may have, please visit the WSTS registration desk.

Name Badge
Please wear your name badge at all times. Admission to all presentations and meals is open only to those registered for the conference.

Parking Information
Parking at UW-Eau Claire is available in the designated lot with the permit that was sent to you prior to the conference. For parking issues, please speak to the registration desk. Parking at the High Shores Supper Club is somewhat limited. We invite all attendees to take the free shuttle over to the Supper Club. The shuttle will take you back to your cars after the event.

Internet Access
Wireless Internet access is available throughout the Davies Center on the UWECpublic network. No password is needed. Please see the registration desk with any issues.

Sponsor Booths & Poster Exhibition
Sponsor and poster exhibits will be on display throughout Monday and Tuesday. The main poster session is Monday afternoon.

Meals
Beverages and various snacks will be available throughout the conference.

Cell Phones
Please turn off your cell phone while inside the presentation hall.

Presentations
Certain PowerPoint presentations, along with other materials from the symposium, may be made available on the WiSys Web page after the event: www.wisys.org.

Speaker Index
A Speaker Index can be found on the inside back cover of this program.

Planning Committee:
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Jon Cook, *WiSys Technology Foundation*
Devon Cournoyer, *Wisconsin Alumni Research Foundation*
Doug Dunham, *UW-Eau Claire*
Jennifer Golat, *UW-Eau Claire*
Ann Muehl, *Wisconsin Alumni Research Foundation*
Katlynn Rodgers, *WiSys Technology Foundation*
Arjun Sanga, *WiSys Technology Foundation*
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Wisconsin Alumni Research Foundation
Wisconsin Economic Development Corporation
WiSys Technology Foundation

Monday, July 21

8:00 - 9:00 am **Registration and Breakfast**

9:00 - 10:00 am **Welcome and Public Session: Session 1**

James Schmidt, Chancellor, UW-Eau Claire

Dr. James Schmidt has served as chancellor at UW-Eau Claire since July 1, 2013.

Prior to joining UW-Eau Claire, Schmidt served as Vice President for University Advancement at Winona State University and as Executive Director of the WSU Foundation Board of Trustees.

Schmidt previously served as Vice President for Student Affairs at Riverland Community College, which has campuses in Austin, Albert Lea and Owatonna, Minn. At Riverland, he was responsible for admissions, financial aid, diversity, career placement and other programs. He has also held leadership positions at Austin (Minn.) Community College and Minnesota Riverland Technical College, which has campuses in Austin, Rochester, Faribault and Owatonna, Minn.

Schmidt holds a doctorate in educational policy and administration from the University of Minnesota, a master's degree in business administration from the University of St. Thomas and a bachelor's degree in political science from Winona State University.

Ray Cross, President, UW System

Raymond W. (Ray) Cross, Ph.D., began his appointment as the seventh president of the University of Wisconsin System on February 15, 2014.

The UW System's two doctoral universities, 11 comprehensive universities, 13 freshman-sophomore UW Colleges, and statewide UW-Extension annually serve more than 181,000 students, and reach more than one million Wisconsin citizens through outreach, public broadcasting, and continuing education programs.

Cross leads a UW System workforce of some 40,000 faculty, academic and classified staff, and graduate assistants. He is also responsible for the UW System's $5.9 billion annual budget, made up of state support, federal funding, tuition and fees, and private gifts. He reports to the UW System Board of Regents.

Previously, Cross served as chancellor of the University of Wisconsin Colleges and University of Wisconsin-Extension from February 2011 through February 2014.

From 1998 until coming to Wisconsin in 2011, Cross was president of Morrisville State College, a residential agriculture and technology college of the State University of New York (SUNY). He led that school in developing and implementing a new college vision and strategic plan, which strengthened the institution's academic quality, promoted the development of several new academic programs, integrated technology into all programs, encouraged entrepreneurialism and innovation, and established applied business centers throughout the college. Cross also spearheaded several agriculture, energy and technology initiatives, including the ThinkPad University partnership with IBM and a biodiesel co-generation project, and made rural entrepreneurship a priority.

Cross served as president of Northwest Technical College in Bemidji, Minn., from 1992-98. Previous to that he was a department head and a professor (1977-92) at Ferris State University in Big Rapids, Mich.

Cross received his doctorate in college and university administration from Michigan State University. He earned a master's degree in industrial education at Central Michigan University and a bachelor's degree in technical education from Ferris State University. In 2007, Colgate University awarded Cross an honorary doctorate of science.

In addition to his career in academia, Cross has experience in the private sector as a design engineer, small-business owner and consultant to business, industry and government. From 1967-70, Cross served with the U.S. Army in Vietnam and was awarded four medals for his service.

Zach Halmstad, Founder and Co-CEO, JAMF Software

Long time resident of Eau Claire, Zach Halmstad is a graduate of North High School and University of Wisconsin-Eau Claire. He studied as a pianist and graduated with a degree in music, but it was his work at UWEC's IT department that fueled his interest in streamlining Information Technology administration. The tools he created to efficiently setup and maintain campus

computers, later became the foundation and motivation to start JAMF Software, the creators of the Casper Suite. Twelve years later the company has 7 offices, 310 employees and over 4,000 customers world wide. Just recently, Zach started Pablo Properties, which is building a permanent home for JAMF Software and is involved in two hotel renovations in Eau Claire's downtown area.

10:00 - 10:30 am Break

10:30 - 11:45 am Scientific Presentations: Session 2

Moderator: Lisa Johnson, Vice President of Entrepreneurship and Innovation, Wisconsin Economic Development Corporation

Lisa Johnson is Vice President of Entrepreneurship and Innovation for the Wisconsin Economic Development Corporation (WEDC), Wisconsin's lead economic development organization. Prior to joining the WEDC in 2011, Lisa spent more than 22 years in business development and technology licensing and operations in the biotechnology center, most recently as Chief Business Officer for Semba Biosciences. Lisa also has held a range of management and business development positions with Novagen-EMD Biosciences and was one of the founding members of the bioscience company. For EMD Biosciences North America, she was Vice President of Corporate & Business Development and Operations.

Jennifer Dahl, UW-Eau Claire

Covalently Crosslinked Gold Nanoparticle Networks: Structural Characteristics and Applications in Photovoltaics

A series of hydrophobic gold nanoparticles were prepared by the Brust-Schiffrin method, employing thiols with chain lengths ranging from C6-C18 as capping ligands. Solutions of the purified nanoparticles were cast as monolayers upon the air-water interface of a Langmuir trough. After collecting compression isotherms and noting collapse pressures for each monolayer film at 20 °C, the impact of covalent crosslinking was studied by introducing a solution of dodecanedithiol in hexanes to the floating film of nanoparticles. It was discovered that characteristic collapse pressures increased significantly for films of nanoparticles with capping ligand alkyl chain lengths of less than 16 carbons. The films are easily transferred to solid substrates with little apparent change in morphology. The plasmonic properties of these films can be exploited to enhance photocarrier generation in transparent conducting oxide materials (TCOs). We are currently exploring two different roles for the films as components of inexpensive photovoltaic materials: either as simple backside reflecting materials, and as AuNP/TCO superstructures.

Jennifer A. Dahl is beginning her fifth year as an assistant professor of Materials Science at the University of Wisconsin-Eau Claire. Dr. Dahl's interest in surface science began as an undergraduate research assistant at the University of Wisconsin Oshkosh, where she completed a B.S. in Chemistry. Her work with nanotechnology continued as a Ph.D. student in Chemistry at the University of Oregon, and as a postdoc at Trinity University in San Antonio, Texas. Dr. Dahl's research program at UWEC has been focused on chemical modification of nanoparticles to better enable solid state applications, and the development of spectroscopic methods to probe surface composition on the nanoscale.

Charles Cornett, UW-Platteville

Towards a Reliable Color Test for Synthetic Cathinones for Law Enforcement Use In-Field

Designer and emergent illicit drugs have entered the market at a rapid pace in the past five years. Synthetic cathinones (aka: "bath salts) are one such category of "new" drugs and have presented problems for traditional in-field color test kits. To further complicate matters, international companies deliberately derivatize the core functional structure in order to circumvent state and federal scheduling related to cathinones as well as other scheduled (controlled) substances. Our project has developed a reliable color test that is effective for both the current derivatives as well as future derivatives of cathinone.

Dr. Charles Cornett has been a chemistry professor at the University of Wisconsin-Platteville for thirteen years. His educational background includes a B.S. in Chemistry from King College in Bristol, TN and a Ph.D. in chemistry from the University of Kentucky. Chuck began his teaching career at the College of Mount St. Joseph in Cincinnati, OH and there shifted his research interests from Alzheimer's disease studies to forensic science. Today, Dr. Cornett supervises the Criminalistics Emphasis in Chemistry at the University of Wisconsin-Platteville and maintains research projects in color tests for controlled substances, error rate determination in ignitable liquids, and application of polymers in latent print analysis.

Seth King, UW-La Crosse

Developing ZnO-Based Electro-Absorption Modulators

Currently there is much interest in using ZnO for optoelectronic devices as it exhibits a band gap in the ultraviolet (UV); making it well-suited for short-wave optoelectronics [e.g. light emitting diodes (LEDs), laser diodes, detectors, and electro-absorption modulators (EAMs)]. ZnO is naturally transparent to visible light and when properly alloyed exhibits good electrical conductivity. For these reasons, it is being developed for transparent electrodes for solar cells. Moreover, ZnO has a large exciton binding energy and when combined with alternating layers of ZnMgO can form type-I quantum wells, making it an extremely promising material for EAMs.

We will discuss an intra-departmental, collaborative research program aimed at developing ZnO/ZnMgO EAMs for short-wave applications. These nanolaminate structures are grown via reactive DC sputter deposition, and structurally characterized with a suite of instrumentation. The optical properties of the films are then examined via temperature-tunable broadband spectroscopic system. The quality of the EAMs will, ultimately, be quantified by determining standard performance parameters such as contrast ratio, insertion loss, optical bandwidth, and bias voltage as a function of temperature and the geometrical and material composition parameters of the structures.

Dr. King is a 2009 graduate of UW – Milwaukee where he earned his Ph.D. in physics, and a 2003 physics graduate of UW – Eau Claire. His dissertation focused on the growth and characterization of wide-bandgap semiconductors which led to new understanding of the role hydrogen plays in stabilizing polar oxide surfaces. Currently an Assistant Professor of Physics at UW – La Crosse, and an Adjunct Assistant Professor in the Department of Chemistry and Biochemistry at UW – Milwaukee, Dr. King's research seeks to develop new and novel oxide materials for applications in photovoltaics, photocatalytics, and optoelectronic devices.

Roland Gong, UW-Stevens Point

New Approach on Deinking Evaluation

One third of paper products in US contain recycled paper. Part of recycled paper products need clean fiber so that deinking process is required. Deinking evaluation is common procedure in many recycled mill labs. Two most applied evaluation methods, visible light image

analysis and optical reflectance using Kubelka-Munk Equation, are insufficient in practice. Visible light image analysis cannot analyze sub-visible ink specks because of the paper unevenness. However, those ink specks are major factor on the paper appearance. The paper unevenness also leads poor evaluation results, such as two-sidedness, large variances and poor repeatability. Optical reflectance method (or Kubelka-Munk Equation) is not effective when deal with the non-transparent substrates, such as paper. Except the large variances and poor repeatability, this method might produce meaningless results. Image analysis using near infrared light is an effective method to avoid above problems. It also has opportunity to be a new industrial standard in the future. With proper design, this technology can be developed into a new deinking evaluation instrument for mill laboratory, or an on-line inspection tool.

Dr. Roland Gong is the Assistant Professor at the Department of Paper Science and Engineering, University of Wisconsin-Stevens Point; where he teaches Fluid Mechanics and Hydraulics, Thermodynamics and Process Control. He graduated with a B.E. of Printing Engineering, Xi'an University of Technology in 1998. After graduation, he started as engineer in the cigarette printing and packaging industry. He had managed several cigarette packaging and gravure printing projects. In 2013, Dr. Gong earned the Ph.D. degree of Paper and Printing Science and Engineering at Western Michigan University (Kalamazoo, MI), where he also obtained his master degree at same program in 2010. His research concentrates on paper recycling and deinking, especially on deinking evaluations. He also researched on paper surface treatments, rheology, print optimization and color management, and packaging during his graduate study and industrial career.

11:45 - 1:00 pm Luncheon and Networking

1:00 - 2:00 pm WiSys Session: Session 3

David J. Ward, Chair, WiSys Board of Trustees

Dr. Ward is currently serving as the interim Senior Vice President for Academic and Student Affairs at the University of Wisconsin System Administration. He is the CEO and founder of NorthStar Consulting of Madison and Sturgeon Bay, Wisconsin. He received his BBA, MBA and PHD from the University of Wisconsin Madison.

David had a 32 year career with the University of Wisconsin and was a professor of finance on campuses at Green Bay and Oshkosh. He also served six years as the Senior Vice President and Chief Academic Officer for the University of Wisconsin System. His career in university administration included five years as vice chancellor for academic affairs at UW-Oshkosh and interim chancellor positions at both UW Green Bay and UW-Oshkosh.

Dr. Ward founded NorthStar Consulting, a private economic consulting firm, in 2000. NorthStar Consulting has played a key role in regional economic development in Wisconsin. NorthStar's strategic economic development plan for Northeast Wisconsin led to the formation of the 18 county New North Economic Partnership. NorthStar has also done regional strategic plans for Centergy, the Grow North Region, and the Upper Peninsula of Michigan.

Dr. Ward is on the boards of the WiSys Technology Foundation, the Ministry Door County Medical Center, and the Door County Economic Development Corporation. He is a member of the Business and Agriculture Advisory Committee for the Federal Reserve Bank of Chicago. He is an active angel investor and is a founding member of the Origin Investment Group in La Crosse, Wisconsin and Angels on the Water Fund in Oshkosh, Wisconsin.

Dean Van Galen, Chancellor, UW-River Falls

Dean Van Galen is beginning his sixth year as the 18th Chancellor of the University of Wisconsin-River Falls. A Wisconsin native and a 1982 alumnus of the University of Wisconsin-Whitewater, Van Galen went on to earn a Ph.D. in analytical chemistry at Kansas State University and conduct post-doctoral research at the University of California at Berkeley. Van Galen began his academic career in 1987 as a chemistry professor at Truman State University in Missouri where he was selected as the State of Missouri's 1991 CASE Professor of the Year. Van Galen

later served as vice president for university advancement at Truman and, prior to his selection as chancellor, served as vice president for university advancement at the University of West Florida (Pensacola) for six years. He is currently a member of the Board of Trustees of the WiSys Technology Foundation.

Arjun Sanga, Executive Director, WiSys Technology Foundation

Arjun Sanga, executive director of WiSys Technology Foundation, is an expert in technology transfer, intellectual property management and commercialization. He most recently served as assistant vice president for technology transfer at UT Health Science Center San Antonio and executive director of a multi-campus technology development office of the University of Texas. Sanga directed system-wide technology management and commercialization strategies.

Sanga has more than 18 years of experience leading research collaborations, managing intellectual property, closing licensing deals and fostering startup companies. He spearheaded major deals in Texas and sought to balance the needs of different stakeholders, including faculty, state government, industry and investors.

A registered patent attorney, Sanga has been involved in every aspect of technology transfer, from operations to management. He has a background in chemistry and computer science.

Justin Anderson, Intellectual Property Manager, Wisconsin Alumni Research Foundation

Justin Anderson is an Intellectual Property Manager for the Wisconsin Alumni Association Research Foundation (WARF), the private, nonprofit patent and licensing organization for the University of Wisconsin–Madison. Justin manages the intake of new inventions, application preparation, and patent prosecution of physical and life science technologies in the areas of chemistry, engineering, biotechnology, and medical devices. Justin, a registered patent agent with B.S. degrees in Chemical Engineering and Biochemistry from UW-Madison, has worked in technology transfer for seven years. Prior to joining WARF, Justin worked as a process engineer with an emphasis on project management, process design, and quality control. In addition, Justin spent a year working at a clean tech start-up where he drafted patent applications and managed an active IP portfolio that included numerous patents, trademarks, and trade-secrets.

2:00 - 3:30 pm	**Poster Competition and Networking**
3:30 - 4:45 pm	**Scientific Presentations: Session 4**

Moderator: Bryan Renk, Executive Director, Bioforward

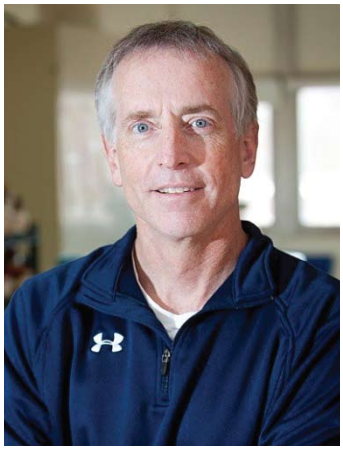
Bryan Z. Renk is Executive Director of BioForward, a member-driven state association that represents Wisconsin's bioscience industry. Bryan's previous roles have been as President and CEO of aOva Technologies, Director of Licensing at the Wisconsin Alumni Research Foundation, and Director at Wm. F. Renk and Sons.

Bryan currently sits on the Board of Directors for Maple Leaf Farms, the largest vertically integrated duck producer in the United States, as well as FluGen, an emerging leader in influenza vaccines. He is also President of the Wisconsin Agricultural and Life Sciences Alumni Association (WALSAA) and a member of the UW - Madison College of Agriculture and Life Science Board of Visitors. Mr. Renk holds MS and BS degrees in Meat and Animal Science and Muscle Biology from the University of Wisconsin-Madison and is a lifetime member of the National W Club.

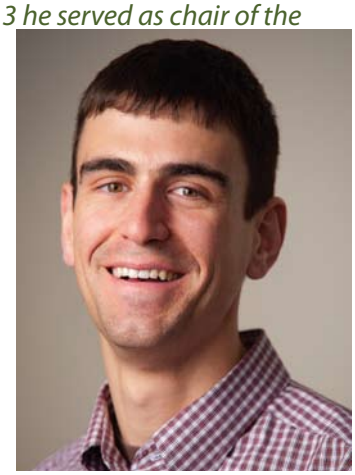
Mike Carney, UW-Eau Claire; Nick Robertson, Northland College

Harvesting Valuable Chemicals from Plastic Waste Streams: A New Method for Polymer Recycling

The U.S. generates nearly six billion pounds of post-consumer polyethylene terephthalate (PET). Traditional PET recycling consumes only 30% of this post-consumer material, with the remaining 70% sent to landfills, often after only a single use. Using ruthenium-based catalysts, we have developed a process that effectively depolymerizes post-consumer PET, as well as other polyesters and polycarbonates, into commercially useful chemicals. In this talk we will outline the overall depolymerization technology, contrast this technology with that of traditional recycling, and provide some recent laboratory results and an overview of our ongoing work.



Mike Carney is a 1983 UW-Eau Claire chemistry alumnus. He obtained his M.A. and Ph.D. in inorganic chemistry from Harvard University in 1985 and 1988, respectively, followed by a post-doctoral appointment in organometallic chemistry at the University of California-Berkeley. After leaving Berkeley, he spent 10 years working on catalyst research and development projects, first at Chevron Chemical Company in Kingwood, TX and later at W.R. Grace & Co. in Columbia, MD. In 2000, Mike returned to UW-Eau Claire to teach chemistry and conduct research with undergraduates. From 2010-13 he served as chair of the chemistry department, and in 2013 he was appointed Associate Vice Chancellor for Undergraduate Curriculum, Internationalization, and Immersive Experiences. Mike holds 25 US patents and has published 25 papers on his research in polymerization catalysis and inorganic chemistry.



Dr. Nick Robertson is an

Assistant Professor of Chemistry at Northland College in Ashland, WI. He grew up in Eau Claire, WI and completed his B.S. at UW-Eau Claire before pursuing his M.S. and Ph.D. at Cornell University, where he worked on developing new organic ion-exchange membranes for fuel cell applications. In 2009 he began teaching at Northland College. His research group focuses on catalytic transformations for reducing the environmental impact of plastics. Nick currently teaches general, organic and inorganic chemistry.

Cheng-Chen Huang, UW-River Falls

Searching for Safer Skin Whitening Reagents Using Zebrafish Embryo

Skin whitening has become a major practice in the cosmetic industry because of its ability to correct uneven skin pigmentation and treat pigment disorders. However, many chemicals presently used in skin whitening exhibit adverse health effects including skin sensitivity and cancers. The goal of this project is to explore safer skin whitening chemicals using zebrafish embryos, which provide an easy system for pigmentation study and toxicology testing. Several current human skin whitening agents and a known melanin synthesis inhibitor, PTU (phenylthiourea) were compared with our newly discovered skin whitening reagents, A11 and MEK-I. We found that in early embryos while most of the human reagents inhibited pigmentation by between 5% and 80%, A11 inhibited >90%. Additionally, when the compound was washed away, all embryos exhibit pigment recovery quickly, except those treated with A11 which recovered slowly and only partially. To test the effect of these reagents on existing pigment, embryos were treated with the chemicals after pigment had developed. Interestingly, only A11 and a few others were able to remove a distinguishable amount of existing pigment. Furthermore, most of the potent compounds, but not A11, caused severe toxicity. Thus, A11 may be a safer skin whitening reagent.

Dr. Huang grew up and completed his undergraduate education in Taiwan and then received his PhD degree in Cell & Developmental Biology at Rutgers University, New Jersey. After the PhD, Dr. Huang took a postdoc position at Wash U in St. Louis with Dr. Steve Johnson, where he began his developmental genetic research career with zebrafish. Three years later, he moved back to Taiwan for family reasons and took a second postdoc position at the national research institute Academia Sinica. In 2008, Dr. Huang started his teaching and research career in the Biology Department at UW-River Falls. His primary interest now is in using the zebrafish embryo for drug discovery and toxicology studies.

Franklin Chen, UW-Green Bay

Physical Chemistry Approach to Solve Environmental-Related Problems

Two examples of physical chemistry applications for solving environmental-related problems are illustrated here. One regards water treatment, the other soil conditioning.

In the water-treatment plant, both clay (China clay) and cationic polymers are used. Cationic polymers are more expensive but more efficient. However, from time to time, the cationic polymers lose efficacy over time. I was asked to investigate the cause of losing efficiency. Using intrinsic viscosity measurement, T.O.C analysis and fluorescence spectroscopy, we reported that the real cause of losing efficiency is due to the presence of organic matter in the river water. We demonstrate that a combination of both China clay and montmorrillite clay is cost-efficient for getting efficient settlement of the sediment.

Another example concerns soil conditioner. Plant growth requires top soil whose formation is a slow process. It is said that it takes 100 years to grow 1 inch of top soil. Yet this 1 inch top soil can be lost in a matter of months by wind or by flood. One method farmers currently use to combat this is a polymer capable of holding clay particles and nutrients together. Yet, the polymer is petroleum-based and cannot be degraded by soil bacteria. Our WiSys project is to find an alternative to replace the current polymer.

Franklin received his B.S.

of Agricultural Chemistry, 1970, from National Taiwan University, Taipei, Taiwan and Ph.D. From Princeton University in chemistry in 1977. He has been employed by Colgate-Palmolive, Johnson and Johnson and finally at Kimberly-Clark. He retired from Kimberly-Clark and joined UW-Green Bay in 2002.

His research interests are physical chemistry approach for solving environmental problems; and quantum chemistry computations

Dan McGuire, UW-Whitewater; Eric Hellstrom, Florida State University

Art, Science, and Industry Collaborate to Advance Modern Metal Casting

Over the course of 12 years, university researchers Dan McGuire, Eric Hellstrom, and Charlie Olson have worked closely through WiSys to collaborate with industrial foundries in order to perfect and transfer class room inventions into commercially viable practices. The researchers will share applied WiSys technologies that have helped to further modern metal casting practices. This body of applied research was made possible due to all three researchers working with students in the class room, as well developing long-term trusted relationship between the researchers and industry.

Eric Hellstrom is Professor Emeritus of Materials Science and Engineering, UW-Madison, Madison, WI; Professor of Mechanical Engineering, Florida State University, Tallahassee, FL. Co-Partner with Dan McGuire – Foundry Solutions LLC; Whitewater Innovation Center, Whitewater, WI

Daniel S. McGuire is Professor of Art, UW-Whitewater, Whitewater, WI. He is co-partner with Eric Hellstrom - Foundry Solutions LLC , Whitewater Innovation Center, Whitewater, WI

4:45 - 5:30 pm Trivia Contest

Join us for the first ever WSTS Trivia contest, a showdown between random teams. Take this opportunity to relax, catch up with old friends and make new ones as Arjun Sanga tests your knowledge of topics related in some way to technology transfer, the region, and our host city.

6:00 - 9:00 pm Evening Reception

The evening reception is taking place from 6-9 pm at the High Shores Supper Club overlooking Lake Wissota in Chippewa Falls. Bus transportation is available and will leave at 5:30 pm from the Davies Center. The address for High Shores Supper Club is:

17985 County Highway X,
Chippewa Falls, WI 54729

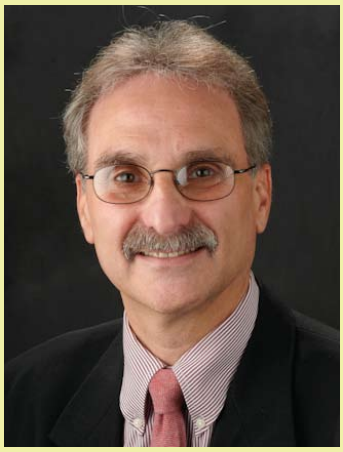
Tuesday, July 22

7:30 - 8:30 am WiSys Board of Trustees Meeting (Closed Meeting)

8:00 - 9:00 am Breakfast

9:00 - 10:30 am Scientific Presentations: Session 5

Moderator: Neil Lerner, Interim State Director, Wisconsin Small Business Development Center Network



Neil Lerner is the interim state director of the Wisconsin Small Business Development Center network. He leads the operations, management, and strategic and financial planning of the Wisconsin SBDC Network, a $3.4 million federal- and state-funded program. The Wisconsin SBDC network provides no-cost, confidential consulting services to business owners, entrepreneurs and inventors to grow existing their firms and start new companies. SBDC locations include 12 service centers, organized into regions, and three specialty centers all affiliated with University of Wisconsin four-year campuses, including UW-Madison where Lerner has been the center director since 1996. In the interim, Lerner will have a dual role, providing leadership for both the statewide network and the center at UW-Madison. Neil

comes to the position with a wealth of experience serving clients, managing an SBDC center and understanding of the statewide network. He has been named a Wisconsin Idea Fellow by UW System, received the UW-Extension Award for Excellence and the Wisconsin SBDC State Star award. The center at UW-Madison has also received the SBDC Service Center Excellence Award from the U.S. Small Business Administration.

Elizabeth Glogowski, UW-Eau Claire

Smart Polymers: Switchable Systems for Enhanced Oil Recovery Applications

Enhanced oil recovery techniques are implemented after conventional recovery no longer yields oil from underground reservoirs. Up to 65% of oil can remain after conventional recovery methods are exhausted. Chemical enhanced oil recovery requires a mix of surfactants, polymers, and water to collect additional oil in reservoirs. Smart polymers, or polymers that respond to external stimuli such as temperature or pH, have the potential to improve current chemical enhanced oil recovery technology. Specifically, the smart diblock copolymer polyethylene glycol-block-poly((2-dimethylamino)ethyl methacrylate) (PEG-PDMAEMA) shows promising initial properties for chemical enhanced oil recovery applications. PEG-PDMAEMA has been synthesized using atom transfer radical polymerization to control molecular weight and molecular weight distribution. Diblock copolymers have been characterized using 1H-NMR spectroscopy and size exclusion chromatography to confirm polymer properties. Thermoresponsive behavior has been measured using UV-Visible spectroscopy and dynamic light scattering to determine the effect of polymer molecular weight, polymer concentration, pH, and ionic strength on polymer properties in solution.

Dr. Elizabeth Glogowski is an assistant professor in Materials Science at UW-Eau Claire. Her research program with undergraduate students focuses on the synthesis and characterization of smart polymers, or polymers that respond to stimuli such as temperature and pH. Her research group uses a polymerization process that allows for the tuning of the microscale structure of the polymers to control the resulting macroscopic properties. These smart polymers have broad ranging applications from enhanced oil recovery to templates for microelectronics. Dr. Glogowski earned her BS in Chemistry at Carnegie Mellon University and her PhD in Polymer Science & Engineering at the University of Massachusetts at Amherst. She was a post-doctoral fellow at the University of Illinois at Urbana-Champaign in the departments of Materials Science & Engineering and Chemistry.

Alex Rajangam, UW-Stevens Point

Bio-Economy Research at WIST

The Wisconsin Institute for Sustainable Technology has received funding to create the Cellulose Pilot and Processing Lab (CPPL). This facility aims to accelerate the development of the renewable materials, paper, green chemicals and biofuels and other emerging bio-based industries through collaborative research and piloting facilities. The facilities and research expertise will be available to major manufacturers, small startups, entrepreneurs and academics that have an idea of how to convert cellulose and lignin, the most abundant natural materials on Earth, into the sustainable and renewable products of the future. The CPPL is currently working on three interrelated projects to accelerate biorefinery commercialization: working with the pulp and paper industry, we are developing methods to turn mill residues into biorefinery feedstocks; we are working to develop value-added chemicals from the oil crop Camelina sativa; and we are working to develop compostable plastics from lignin. The CPPL looks to support industries and entrepreneurs looking into new ways to process biomass into chemicals, textiles, packaging, fuels, and materials, which will in turn develop new industries for a more sustainable economy.

Dr. Rajangam has been a researcher for the last 13 years in the field of Wood Biotechnology as a Molecular Biotechnologist, working in various projects related to biosynthesis, biodegradation and bioconversion of lignocellulosic biomass and channelize the processed biomass to various sustainable applications. He got his PhD in the field of Wood Biotechnology at KTH, Sweden under the supervision of Prof. Tuula Teeri. During his PhD

University of Wisconsin
Eau Claire

UW-Eau Claire helps to unleash the power of "and" by challenging students, faculty, staff and alumni to explore their multiple passions and academic pursuits. Blugolds are not defined solely by one interest or discipline. They are competitive, successful graduates with much to offer the world.

research, he worked with discovery, characterization of Carbohydrate Active Enzymes (CAZymes) involved in wood biosynthesis and degradation in Poplar tree. He had worked in Indo-Israel, Swedish, European and Swedish-US funded projects in his career and his research interest lies within the field of Applied Biology, Engineering and Business for biomimetic application of biosynthesis of biofuel and biomass. Currently he is working as a Research Associate at WIST, University of Wisconsin, Stevens Point to develop various projects by metabolic engineering of microorganism to make biofuels by transforming cellulose rich biomass. He will work along with other scientists in WIST to scale up research projects to industrial scale harboring various biofuels and useful biochemical.

Michelle Farner, UW-River Falls

Undergraduate Research and Business Outreach Opportunities in the Dairy Pilot Plant at UW-River Falls

The Dairy Pilot Plant at the University of Wisconsin-River Falls is a pilot plant scale dairy manufacturing facility where students participate in producing cheese and ice cream products that are served in the campus dining hall and sold in retail size packages. The Pilot Dairy Plant also serves as a food science laboratory where undergraduate research topics can be initiated and studied. Some of the research topics studied in the past have included variations in cheese salting techniques, producing cheese with blended milk, and salt alternatives for cheese. Students are able to develop and produce their own dairy products and study various treatment effects on their products utilizing tools and equipment available through the Dairy Pilot Plant.

For over 30 years, private companies have utilized the Dairy Pilot Plant as a research facility to enhance and develop products and processes for the dairy industry. Our location, pilot-scale size, and plant capabilities allow us to offer services that few universities can compete with. Undergraduate students have the unique opportunity to work directly with private companies and their products, gaining practical research and development experience prior to graduation. This includes work on unique ice cream blends, whey permeate products, and cheese ingredient trials. Currently, two students are working on the development of a new cheese product for a private packaging company that would greatly reduce their trim waste.

Michelle Farner is the Dairy Pilot Plant Manager at the University of Wisconsin-River Falls. She holds a Bachelor of Science degree in Food Systems and Technology from the University of Wisconsin-Stout and a Master of Science degree in Agricultural Education from the University of Wisconsin-River Falls. Michelle has been a licensed cheesemaker since 2002 and has worked with farmstead and organic creameries, producing American style cheeses, various cream cheeses and blue cheese. Her professional experience encompasses working with dairy related start-up companies to Fortune 500 companies. Michelle also has extensive food safety and quality assurance experience as an ISO 22000:2005 certified internal auditor. Currently she teaches students dairy manufacturing principles through dairy manufacturing courses. Michelle also teaches cheese and ice cream processing to students utilizing the Pilot Dairy Plant at the University of Wisconsin-River Falls, which serves as an on-the-job training platform.

Wei Zheng, UW-Stout

Research Development on Biodegradable Plastics

This talk focuses on the research development on biodegradable plastics primarily carried out in the Plastics Engineering Program at the University of Wisconsin-Stout. To meet the plastics market needs, tremendous efforts have been made to understand and engineer biodegradable materials such as polylactic acid (PLA), PLA/clay nano-composites, and an alternative "green" thermosetting resin. Research findings from

these three systems will be presented including the thermal and physical properties of PLA, the curing process of the novel resin, and the development and characterization of the PLA/clay composites. Thanks to the support from the University of Wisconsin System, the research has involved a large group of students and faculty spanning multiple UW campuses including UW-Stevens Point and UW-Milwaukee. The collaboration effort and its implication to the research development will be discussed in the presentation as well.

Dr. Zheng is currently an Assistant Professor of Plastics Engineering Program at University of Wisconsin-Stout. Prior to joining UW-Stout in 2012, she was a Postdoctoral Researcher in the Polymer Science and Engineering Department at University of Massachusetts-Amherst. She received her Ph.D. in Chemical Engineering at Texas Tech University in 2008, and a B.S. in Chemical Engineering at East China University of Science and Technology in 2003. Her research is primarily in the areas of polymer physics, mechanics, and processing including the development of biobased nanocomposites, curing kinetics of thermosetting resin, rheology of complex fluids, and structure-property-processing relationship. She has published 25 referred articles, currently has over 400 citations, and made more than 25 conference presentations.

10:30 - 11:00 am	**Break**
11:00 - 12:00 pm	**Start-Up Presentations: Session 6**

Moderator: Greg Robinson, Managing Director, 4490 Ventures

Greg has over two decades of operating and venture capital experience. Prior to 4490 Ventures, Greg spent over a decade at Peninsula Ventures investing in early stage software companies. Greg was also a co-founder and COO of Cogent Technologies, which was acquired by Brightstar. Greg has a Master of Business Administration from the Tuck School of Business at Dartmouth and a Bachelor of Sciences in Economics from Arizona State University.

Marlo Vasquez, CEO, VibeTech, Inc.

VibeTech is committed to providing safe and effective medical rehabilitation equipment for patients with impaired mobility. We have created a new era of technology that restores strength and function with the introduction of our premier product to the eldercare market. The VibeTech One is the first and only semi-recumbent strength training and vibration therapy system for neuro-musculoskeletal rehabilitation of the lower extremities. Feedback from this newly released product has been very positive and suggests great potential for adoption into the rapidly growing eldercare market and follow-on markets such as sports medicine, home care, and orthopedics."

Mr. Marlo M. Vasquez is currently the CEO of VibeTech, Inc., a pioneer in the medical rehabilitation device industry that improves people's health, independence and quality of life through vibration science. Prior to this, Mr. Vasquez was Vice President and General Manager for the Nutritional Chemistry and Food Safety (NCFS) Business at Covance generating around $80MM a year in revenues. He spent 9 years with GE HealthCare in multiple roles including roles in Engineering, Manufacturing, Service, Six Sigma, and Marketing. As North America Services Marketing Manager, he was responsible for growing a $200MM base business. Mr. Vasquez also worked as an Operations Management Consultant for Booz-Allen & Hamilton where he drove strategic growth and operational improvements for his clients. Mr. Vasquez holds a Master in Business Administration from the University of Chicago, a Master in Management Information Systems and Bachelor of Science degrees in Electrical and Industrial Engineering from Texas A&M University. Mr. Vasquez is also a recipient of Kellogg's School of Management Executive Scholar Certificate in Leadership and Management.

Allen Clauss, Vice President, R&D, Xolve

Xolve Inc. was initially funded in January 2011 based on nanotechnology discoveries from scientific founder James Hamilton's group at UW-Platteville. During the past three years, Xolve has developed a proprietary, cost-

effective and scalable process for producing high quality graphene nano platelets, and proprietary processes for incorporating graphene into a wide range of commercial polymers. Polymer composites containing Xolve graphene provide improved mechanical, electrical and barrier performance properties useful in a diverse range of commercial applications including consumer products, automotive and aerospace. In the face of an enormous amount of competitive graphene research, development and commercialization activity world-wide, Xolve has emerged as a recognized leading player in spite of its small size and limited resources. Key to Xolve's success has been its business model which has focused from the outset on applications and functional graphene-containing intermediates rather than commercialization of the raw material. Xolve currently has developmental graphene-containing polymer intermediates under evaluation by a large number of high profile commercial customers throughout the world.

Dr. Clauss holds a Ph.D. in Inorganic Chemistry from University of Illinois-Urbana. He is a very experienced industrial chemist and manager of research and development. He was employed by The Procter and Gamble Company for 18 years where he worked in a wide range of technology areas spanning all disciplines of chemistry, and served as a senior R&D manager. In addition to other achievements, Dr. Clauss played a lead role in establishing two of P&G's R&D centers in China. From 2000 to 2011, Dr. Clauss served as Director of Organic Chemistry Instructional Laboratories and Senior Lecturer in Chemistry at University of Wisconsin-Madison. He is currently Vice President, R&D, for Xolve Inc. Dr. Clauss has authored numerous scientific publications and is an inventor on eight U.S. patents.

Susan Gallagher-Lepak, Associate Professor & Chair of Nursing, UW-Green Bay; T. Heather Herdman, CEO & Executive Director, NANDA

Nursing diagnosis is central in the education of nurses and nursing practice. The gold standard for nursing diagnosis terminology is the NANDA International, Inc. (NANDA-I) taxonomy was previously found only in a 533 page textbook. NANDA-I serves an international market with translation of nursing diagnosis terminology in 17 languages. The electronic clinical support tool (CST) using nursing diagnosis for use on computers, tablets, and smart phones will be used by nursing students, nursing faculty, and practicing nurses. The presentation will demonstrate the CST interface design, 4 primary pathways and general functionalities of the app. Inclusion of user analytics into the CST allows a method to capture how the CST is used by student nurses and professional nurses.

Susan Gallagher-Lepak is Associate Professor and Chair of Nursing at the University of Wisconsin-Green Bay. Susan received a PhD in Rehabilitation Psychology from UW-Madison, Masters in Nursing from UW-Milwaukee, and Bachelors in Nursing from Marquette. She is a Licensed Psychologist and Registered Nurse with a scholarship focus on e-learning and use of nursing diagnosis.

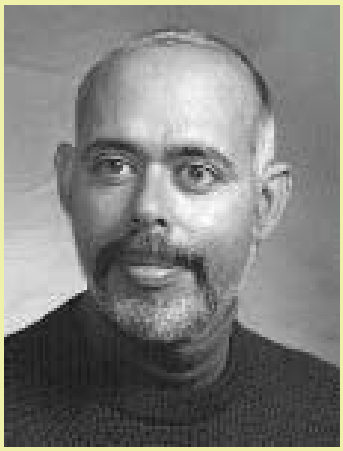
T. Heather Herdman is Chief Executive Officer and Executive Director of NANDA International, Inc. (NANDA-I) and a Researcher at University of Wisconsin-Green Bay. Dr. Herdman obtained a bachelor's degree in nursing from the University of South Carolina and master's and doctoral degrees from Boston College. She has served as Chief Strategic Officer for a medical technology company and Chair of the NANDA-I Diagnosis Development Committee. Dr. Herdman has clinical experience in maternal-child health, nursing administration, and quality/clinical effectiveness. Their recent work has focused on development of an electronic nursing diagnosis clinical support "app" using the NANDA-I nursing diagnosis taxonomy.

Robert Meyer, CEO, OptSolv LLC.

For 35 years, as a member of the Computer Sciences (CS) faculty at UW-Madison, I assisted students in navigating the maze of requirements for a college degree – that is, the CS portion of that big and complex maze. Guidance for direction in the other parts of this puzzle had to be obtained by a (hopefully) careful reading of the university catalog combined with visits to minor and college advisors. Finally, the student had to check that all of these pieces actually fit together coherently to provide a feasible route from degree start to completion.

Unfortunately, in a rule-laden process this complicated, people often make mistakes, resulting in added semesters and expense (both for the student and state) as well as frustration with an arduous and error-prone system in which missteps may be discovered too late to allow efficient correction.

On the other hand, computers are ideal for dealing with large sets of rules and data. Thus, OptSolv LLC of Madison utilizes both computer and algorithmic technology to solve a problem that has plagued students, staff, and faculty since the creation of the academic degree in the 11th century.



Robert Meyer is currently Professor Emeritus, Computer Sciences Department, University of Wisconsin-Madison and CEO of OptSolv LLC. Over the course of his career in industry and academia, he has authored or co-authored more than 100 published journal papers and book chapters, and edited several volumes of conference proceedings and special journal issues. His research since his Ph.D. in Computer Sciences in 1968 has spanned a wide variety of areas including nonlinear regression, nonlinear programming, discrete optimization, network optimization, logistics, and radiation treatment planning for cancer therapy, and emphasizes the use of advanced optimization techniques, machine learning, and parallel computing. Most recently, he is collaborating with colleagues at UW-Whitewater on algorithms and systems for college degree planning and on portfolio optimization tools based on clique partitions.

Annamalai Karthikeyan, CEO, Microionic Systems LLC.

Demand for cleaner energy, air, water, high density energy storage and cleaner industrial processing methods are essential components of 21st century living. Activated carbon (market size 1mmt) plays a vital role in all these areas and its demand is continuing to increase (CAGR >11%). Microionic Systems LLC is focused on manufacturing activated carbon superior in quality to current industry standards, using a patented process that converts solid wastes at (i) less than 50% of current production costs, (ii) less than 50% of plant capital investments, and (iii) significantly lower environmental impact than coal based manufacturing. Recent developments in high-tech industries such as power storage devices (CAGR >17%), fuel storage/recovery units, hybrid batteries have all contributed new application areas for specialty activated carbon. Our unique concepts on functionalizing carbon offer high value propositions. Microionics is currently developing a bench scale units in Neenah, WI towards commercialization. Recently, Microionics has been awarded Ideadvance Phase-1 grant to carry out market research, customer requirements, cost structure, etc towards developing a business plan and an action plan. Investments are required to set up a full scale pilot plant and to launch products.

Annamalai Karthikeyan is the founder and technical lead of the Microionic Systems LLC (MiST). He is responsible for developing and contributing to R&D projects related to concepts in materials processing, device configurations, testing and commercialization. He graduated in 1995 with Ph.D. Applied Materials Physics for developing solid state batteries based on novel silver electrolyte materials. He has 25 years of full-time research expertise in various leading institutions and projects in projects in the field of nanoionics, materials, ultracapacitors, solid state batteries, hydrogen separation, fuel cells, electrolyzer cells and atomistic simulation. His current efforts, In Microionics are focused on building new type of ultrafast batch

processing and continuous industrial processing method to manufacture specialty nanoporous carbon and energy storage devices in the state of Wisconsin. The technologies under focus were supported by WiSys Technology Foundation.

12:00 - 1:15 pm Luncheon and Networking

1:15 - 2:30 pm Entrepreneurship Panel: Session 7

Moderator: Jon Cook, Associate, WiSys Technology Foundation

Jon Cook is an Associate at the WiSys Technology Foundation. He is primarily responsible for external marketing and licensing of WiSys technologies. Jon also manages WiSys grant programs in coordination with the UW System and coordinates research and development initiatives with UW System campuses and small companies. He received a B.S. in Life Sciences Communication from the University of Wisconsin – Madison.

Idella Yamben, Program Manager & New Idea Concierge, Ideadvance Seed Fund

The Ideadvance Seed fund is designed to create new companies from ideas and technologies discovered at UW System campuses and at UW-Extension. Ideadvance grants are also designed to provide start-up "gap" funding between UW-System research grants (i.e. the Applied Research Grant (ARG), the Joint UW System-WiSys Applied Research-WiTAG program and the Prototype Development Fund (PDF)). Using Lean Startup methodologies, Ideadvance assists entrepreneurs to reduce the business risk in their ideas by validating the market, competitive advantage, and other key business elements.

Up to $75K in grants is available in two stages to support entrepreneurs across all disciplines as they actively work on commercialization milestones. Entrepreneurs are guided through milestones by dedicated, experienced business professionals within UW-Extension's Division of Entrepreneurship and Economic Development (DEED). Additionally, this team will help entrepreneurs identify local resources on their campus and in their community to make the idea a success.

Grants are available for part-time or full-time staff, faculty and students who are part of the UW System. Also eligible are applicants and young companies with WiSys Technology Foundation or UW-Milwaukee Research Foundation licensed technologies. For additional information, visit www.uwideadvance.org or email at uwideadvance@uwex.edu.

Dr. Yamben is currently the Program Manager & New Idea Concierge for the Ideadvance Seed Fund housed in UW-Extension's Division of Entrepreneurship and Economic Development (DEED). In this role, Dr. Yamben actively works with UW System entrepreneurs to prepare competitive Ideadvance proposals and provides support as they progress through the Ideadvance Stage 1 and 2 commercialization milestones. Prior to Ideadvance, Dr. Yamben was the Program Manager for the Center for Technology Commercialization. Dr. Yamben earned a PhD from UW-Madison in Cellular and Molecular Biology and a B.S. in Biology from the University of Chicago.

David Eckmann, Special Assistant to the Chancellor for Economic Development, UW-Stevens Point

As Special Assistant to the Chancellor for Economic Development at the University of Wisconsin–Stevens Point, Dave's work involves developing resources and connecting the university and UW System to regional and statewide community and economic development initiatives. This includes working with a wide variety of economic development organizations, workforce development, business and industry, government and K12 education systems.

Prior to coming to UW- Stevens Point, Dave served as the Economic Development Director of the Marathon County Development Corporation and Business Service Manager

for the North Central Wisconsin Workforce Development Board. Duties in those positions included creating and supporting entrepreneurial development programs; development and oversight of a business retention-expansion program and address workforce challenges we face in today's global economy.

Dave holds a Bachelor of Arts in Political Science and a Master of Public Administration from Arizona State University and is currently working on his doctorate in higher education leadership.

Neil Lerner, Interim State Director, Wisconsin Small Business Development Center Network

Please see page 14 for Neil's Biography and Photo.

Aaron Hagar, Technology Investment Manager, Wisconsin Economic Development Corporation

Aaron will present information on the Wisconsin Economic Development Corporation's entrepreneurship strategy and efforts to support startup and emerging growth companies. Information will be provided on what programs are available for startup companies and a discussion of common funding and commercialization issues associated with new technologies.

Aaron's primary role with the WEDC is to work directly with entrepreneurs, investors, economic development professionals, government officials, and other parties to address the funding needs of early-stage, high-tech businesses. Aaron's professional career started in bio-medical research where he performed research on the immune response to brain tumors. A desire to work in a more dynamic environment led him to graduate school and to work as an independent economic development consultant. This diverse background provides him with a unique perspective on technology, entrepreneurship, and economic development. Aaron has a master's in Urban and Regional Planning with a specialization in Economic Development from the University of Minnesota and a B.S. from the UW – Madison in Medical Microbiology and Immunology.

Denise Ehlen, Business Outreach Services Director & Whitewater Incubation Program iMentor/Coach , UW-Whitewater

Ehlen will join the panel to highlight business outreach and entrepreneurship support strategies deployed in the Whitewater community. The discussion will focus on key programs, services, and resources leveraged to nurture start-ups and early stage companies including the Whitewater Incubation Program (including the Innovation Corps and Innovation Hub), the Capital Catalyst Program, Growth Wheel coaching, the Wendy Kennedy model, and faculty/staff outreach efforts. Ehlen will also discuss unique community assets including the partnership between the City, Community Development Authority, University of Wisconsin-Whitewater, and the Whitewater Technology Park Board.

Denise Ehlen directs Outreach Services in the University of Wisconsin-Whitewater's College of Business and Economics and is a lead coach/mentor in the Whitewater Incubation Program. She recently served as the campus' Director of the Office of Research and Sponsored Programs, quadrupling the institution's extramural funding portfolio during her term (1998 to 2014). Denise leads the institution's technology transfer initiatives and coaches a variety of client companies using Growth Wheel, the Wendy Kennedy model, and Lean Startup strategies. The Whitewater Incubation Program was launched by her office in 2011 connecting the University's assets to the Whitewater University Technology Park and Innovation Center to support start-up ventures. She brings private sector experience to her roles, having owned a business while living in England in the 1990s.

2:30 pm Closing Remarks

Patricia Kleine, Provost and Vice Chancellor for Academic Affairs, UW-Eau Claire

Dr. Patricia A. Kleine is the Provost and Vice Chancellor for Academic Affairs at the University of Wisconsin-Eau Claire. Dr. Kleine has held leadership positions in higher education for 25 years. After completing her doctorate, she worked as a field researcher for the Center for the Study of Social Policy evaluating large ($50,000,000), nationwide projects designed to improve the outcomes for inner-city adolescents and rural, Appalachian poor. A prolific grant writer (over $26,500,000) and researcher, Dr. Kleine's scholarly interests have ranged from identifying under-achieving, multi-cultural, gifted students to exploring women's confidence (or lack thereof) in mathematics.

As provost, she has shepherded a "differential tuition" process to provide Academic Affairs and the University with $13,000,000 additional funding per year; activated an evidenced-informed decision mechanism for distribution of resources; and begun a practice of identifying and confirming "leading indicators" on which academic departments and units should focus to improve retention and four-year graduation.

1) Controlled Depolymerization of Polyesters and Polycarbonates Catalyzed by Ruthenium(II) Pincer Complexes

Alex Nett, Ryley Glasgow, Anne Fischer, Michael Carney, UW-Eau Claire; Eric Krall, Tyler Klein, Ryan Andersen, Diana Reader, Brian Dauphinais, Sean McIlrath, Dylan Hudson, Nicholas Robertson, Northland College

Billions of pounds of plastics are discarded each year, often after a single use. Melt process recycling diverts some of this waste stream from landfills, however, this method produces inferior polymers when compared to those derived directly from petroleum. As an example, only thirty percent of polyethylene terephthalate (the polyester used for beverage bottles) is recycled, primarily into relatively low-value applications such as fibers and fabrics, and the remaining seventy percent is landfilled. We have sought approaches to use this enormous waste stream for more useful purposes. Toward that end, we have recently developed new technology to harvest value-added chemicals from used polyesters and polycarbonates by controlled depolymerisation, a process which unzips the polymer into smaller molecules. In this poster, we will present our recent results using ruthenium(II)-based pincer catalysts to depolymerize polyesters into dialcohols and polycarbonates into glycols plus methanol via hydrogenation. Many of these dialcohols and glycols, which are currently derived from petroleum, are used in large amounts by both commodity and fine chemicals producers.

2) The IDP/AHA Degree Planning and Enrollment Forecast System

Robert Meyer, UW-Madison; Athula Gunawardena, Sobitha Samaranayake, UW-Whitewater

The Interactive Degree Planner (IDP) is a web-based software system that alleviates the arduous, error-prone, and risky task of navigating through the myriad of complex college degree requirements needed to achieve a desired college degree. The system requires only that the student input courses already taken (if any, and such courses may also be imported from an existing student record system) as well as the desired degree type, and then select degree options (such as major focus areas and minors). The IDP will then utilize a structured course database for the student's university and optimization technology to generate a complete four-year (or two-year for two-year colleges) plan of courses (or minimize the number of semesters needed to complete the degree, if desired). The IDP automatically enforces prerequisites and degree requirements, and allows students to specify the desired number of credits for each semester. A prospective or beginning student can thus use IDP as an exploratory tool to quickly investigate a wide variety of degree options, course selections, and credit loads, or an advanced student may employ it as a planning aid to determine the remaining sequence of courses needed for degree completion at minimum total cost both to the student and the institution.

AHA (Alert: HeadsAhead) is an add-on to IDP that provides to faculty and administrators forecasts for course enrollments years in advance based on data mining of degree plans created via IDP.

3) Photoluminescent Borosilicate Glass: A Material with a Bright Future

Felipe Marra-Mateus, Matthew Ray, UW-Stout

Luminescence is the effect whereby materials give off light without being stimulated by heat. One special type of luminescence, known as fluorescence or photoluminescence, is stimulated by an electromagnetic radiation such as UV-light or X-ray sources. This phenomenon can occur in glass matrices that are doped with transition or rare-earth metals as well as in glazes-that are glasses applied over ceramic substrates, such as porcelain. The primary goal of this research is study photoluminescence effects in borosilicate glass. The glass matrix known as "Worthington" glaze in Studio Art Ceramics is low melting, clear, glossy and stable and was chosen to bridge the connection between Chemistry and the Studio Arts. Using a combinatorial approach, it was possible to quickly and efficiently test the fluorescence of rare-earth metal dopants (such as Europium, Samarium, and Terbium) individually as well as in combination. In addition, the fluorescence behavior of silver nanoparticles as glass dopants was studied and white-broad continuum fluorescence was observed presumably related to the size distribution of the colloidal nanoparticles in the glass matrix. The research

presented also examined the role of early transition metal ions, such as cobalt and iron in quenching the fluorescence emission of rare-earth dopants dispersed in the matrix.

4) The Synthesis and Halochromism of 6-Aryldibenzo[*b*,*d*]pyrylium salts

Jonathan Kitzrow, Joel Patrow, Erin Prust, Erik Carlson, Bart Dahl, UW-Eau Claire

We are interested in a very rare class of oxygen-containing charged polycyclic aromatic hydrocarbons containing the 6-aryldibenzo[*b,d*]pyrylium moiety. This moiety is isomeric with the 9-aryldibenzo[*b,e*] pyrylium (xanthylium) unit, found in numerous important dyes, such as rhodamine. This unit is also a further benzannulated analog of the flavylium ion, found in many naturally occurring pigments, such as anthocyanins. We report the synthesis of several new 6-aryldibenzo[*b,d*]pyrylium salts as well as their reversible spectroscopic and optical character in varying pH environments (halochromism). Progress toward the synthesis and study of other analogs containing longer conjugations pathways will also be reported. Reversible disruption of conjugation, and thus intramolecular charge transfer, occurs upon addition of a nucleophile to these compounds and we are exploring the structures of these products as well.

5) Development of Peripheral Visibility Garments

Daniel Weispfenning, UW-Stout

The project investigated the possibility of creating garments specifically to increase the angle from which wearers are visible. Increasing angle of visibility is an aspect of visibility currently unaddressed by high-visibility clothing and would provide a benefit in many workplaces such as warehouses or construction sites. Because photoreceptor cells in the peripheral retina are stimulated by different types of light than the receptors in the central visual field, current high-visibility garments may lose efficacy in the peripheral visual field.

Fabrics were designed to stimulate photoreceptor cells and made into a simple test garment. 15 volunteers assisted with measurement by keeping attention on a focus while a researcher walked alongside. Volunteers noted when the researcher was perceived as well as garment color.

It was concluded that color does not have a significant effect on peripheral visibility. Light/Dark contrast was shown to be a more effective way to increase peripheral visibility.

6) Synthesis and Systematic Study of Smart Diblock Copolymer PEG-PDMAEMA

Phillip Conor, Elizabeth Stubbs, Dylan Karis, Michael Schneider, Elizabeth Glogowski, UW-Eau Claire

Smart polymers are polymers that dramatically change their properties in response to an external stimulus, such as temperature or pH. Smart polymers have numerous applications in industry, including medicine, cosmetics, and plastics. We use a specific polymerization process to control how long our polymer chains are, because the smart properties depend on polymer chain length. These polymers are characterized using 1H-NMR, GPC, UV-Vis, fluorescence, and DLS to determine both polymer chain length and smart polymer properties. We have synthesized and characterized diblock copolymers of PEG-PDMAEMA with different molecular weights that ultimately affect the smart polymer behavior.

7) Where Have All the Crayfish Gone? Change in Distribution of Invasive and Native Crayfish in the St. Louis River Estuary Over 14 Years.

Kara Tudor, Shon Schooler, UW-Superior; Jeffrey Gunderson, Douglas Jensen, University of Minnesota

The rusty crayfish, Orconectes rusticus, originates from the Ohio River Basin and is currently invading lakes and rivers of Northern Wisconsin. It has been found to disrupt aquatic ecosystems; negatively affecting native crayfish, fish, insect, and plant populations. However, few studies have examined their presence and environmental effects in the Lake Superior Basin. In July 1999, we sampled rusty and native crayfish at 84 locations in the St. Louis

River Estuary. We found two rusty crayfish in Superior Bay and 87 native crayfish throughout the estuary (O. virilis, O. propinquus, and O. immunis). In 2013 we replicated the study; including measures of habitat, substrate, vegetation, and calcium levels. We set 148 traps in July and August, 2013, using the same methods as before, except using two types of bait in paired traps (beef liver and fish), whereas the previous study used only fish. We hypothesized that the population of rusty crayfish would have expanded during the 14 years between samples. Despite a greater sampling effort, we caught no rusty crayfish and only three native crayfish (all O. virilis) during the 2013 sampling. Calcium levels were found to be high enough (above 2.5 ppm) to support rusty crayfish populations. Crayfish populations may have been reduced by a large storm event that occurred in June 2012 (1/5,000 year event). Additional research is needed to determine what happened to the crayfish in the estuary from 1999 to 2013.

8) Carotenoid Isolation and Analysis in Freshwater Bacteria

Thomas Kuborn, UW-Oshkosh

Carotenoids are a class of pigmented organic molecules commonly found within plants, bacteria, and some more complex heterotrophs. There are over six hundred known carotenoids whose biological functions include basic colorization, roles in photosynthesis, and as protective antioxidants. Our work began with the isolation of large numbers of carotenoid producing strains of bacteria from Wisconsin freshwater biofilms. This work continues with the purification and identification of the carotenoids present in multiple strains of bacteria belonging to genera such as Hymenobacter, Flectobacillus, Deinococcous, and Microbacterium. As most organic pigments are unstable outside of the organism methods have been developed limiting their exposure to light, temperature, and oxygen. After a rapid extraction and cleanup of the extract, HPLC/UV-vis was used for separation and analysis of the dominant carotenoids. Thin layer chromatography (TLC) was used to determine the presence of any minor carotenoids. Additionally liquid chromatography coupled with mass spectrometry was utilized to give a predicted molecular weight to assess uniqueness of each carotenoid. NMR data was used to gain further information as to the structure of each carotenoid. From a scientific perspective further research into carotenoids has led to alternative means of identification for certain genera of bacteria.

9) PM2.5 Airborne Particulates Near Frac Sand Operations

Jonathan Dahlen, Jonathan Jilek, Kristen Walters, Alayna Spengler, Bethany Valentine, Jennifer Schmitz, Christopher Conrad, Zachary Kroening, Ian Wezel, Cory Adam, Crispin Pierce, UW-Eau Claire

Over 130 frac sand mining facilities are spread throughout the state of Wisconsin. During frac sand mining operations, fine and coarse particulates are emitted into the air. The research we have conducted at University of Wisconsin-Eau Claire focuses on the elevation of particulate matter during frac sand mining operations, but principally PM2.5, which are particles with 2.5 micrometers or less in aerodynamic diameter. Increasing emissions of PM2.5 due to frac sand use is associated with decreasing levels of air quality, which negatively influences not only the environment, but also human health. PM2.5, which includes silica, can enter the respiratory system and be deposited into the alveolar region of the lungs and in turn cause cardiovascular and respiratory diseases. Measuring levels of PM2.5 is crucial in maintaining and ensuring air quality for the health and safety of community members and employees around frac sand plants. The SKC Deployable Particulate Sampler is a filter based sampler that was utilized in the collection of 6 different samples around frac sand facilities located in Bridge Creek, Arcadia, Winona and New Auburn. Sampling occurred at 2 meters in height, 30m – 1300m away from mining facility, and duration of 24 hours. Also, a positive control test was designed to confirm the DPS measurements in the field. Results were compared to measurements that DNR and MPCA have recorded. DPS PM2.5 concentrations in these locations measured a range of 5.82 µg/m^3 (S.D. of +/- 1.30) to 50.8 µg/m^3 (S.D. of +/-9.48). Our PM2.5 concentrations exceeded background measurements except for site 2, which is located in Arcadia next to a small inactive mine. Data suggest that the levels of PM2.5 concentrations are of concern for the community members and employees in the proximity of frac sand facilities. Future research

will be conducted using EPA approved Andersen Dichotomous Samplers and direct reading instruments which we can provide testing options for local health departments.

10) Wireless Weather Project

Brentton Paulus, Sam Reiswig, Sergei Bezrukov, UW-Superior

This project's end product was an extremely affordable, low power, low maintenance weather monitoring server with a website that makes it easy to get the readings from the device. This required planning of what components to use and how to utilize them to their maximum effectiveness. This also included researching several technologies and how to effectively use them, including: I2C protocol and its firmware implementation, SPI protocol and its firmware implementation, MSP430 microcontroller architecture, Development software and firmware supporting USB protocol, Wireless radio functionality and firmware development, HTML5 canvas programming and using AJAX technology, Interacting with environmental sensors. Each of these items were new to us and not covered in UWS CS program, therefore we had to learn how to deal with them.

The Project is current functioning on the UW-Superior campus and is being maintained by Dr. Bezrukov, Sam Reiswig, and Brentton Paulus. We foresee that once more data has been accumulated it will be useful for the natural sciences department. We have applied some major upgrades to the system since our summer project had officially ended and now a second board on the receiver station handles the work of the computer and specialized software that was designed.

11) 4-Point Resistivity Measurements of Silicon-Carbide Nanowires

Kelsey Steinke, Nokoma Kohl-Blomsness, Doug Dunham, UW-Eau Claire

Silicon carbide is well suited for optoelectronic, microelectronics and nanoelectronics due to its unique properties such as high thermal stability, mechanical strength, large band gap, chemical inertness, and high electron mobility. We are investigating the electrical properties of silicon carbide nanowires (SiC NWs) we have grown by reacting SiO with carbon nanotubes at 1450 C. We are testing the electrical properties of the SiC NWs with miBot Mobile Robots. The miBot Mobile Robots are placed in a Scanning Electron Microscope (SEM) in order to allow the placement of the probes relative to the SiC NWs. The probes at the end are about 1 micrometer in diameter. The miBots provide the electrical connections to perform 4-point electrical resistivity tests. With the miBots connected to a source meter, we can measure the resistance of a SiC nanowire by controlling the current that the two outer miBots send through the wire and measuring the voltage drop between the inner miBots. The resistivity is calculated using the geometry of the wires as measured in the SEM.

12) High-Density Electroencephalography (dEEG) and a Novel Method of Lie Detection

James Vance, Desiree Budd, UW-Stout; Michael Donnelly, Sulcus Scientific Consulting, LLC

Rationale: In the traditional lie detection procedure--the Control Question Test (CQT)--an interrogator asks yes/no questions and measures physiology such as sweat and heart rate. Unfortunately, those measures are not sufficiently reliable. We think measures of brain activity may be a more reliable alternative. Our method is based on "response conflict" that occurs when a truthful response requires one answer but the respondant produces another answer for strategic reasons. We hypothesized that false denials and false affirmations would require separate brain mechanisms, resulting in distinct EEG signatures.

Method: Participants were instructed to tell the truth or lie about having valuable playing cards (from the Pokémon game) that we gave them, while we measured EEG using a high-density electroencephalograph that measured scalp voltages from their entire head. They were given 1-2 Pokémon cards and asked to sometimes lie and sometimes tell the truth about which cards were in their possession. They made two kinds of lies; lies of affirmation, saying they had a particular Pokémon card when they really didn't, and lies of denial, saying they didn't have a Pokémon card they actually had. Analysis: Scalp voltage data were cleaned of artifact, and averaged according to standard methods. Resulting averaged potentials (known as ERPs) were then compared according to what type of response was given (truthful yes, truthful no, false affirmation, or false denial). Our data to this point appear to show that lying results in an enhanced N200, especially when the individual is not practiced in telling the lie.

Conclusion: Our results appear to show that under controlled conditions, EEG measurements of brain activity might be used to indicate deceptive responding, in a procedure that allows the use of yes/no questions from an interrogator. Subsequent work will require that we submit this procedure to testing for the purpose of determining sensitivity and discrimination, which will allow us to know how often lies can be caught without also falsely identifying truthful responses as lies.

13) Characterization of Post-Reaction Void Structures from Various Pre-Reaction Architectures for Internal-Sn Process Nb3Sn Wires

Nicholas Sullivan, Matthew Jewell, UW-Eau Claire

Nb3Sn is a superconducting material seeing use in large magnet designs such as particle colliders or prototype fusion reactors. These magnets suffer large forces perpendicular to the direction of current flow and magnetic field known as Lorentz Forces. Due to the brittle and fragile nature of Nb3Sn, the superconducting filaments must be placed within a composite wire to support them and withstand these magnetic forces.

These composite designs vary from one manufacturer to another, and we seek to explore how their microstructures vary. This study focuses on the arrangements of void space (space unfilled by any material) within these wires, and how their geometries may differ because of the wire architecture. Such void spaces can significantly impact the wire's mechanical properties and its ability to carry electrical current.

Through a process of incremental polishing wire cross-sections, backscattered SEM imaging, and image analysis we are capable of characterizing these void spaces quantitatively. Results suggest that certain designs yield greater amounts of inter-filamentary voids, which are particularly undesirable as they leave percentages of the filament perimeter unsupported and vulnerable to fracture.

An understanding of wire architecture and its effects on microstructure will lead to superconducting wires that not only perform better, but will perform for a longer period. Wire lifetime is a critical factor in these projects because replacing magnet assemblies with frequency will lead to extraordinary and avoidable expense.

14) Continuous, Month-Long Production of Isoprene by Solar Energy and CO2 Capture in Fast-Growing, High-Light Tolerant Cyanobacteria

Matthew Nelson, Olalekan Aremu, Rhiannon Carr, Meghan Raebel, Brandon Brummeyer, Andrea Felton, Franki Mayer, Brandon Thomas, Sara Arafeh, Toivo Kallas, UW-Oshkosh; Shona Duncan, Eric Singsaas, UW-Stevens Point

Cyanobacteria capture enormous amounts of solar energy and CO2 and hold great potential for production of renewable bioproducts. One such product is isoprene (C5H8), a precursor for thousands of terpenoids including synthetic rubber, pharmaceuticals, fragrances, and bio-fuels. Isoprene can be made via the 2-C-methyl-D-erythritol 4-phosphate (MEP) pathway whose products are isopentenyl diphosphate (IPP) and dimethylallyl diphosphate (DMAPP). Cyanobacteria possess the MEP pathway but lack an isoprene synthase (IspS) enzyme for converting DMAPP to isoprene. We have introduced optimized IspS and IPP-DMAPP isomerase (IDI) genes from Populus sp. into Synechococcus sp. PCC 7002 cyanobacteria and produced isoprene at maximal rates some 80 fold higher than previously published for cyanobacteria. We have further inactivated genes for glycogen synthesis, a major competing carbon pathway, and introduced IspS-IDI genes into both chromosomal and plasmid sites to increase gene copy number. These strains have been tested in photobioreactors linked to a real-time, Fast Isoprene Sensor under both continuous light and light-dark cycles to assess isoprene production under field conditions. Isoprene was produced continuously for 30+ days in a 5 liter bioreactor. Strains capable of glycogen synthesis also produced isoprene during darkness, presumably with energy and carbon from glycogen. A strain with IspS-IDI targeted to both the chromosome and a plasmid stably expressed these genes over time and produced ~1.5 times the isoprene of strains with genes in the plasmid only. These findings demonstrate important steps toward commercialized

isoprene production by solar energy and CO2 capture in cyanobacteria. Patent application US-2014-0030785 has been filed with the aid of WiSys.

15) An Ultrasensitive Laser Interferometer for Detecting Motion with Picometer Resolution

Erin Sullivan, Sean Minster, UW-Stevens Point

We have constructed and calibrated an ultrasensitive laser interferometer in order to measure the vibrations of miniature mechanical structures. Examples of such miniature mechanical systems are thin membranes or atomic force microscope cantilevers, which are used as nanoscale force and torque sensors. Our interferometer is based on an infrared laser which is focused through a lens onto the cantilever. The intensity of laser light at the output of the interferometer is a sensitive function of the cantilever position. Initial experiments show that our interferometer can track changes in the cantilever position with a resolution of one picometer (10-12 m). This interferometer has recently been integrated within an ultrahigh vacuum apparatus where it is being used to study the properties of a magnetic micro-cantilever. We will present experimental results from this apparatus and discuss how a low-noise interferometer allows us to measure weak magnetic forces approaching a femtoNewton (10-15 N). The ability to detect such weak forces allows us to study the properties of nanoscale magnetic structures.

16) Metallographic Preparation of Bi-2212 Superconducting Wires

Sarah Sortedahl, Amir Kajbafvala, Matthew Jewell, UW-Eau Claire

High-temperature superconductors (HTS) are allowing superconducting magnets to generate magnetic fields upwards of 20 Tesla. Bi2Sr2CaCu2O8+x (Bi-2212) is the only HTS material available as a round wire, which is preferred for magnets that require cables. Potential applications of Bi-2212 are MRI, NMR, and fusion magnets. Bi-2212 wires contain brittle Bi-2212 filaments embedded in a soft, silver matrix. The extreme differences in the hardness of these two materials existing in one wire makes creating a well-polished specimen difficult. The electrical and mechanical behavior of a Bi-2212 superconducting wire highly depends on its processing and microstructure. It is critical to have a polished sample surface for microstructural analysis. Having a smooth sample surface is necessary for nano-indentation, chemical, and visual analysis to observe various phases, voids, and cracks. Ultimately, we want to study how these defects affect the critical current of the examined wires. As a result, it is critical that defects found in a given wire sample are not a result of the polishing technique. In this study, longitudinal and transverse Bi-2212 wires were mounted using hot and cold resins. Samples were ground using various grit sizes of silicon carbide papers. Then, alumina and diamond suspensions were used for final polishing. To achieve an optimal polishing method, a variety of techniques were used including manual, automatic, and vibrational polishing. A scanning electron microscope and an optical microscope were used to assess the quality of the polished samples. This systematic investigation of the sample preparation procedure provides confidence for the subsequent quantitative analysis of these brittle, composite wires.

17) Processing and Diffusion of Oxygen in Biodegradable Polylactic Acid/Clay Nano-composite Films

Michael Beeler, Wei Zheng, Justin Claus, UW-Stout

Biodegradable Polylactic acid/clay nano-composite films have been developed and characterized using a variety of techniques such as differential scanning calorimetry (DSC), tensile tester, permeation apparatus, and thermogravimetric analysis. Different mixing methodologies such as twin screw extrusion, mixing by hand, and the form of the virgin material have been examined to optimize the dispersion of clay. Permeation testing has indicated that the concentration of clay reinforces and decreases the film oxygen permeation coefficient. Isothermal experiments have been carried out to study the effects of clay on the thermal behavior of the nano-composites.

18) Nanoindentation of Cr Coated Superconducting Wires

Joe Christian, Jason Luhmann, Matthew Jewell, UW-Eau Claire

Copper wires carrying superconducting filaments in a cable-in-conduit conductor are coated with chromium to help tune the electrical resistivity of the cable by increasing the overall interstrand resistance. Failing wires due to damage of the chromium coating has been noticed by a company responsible for coating and cabling these superconducting wires together. The company uses two different styles of chromium, hexavalent and trivalent, and along with this, they are noticing a difference in their respective levels of damage. Specifically, one type of wire has dramatically more flaking and mechanical abrasion of the coating. Traditionally hexavalent chromium has been used in this process due to its good mechanical properties but the trivalent chromium is a more environmentally friendly approach the company is trying to pursue. The level of damage can greatly affect the superconducting properties of the wire and will ultimately lead to failure. Through our research, the company would like to find out if this damage is coming from an intrinsic problem with the chromium itself, or if this is an extrinsic problem due to their cabling process. This experiment's goal was to establish a method to test the elastic moduli and hardness of the different types of chromium through nanoindentation since the coating on these wires is around 1-2um thick. In the course of our initial study, we have not seen a statistically significant difference in the two chromium types. This leads us to suspect the excess damage is an extrinsic problem coming from the cabling process, which shows promise for the mechanical ability of the environmentally friendly approach. We are also using this study to compare our technique to the American Society for Testing Materials standard for indentation testing. This technique will allow us to use the nanoindentor to investigate the mechanical properties of various wires, and offer the nanoindentor as a quality assurance tool using the standard practice for instrumented indentation testing.

19) Improving Solubility of Malted Milk Powder Through Ingredient Addition and Process Modification

Karunanithy Chinnadurai, Dipak Pokhrel, Naveen Chikthimmah, UW-Stout

The popularity of powdered beverage mix has been increasing because of their convenience, stability, longer shelf life and microbiological safety. Solubility is the most important feature of powdered beverage mix. Fish eye formation, where the exterior of the powder absorbs water very rapidly resulting in a viscous layer which slows down the penetration of liquid and forms lumps, dry on the inside, is one of the major issues that interferes with the solubility of a powder mix. The objective of this study was to improve the solubility of malted beverage mix through ingredient and process modification. Thirteen different ingredients such as canola oil, soy lecithin granules and liquids (4 types), HMGL liquid, four different maltodextrin types, modified food starch (B672), xanthan gum, pre-hydrated pectin at 0, 5, 10, 15 and 20% (w/w) were used as solubility enhancers. Four different samples were prepared through agglomerating the samples with the same four liquid lecithin at 2% w/w. Physical properties of prepared samples including solubility, moisture, water activity, density, and color (L, a, b) were measured in duplicate and analyzed for statistical significance. Among the ingredients tested, canola oil was most effectively increased the solubility from 24% (control) to 92% with 20% canola oil ($p<0.05$), whereas agglomerated samples had solubility in the range of 84-97% with, 2% enzyme modified soy lecithin was the most effective (97%). Samples with the highest solubility through agglomeration and ingredient modifications significantly decreased bulk density (0.602 to 0.467 g/cm3), surface area (105 to 63.8 m2/g),color values, and increased particle size (200 to 375 µm) at $p<0.05$. SEM images showed that the existence of larger internal channels in the prepared samples. This study suggests that addition of canola oil as an ingredient modification or addition of 2% enzyme modified soy lecithin during agglomeration enhances the solubility of malted beverage mix. Sensory evaluation indicated both methods are acceptable for consumer; however consumers indicated the preference for omega 3 fatty acids (canola oil).

20) Fabrication and Evaluation of Gold Nanoparticle Films for Enhanced Performance of Photovoltaic Materials

Jennifer Dahl, Eric Miller, Kyle Lobermeier, Tayo Sanders, UW-Eau Claire

The structural dynamics of thin films of surfactant molecules can be characterized by their behavior in a Langmuir trough, where the molecules reside at the air-water interface. Parameters such as molecular order, film density, and surface pressure are easily addressed, and multilayer superstructures can be fabricated using this classic surface science strategy. Less common is the use of a Langmuir trough for the fabrication of organized two-dimensional arrays of alkanethiol-capped gold nanoparticles. Here, hydrophobic nanoparticles are introduced to the air-water interface as a solution in hexanes; as the solvent evaporates, the floating nanoparticles can be compressed into a monolayer within the Langmuir trough. Preliminary studies have explored the use of a dithiol crosslinking ligand to improve film morphology; it has been found that the addition of alkanedithiols prior to film compression yields covalently bound soft networks of nanoparticles with greatly improved collapse pressures. These crosslinked films show great potential for use as backside reflectors in photovoltaic devices for enhancing photocarrier generation. We are reporting the fabrication of several composite films containing alternating layers of crosslinked film and transparent conducting oxide. These will be further analyzed with ellipsometry and conductive studies to assess real-world applicability.

21) Shelf-Life Prediction of New Packaging Container for Breakfast Cereals

Karunanithy Chinnadurai, Kurtis Drager, J. Shin, UW-Stout

Extension of shelf life of a food product is important in offering consumers high quality products. Packaging is one of way to extend shelf life without changing the components of a food product. Since traditional shelf life test period to optimize packaging system take long time (several months to years), ASLT (accelerated shelf life testing) on a food product would limit testing time to a few weeks to a few months.

ASLT was conducted on a high and low fat/sugar RTE breakfast cereal at 10, 23, and 38°C over a humidity range of 11-98.2%. Water vapor transmission rate (WVTR) testing was conducted on 4 quarts airtight polypropylene (PP) containers and standard breakfast cereal packaging (HDPE pouch in paperboard box). Critical moisture content of each cereal was determined by water activity, breaking strength, and sensory analysis results. The Guggenheim-Anderson-de Boer (GAB) model was used to predict the shelf life of each cereal stored in each type of packaging.

Results showed that the GAB model provided good fits for both cereals (with R2>0.9524, %RMS<10.2039, E<8.0890, and RMSE<0.0318). Water vapor transmission rate (WVTR) increased as size of the container increased (0.0375 and 0.0407 g/pkg-day for 4 quarts and standard packaging, respectively at 23°C). The critical moisture content was 5.5% and 6.5% for the high and low fat/sugar cereal, respectively. It was found that a 4 quarts airtight PP container compared to standard packaging extended the shelf life from 59 to 156 days (high fat/sugar) and 89 to 236 days (low fat/sugar) when stored at 23°C (80% RH). The results suggest that once a breakfast cereal package is opened the shelf life can be extended by storing the cereal in airtight PP containers in order to limit moisture gain.

22) PM-IRRAS as a Probe for Evidence of Regioselective Ligand Exchange Reactions on Confined Gold Nanoparticles

Jennifer Dahl, Eric Miller, Kyle Lobermeier, UW-Eau Claire

Modification of the surface chemistry of gold nanoparticles is commonly achieved by ligand exchange reactions. While these reactions are usually intended to completely displace the native ligands on the metal with a new, chemically distinct incoming ligand, partial exchange reactions can yield multifunctional nanoparticles with mixed ligand shells. However, the ligands are usually homogeneously distributed over the surface of the gold core, thus minimizing the unique chemical characteristics imparted by each type of ligand. Here, we describe a strategy for regioselective ligand exchange on crosslinked nanoparticle films confined

to biphasic aqueous/organic interfaces, resulting in single-core Janus nanoparticles. Polarization-modulated infrared reflection absorption spectroscopy (PM-IRRAS) is used to analyze the surface of modified films that have been transferred to a solid substrate. This surface sensitive method is well-suited to characterizing the ligands as they present to an external interface, as well as confirming the degree of ligand intermixing between each hemisphere of the particles.

23) Shelf-Life Evaluation of New Packaging Container for Feta Cheese

Karunanithy Chinnadurai, Dipak Pokhrel, UW-Stout

Feta is a white soft to semi-hard cheese, with a tangy, salty flavor that can range from mild to sharp and blends well with dips and sauces to provide viscosity. Feta cheese is produced either from sheep milk or a combination of sheep and goat milk; it has an excellent market with prospects for growth. At present a feta cheese producer in the Midwest gives 10 days once container is opened and 4 months for unopened containers if stored under proper refrigerated conditions. Packaging is one of way to extend shelf life without changing the components of a food product. This study was conducted to compare the performance of a new packaging container with existing container for crumbles and blocks at refrigerated conditions. Accordingly, dependent variables such as weight (total, cheese, brine, and container), water activity, moisture content, conductivity (cheese and brine), pH (cheese and brine), visual appearance of cheese/color, and sensory were measured using standard procedures and reported here. Statistical analyses revealed that the existence of significant differences in dependent variables; crumbles and blocks stored in brine in opened containers was found acceptable for 15 days and unopened containers found acceptable for 6 months.

24) Optical Properties of Non-stoichiometric Zinc Tungstate Thin Films

Zach Swanson, Brandon Zink, Ethan Dinauer, Seth King, UW- La Crosse

Zinc tungstate (ZnWO4) has recently gained much attention as a photoactive oxide with possible application in photocatalysis, photovoltaics, and optoelectronic devices. While numerous studies have focused on the fabrication and characterization of nanoscale structures of stoichiometric zinc tungstate, few have investigated the properties of zinc tungstate thin films. Fewer have explored the properties of non-stoichiometric zinc tungstate materials. Having developed a fabrication method in which we may fabricate non-stoichiometric thin films of Zn1-xWxO4 (where x varies between 0 and 1) without the presence of minority species, it is necessary to examine the affect that such variation in stoichiometry has on the optical properties of the material.

In the current work we utilize variable angle spectroscopic ellipsometry, with surface roughness and film thickness information gained from atomic force microscopy, to investigate the variation in the index of refraction and extinction coefficient of these non-stoichiometric films as a function of the Zn to W ratio.

25) Curing Kinetics of a "Green" Thermosetting Resin

Michael Davis, Wei Zheng, UW-Stout; John Droske, UW-Stevens Point

This work focuses on studying the curing kinetics of a "green" thermosetting resin, an oligomer of bis(hydroxyalkylene)-2-mercaptosuccinate. Curing in these thermosetting resins results from crosslinking via pendant thiol groups. In order to realize and assess the potential of these resins as sustainable materials, the curing process was investigated using differential scanning calorimetry (DSC) and rheology. The progression of physical and mechanical properties, such as the glass transition temperature (Tg) and the shear modulus, was monitored as a function of time and temperature. Tg of the resin was found to increase with curing, and the increase in Tg corresponded with the change in rheological properties. The shear modulus obtained for fully cured samples reached a high modulus of 6.5 × 106 Pa at 200 oC, and increased with decreasing the temperature. Additionally, the gel point was measured from the crossover of the storage and loss moduli. Based on the gel points, the apparent activation energy of curing also was determined.

26) Skin Lightening: Searching for Safe Alternative Reagents

Joseph Norby-White, Cheng-chen Huang, UW-River Falls

Skin lightening cosmetic products comprise one of the fastest growing industries in the world, anticipated to be worth $19.8 billion annually by 2018. For decades hydroquinone based treatments dominated the skin lightening market, until a large body of research indicated that hydroquinone has carcinogenic and toxic properties. Several countries have banned the use of hydroquinone in consumer goods. The current study examines the efficacy and safety of several potential skin lightening reagents, using zebrafish embryos as models. Zebrafish models are effective for use in skin lightening research due to the ease with which their pigment formation can be observed as well as their rapid development and low cost to maintain. Skin lightening reagents were applied to live zebrafish embryos at various stages of development: before, during, and after pigment formation. The embryos were examined and photographed under a dissecting microscope at several time points. The current study found that several reagents used in on-the-market skin lighteners produced varying degrees of toxicity in developing embryos, including the following reagents: kojic acid, niacinimide, tretinoin, azelaic acid, and gallic acid. The results of the study confirmed the high efficacy of two known skin lightening reagents, phenylthiourea (PTU) and morpholinobutylthiophenol (MoTP) and identified A11 as a third highly effective and seemingly non-toxic skin lightening reagent. It is known that PTU is a potent tyrosinase inhibitor and MoTP causes melanocyte death. The mechanism by which A11 lightens skin is unknown and is a potential topic for further research.

27) Crystallization Kinetics and Structure Evolution Of A Polylactic Acid During Melt And Cold Crystallization

Jordan Henricks, Meghan Boyum, Wei Zheng, UW-Stout

The isothermal melt and cold crystallization and the evolutions of the mobile and rigid amorphous fractions (MAF, RAF) during the crystallization are fully investigated for a polylactic acid using differential scanning calorimetry. The crystallization kinetics are analyzed through fitting the Avrami equation to two different sets of crystallinity data. Both sets yield similar results. The overall rate constant is found to be higher for the cold crystallization, and the difference increases with increasing the crystallization temperature. The Avrami exponent of cold crystallization seems to decrease with increasing the crystallization temperature whereas the exponent of melt crystallization is relatively constant. In addition to the crystalline phase, properties of the MAF and RAF are also studied and compared. With the increase of crystallinity, the glass transition temperature (Tg) of the MAF is found to decrease during the cold crystallization whereas Tg decreases and then increases during the melt crystallization. However, no obvious difference is found regarding the cooperative length scale associated with Tg. The length scale determined from Donth's fluctuation model decreases from 3.2 to 1.8 nm at the maximum crystallinity. Furthermore, the RAF is found to remain relatively constant at crystallinity lower than 10%; afterwards, the fraction goes up steadily. The absolute value of the RAF depends on whether it is formed during melt or cold crystallization. The results provide important guidelines on product design and processing optimization.

28) The Search for a Caffeine Remedy: Caffeine Analogues and Antagonists

Ajay Kumra, Cheng-chen Huang, UW-River Falls

Caffeine is a central nervous system stimulant and is widely used in many beverages. Scientific journals however have suggested the toxicity of caffeine both adults and developing embryos. The molecular mechanism of how caffeine toxicity happens is not yet fully understood. The goal of this project was to further characterize the progression of caffeine toxicity by using a zebra fish model. We also surveyed potential caffeine antagonists and less toxic caffeine analogues. Zebrafish are great for teratology because of their genomic similarities to humans. To study the progression of caffeine toxicity, we treated embryos with 5mM caffeine, as well as confirmed caffeine antagonists, SK0521 and SK0522. Embryo behavior and body curvature was recorded at 30 minutes, 2 hours, and 4 hours post treatment. The experiment was repeated on embryos in ages ranging from 16 hours post fertilization (hpf) to 48 hpf in order to observe age related sensitivity and for continuity. The amount of caffeine-induced twitching was highly dependent on the age of the embryo. Our

results suggest that caffeine may effect undeveloped motor-neuronal structures more severely. SK0521 and SK0522 showed a reduction in twitching behavior in younger embryos (16 hpf). CS-06 and TB-1, both caffeine analogues showed frequent twitching with no body curvature. This suggests that CS-06 and TB-1 could possibly be safer alternatives to caffeine.

29) Conversion of Cellulose-Rich Residuals from Pulp and Paper Mills for Bio-Based Fuels and Chemicals

Bradley Gorzek, Nicholas Lecher, Raghu Gurram, Shona Duncan, Eric Singsaas, UW-Stevens Point

Paper mills accumulate a large amount of solid waste that would normally be landfilled or discarded elsewhere. We have collected this waste from a number of mills in central Wisconsin. We analyze these residuals, colloquially called "sludges", to calculate total potential sugar production from the material. Further experiments use different doses of enzymes to optimize the conversion of cellulose to fermentable sugars. We investigated the use of accelerants to reduce the enzyme dosage and improve overall cost of the biorefinery through faster hydrolysis rates and yields. These sugars can then be used to produce ethanol and other biofuels, as well as bio-based chemicals such as acetic acid, lactic acid or isoprene. These results show that conversion of these residuals to biofuels and/or chemicals can turn a waste product into a potential source of revenue for Wisconsin's paper industry.

30) Natural Hmong Herb Extractions for Active Compounds to Rescue Heart Failure in Zebrafish (Danio rerio) Embryo

Pheng Yang, Cheng-Chen Huang, Karl Peterson, UW-River Falls

Cardiovascular disease is a major health concern and many adults are diagnosed with serious heart problems that can lead to heart failure. The usage of traditional Hmong medicines has been passed down and practiced for generations without any scientific evidence. There is a wide range of herbs that can help treat people with heart diseases; while only a handful do benefit patients, another large number of these herbs fail in doing so. The goal of the research is to identify compounds from natural Hmong herbs that can attenuate heart failure using zebrafish embryo models. First, we used steam distillations to extract compounds into either water or ethyl acetate. All fractions will undergo a biological assessment on 24 hours post fertilization embryos that have been treated with *aristolochic acid (AA),* causing heart failure in the embryos. After testing a total of six fractions from three different herbs, we found that one fraction, identification number PYGI-1S, has the potential to rescue heart failure. During our preliminary treatment, 17% of 20 embryos showed attenuated heart failure. We ran a second trial and the results were parallel, 50% of 60 embryos were attenuated. However, a higher concentration of PYGI-1S became too toxic for the embryos causing premature death. Future experiments are to increase PYGI-1S production and conduct a liquid column chromatography to isolate individual compounds from PYGI-1S fractions to see which compound is responsible for heart failure rescue.

31) Fabrication of ZnO/ZnMgO Electro-Absorption Modulators Grown by Reactive DC Sputter Deposition

Zachary Koop, Taylor Bailey, Miranda Elkins, Seth King, Eric Gansen, UW- La Crosse

ZnO has a large exciton binding energy, a wide optical bandgap, and, when combined with alternating layers of ZnMgO, can form type-I quantum wells; making it an extremely promising material for electro-absorption modulators (EAM). In an EAM, the light transmitted through the structure can be controlled electrically through the Quantum-Confined Stark Effect, which is characterized by a shift in the absorption features near the band-gap resulting from an applied bias. There is a high demand for EAMs that operate in the visible blue to ultraviolet (UV) spectral region for a number of applications, including high-density data storage and UV non-line of sight communications. Our aim is to develop short-wave EAMs using ZnO/ZnMgO quantum well (QW) structures grown by reactive DC sputter deposition. Here, we will discuss our recent progress in developing these devices. Specifically, we will discuss the structural and optical properties of ZnO/Zn.90 Mg.10

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O QW structures and show how the characteristics of the samples vary with well width, sample temperature, and annealing conditions. Our experimental results will include absorption spectra collected using a broad-band, temperature-tunable, spectroscopic system and high-resolution surface maps collected using an atomic-force microscope.

32) Processing and Characterization of Biodegradable Polylactic Acid/Clay Films

Justin Claus, Michael Beeler, Wei Zheng, UW-Stout

This work focuses on processing and characterizing biodegradable polylactic acid/clay nano-composite films using a variety of techniques such as differential scanning calorimetry, tensile tester, permeation apparatus, and thermogravimetric analysis. In order to achieve well-dispersed clay fillers in the polymer matrix, different mixing methodologies are adopted to optimize the film properties. It is found that with proper concentration the clay reinforces the films and decreases the oxygen permeation coefficient. Clay is also observed to affect the crystallization kinetics of polylactic acid. Isothermal experiments have been performed to study the effects of clay on the thermal behavior of the nano-composites. The result and its implication will be presented in details.

33) Characterization of CH-18; a Potential Heart Failure Drug Derived from a Chinese Herb

Amanda Young, Cheng-chen Huang, UW-River Falls

Heart disease is the leading cause of death in the world. There is high demand for drugs that relieve heart failure symptoms. Preliminary research began by testing hundreds of extracts derived from herbs used in Chinese medicine. Zebrafish embryos were used to determine if these extracts had potential for rescuing the heart from failure. We found one extract that gave positive results. Further separation was performed from that extract, identifying a pure compound named CH18, responsible for the positive heart rescue effects. The goal of this research is to characterize the compound CH-18.

Heart failure is induced in zebrafish embryos using 10 uM aristolochic acid (AA) at 24 hours post-fertilization (HPF).To determine the most effective dosage of CH-18, it is given in 1, 10 or 50 uM doses at 24 HPF. The embryos are incubated for three days, then their cardiac function is observed to determine if the dosage was effective. High doses of CH-18 are most effective. To determine the time windows of effective CH-18 treatment, heart failure was induced at 24 HPF. At 0, 6, 12, 18 and 24 hours-post-administration of AA, we gave CH-18 to the embryos. The embryos are incubated for three days and their cardiac function is analyzed. CH-18 is most effective when administered immediately. As time progresses, CH-18's efficacy is reduced. We tested two analogues of CH-18, CH-18a and CH-18b, at 10 and 50 uM concentrations. CH-18a showed the greatest rate of heart rescue.

The zebrafish model is effective for use in drug discovery research; zebrafish cardiac development is similar to humans, they facilitate fast results and they are inexpensive to maintain.

34) *Camelina Sativa*-Based Biorefinery

Nicholas Lecher, Raghu Gurram, Bradley Gorzek, Malek Alkasrawi, Eric Singsaas, UW-Stevens Point; Md Joynal Abedin, Montana State University

Camelina sativa is a cool season oil seed crop that has been used to produce bio-jet fuel. Researchers at the Wisconsin Institute for Sustainable Technology (WIST) are collaborating with Wisconsin-based farmers and scientists at Montana State University – Northern (MSUN) to investigate its use in a biorefinery that uses the entire plant to produce bio-jet fuel plus a number of value-added bio-based products. MSUN scientists have developed a cost-effective catalytic conversion of Camelina seed oil to bio-jet fuel. WIST's work focuses on analysis of the non-oil portions of the plant, which can be used in a lignocellulose biorefinery to produce lignin, butanol, ethanol, and fuel pellets. We expect that a multiple-product biorefinery will help to defray biomass growing and harvesting costs and thereby bring the cost of bio-jet fuel into a range where it is economically feasible to use on a commercial scale.

35) Fracture Statistics of Individual Nb3Sn Filaments

Sam Schultz, Maxwell Dylla, Nicholas Sullivan, Matthew Jewell UW-Eau Claire

Nb3Sn cable-in-conduit superconducting wires are being used in magnet systems for experimental fusion reactors. The Nb3Sn brittle filaments inside these wires can crack due to the high Lorentz forces generated during magnet operation; these cracks degrade the superconducting properties of the wires. Here, individual brittle Nb3Sn filaments were tested under tensile stress to generate Weibull fracture statistics for Nb3Sn filaments. Filaments broke at an average of 2.0- grams of force (505Mpa stress) with a standard deviation of 0.99 grams. After fracture, SEM analysis and an elliptical model were used to determine the cross sectional area of each broken filament. Stress values were then calculated for individual filaments. The Weibull statistics (m=3.0654, σ0=542.8303 MPa, and v0=0.000576 mm2) of the fracture stresses generated from this work will help simulate when filaments crack during magnet operation and the effect that those cracks have on the superconducting properties of magnet systems.

36) Development of Fermentation Techniques for Potential Development of a Lignocellulose Biorefinery at a Pulp Mill

Alex Rajangam, Shona Duncan, Justin Hall, Raghu Gurram, Bradley Gorzek, Nicholas Lecher, Malek Alkasrawi, Eric Singsaas, UW-Stevens Point; Robert Buchan, Sandy Corrion, Cosmo Specialty Fibers

The University of Wisconsin-Stevens Point biorefinery research program aims to develop new processing technologies that will allow pulp and paper mills to produce renewable chemicals and fuels using existing infrastructure. In February of 2013, we began collaborating with Cosmo Specialty Fibers, an investor-owned dissolving wood pulp sulfite mill in Cosmopolis, Washington, to study the opportunities for increased revenue from conversion of mill residuals and low-cost biomass into renewable chemicals. WIST and mill staff analyzed potential feedstock for bio-based chemical production. Analysis identified 460,000 annual metric tons of carbohydrate in residual streams of material remaining after sulfite processing. These combined rejects residuals consist of hemlock fibers that do not meet mill specifications after digestion. The fibers are 40% glucose and approximately 17.7 dry tons are produced/day correlating to 6500 kg/day. We demonstrate the fermentation of sugars derived from the combined rejects residual stream to produce value added products lactic acid, ethanol and isoprene. Flask scale fermentation using transgenic E.coli strains for isoprene, Yeast Ferm pro for ethanol and L.rhamnosus for lactic acid production demonstrated that all three value added products could be successfully produced at concentrations that are industrially acceptable. Work is continuing with bench top bioreactor scale fermentations. These results show that the mill can benefit through reduced process costs, increased revenue streams through product sales, and potential renewable energy credits.

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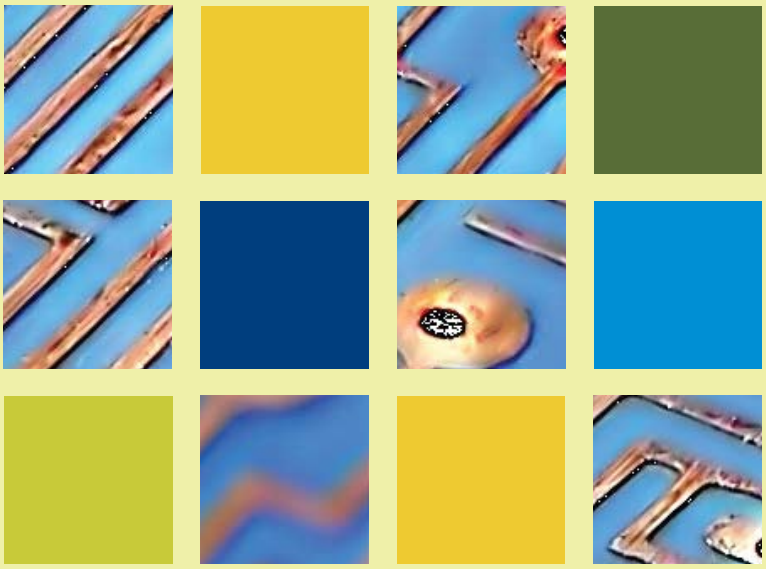
Thank you for your attendance at WSTS 2014! We hope it was a productive time for your research and commercial endeavours.

From the whole WiSys team, we appreciate your efforts in education, research and entrepreneurship. If there is any way that WiSys can be of assistance to you, don't hesitate to contact us.



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