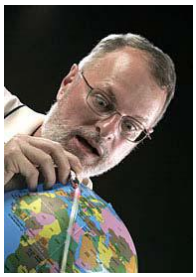
UWMRF Bradley Catalyst Grants
Round II Awards (Spring 2009, Announced in Summer 2009)

Bradley Catalyst Phase 2 Awards ($500,000 awarded in summer 2009)

The Research Foundation has selected seven new projects for funding with the second round of support from The Lynde and Harry Bradley Foundation. A total of $500,000 will be awarded to support these projects starting in the summer of 2009.

Fiber Optic Sensors for Water Quality Monitoring

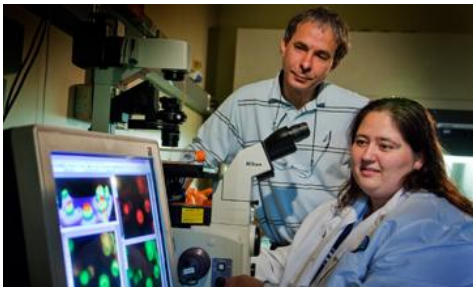
Peter Geissinger, Ph.D., Associate Professor, Chemistry Department



Project Overview. Dr. Geissinger's research is built on the study of molecular interactions; he applies combinatorial chemistry and that basic understanding of molecular interactions to create sensors based on fiber optic cables. This project, "Multifunctional Plasmonic Optical Fiber Sensor Arrays for Environmental Monitoring and Automated Process Control," will provide basic proof of concept for new sensors that local water-related companies may bring to market. In many applications of industrial waste water processing, waste water samples are removed from the measurement site for off-line analysis. This time-consuming and labor-intensive process makes it difficult to implement many real-time process controls that rely on continuous measurements. Geissinger will adapt fiber optic sensors for the measurement of heavy metals.

Production of Inexpensive, Environmentally-Friendly Pigments

Guilherme Indig, Ph.D., Associate Professor, Chemistry Department



Project Overview. Pigments are employed in the production of a wide variety of industrial goods, and they represent a multi-billion dollar worldwide market. Unfortunately, typical production methods make extensive use of solvents and have low yields, which leads to a significant environmental impact. This project, "Ultrasound and Microwave-Assisted Synthesis of Inorganic-Organic Pigment Composites," is aimed at the development of new pigments from inexpensive, readily available phyllosilicates. This exploratory project will focus on the evaluation of reaction efficiency, convenience of use, potential environmental impact and overall cost, followed by the analysis of how the molecular properties of the respective dye products (i.e. size, charge, acid-base character, and chemical functionality) may affect both the photophysical/photochemical properties and chemical stability of the final organic-inorganic composites.

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Tool for Evaluating Toxicity of Nanomaterials

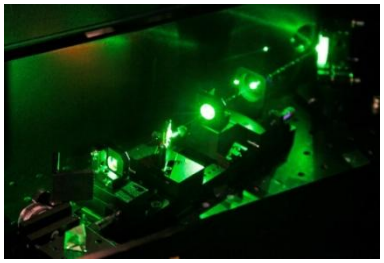
Rebecca Klaper, Ph.D., Shaw Assistant Scientist, Great Lakes WATER Institute

Project Overview. Engineered nanomaterials are being proposed for use in products for everything from medicine to environmental cleanup. Many industries and government regulatory organizations are struggling to identify the potential environmental implications associated with nanomaterials. In this project, "A Tool for the Evaluation of the Toxicity of Nanomaterials," Klaper and her colleagues will develop libraries of gene products that are associated with exposures to a variety of nanomaterials using next generation gene sequencing technologies. Genes in these libraries identified as differentially expressed with nanomaterial exposures will be analyzed for their relevance to various physiological pathways important for survival and reproduction. These genes will then be used to create a custom microarray tool and individual biomarker assays for risk assessment assays of the harmful impacts of nanomaterials. This will pave the way for a standardized product to assess the environmental impact of nanomaterials.

Investigating Protein Interactions for Drug Development

Valerica Raicu, Ph.D., Assistant Professor, Physics Department

Project Overview. Raicu and his team have developed a powerful new method for determining the internal structure of protein complexes in living cells, which relies on highlighting the proteins of interest with fluorescent tags and detecting the resonance energy transfer (RET) between tags with a novel two-photon microscope with spectral resolution (TPM-SR). In this project, "Investigation of Protein Associations in Living Cells as a Guide for Therapeutics Development", Dr. Raicu will make critical improvements to the technology and use the instrument to investigate G protein coupled receptors (GPCR's). GPCR's are implicated in a host of diseases and disorders, and two membrane receptors important in regulation of heart rate and myocardial contractility will be studied.



High Speed Magnetic Resonance Imaging (MRI)

Lei Ying, Ph.D., Assistant Professor, Dept. of Electrical Engineering and Computer Science

Project Overview. Magnetic Resonance Imaging (MRI) is a powerful biomedical imaging technique used widely to visualize the internal biological structure and function of human body. The objective of this project, "High Resolution, High Speed Magnetic Resonance Imaging Using Random B1 Field," is to apply compressed sensing, a new theoretical framework, to MRI to revolutionize its imaging speed and resolution. The proposed research will develop pulse sequences and image reconstruction algorithms to realize the novel technique in commercial MRI systems. Practical issues will be addressed and performance will be evaluated using real experiments. The technique is expected to improve the speed and resolution by at least an order of magnitude, and thus improves diagnosis in many applications such as cardiac imaging and dynamic contrast-enhanced imaging when motion and contrast variations present challenges

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Automated Patient Search for Breast Cancer Trials

Jun Zhang, Ph.D., Professor, Department of Electrical Engineering and Computer Science

Project Overview. Clinical trials are critical to breast cancer research. For the results of a clinical trial to be scientifically valid and clinically useful, a significant number of qualified patients need to be enrolled. Unfortunately, at most participating hospitals, qualified patients are identified manually through a labor-intensive process of sorting through patient records. The purpose of this project, "Automatic Patient Search for Breast Cancer Clinical Trials," is to develop innovative algorithms and software to automatically identify qualified patients for breast cancer clinical trials.

Improved Wind Forecasting Methods

Joseph Bockhorst, Ph.D., Assistant Professor, Department of Electrical Engineering and Computer Science

Project Overview. Wind is one of the most promising sources of renewable energy and there is a strong push to have wind energy provide as much as 20% of U.S. electrical energy by 2030. However, integrating wind energy with the electrical power grid is particularly challenging because wind speed fluctuations lead to fluctuations in power supplied to the grid. Current tools to predict wind speed are inadequate, with time scales too long to be meaningful for real-time management of an integrated power grid. This project, "Probabilistic Methods for High Wind Penetrated Power Systems", addresses the challenging task of short-term wind speed prediction by creating models that reduce the timescale from hours to minutes. Bockhorst and his team will deploy a network of low-cost wind sensors and apply dynamic Bayesian network approaches for improved wind speed prediction. Working with industry collaborators at American Transmission Company (which operates a network of power transmission lines) and 3Tier (a Seattle based renewable energy information services company), the new approaches will be compared with current state-of-the-art approaches.