10th ANNUAL UNDERGRADUATE SYMPOSIUM ON SUSTAINABILITY AND THE ENVIRONMENT

BRIDGEWATER STATE UNIVERSITY
New! CONANT SCIENCE CENTER

Saturday, November 19, 2011
9:00 AM - 3:00 PM

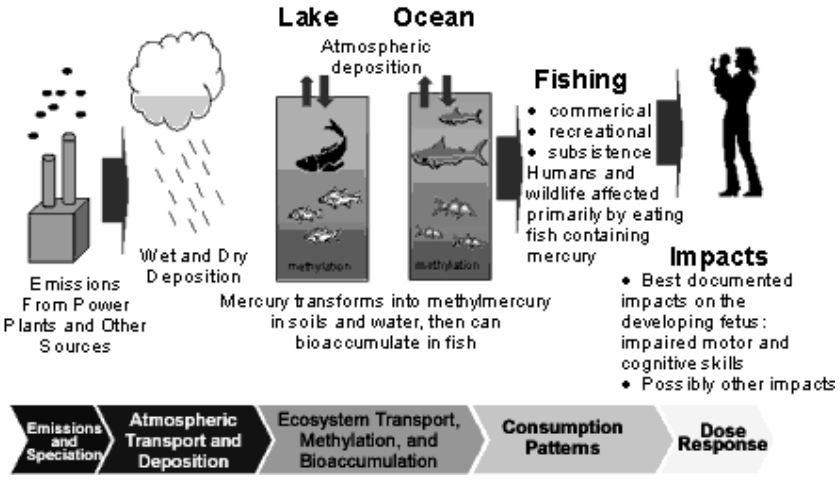
PROGRAM AND POSTER TITLES

10th ANNUAL UNDERGRADUATE SYMPOSIUM ON SUSTAINABILITY AND THE ENVIRONMENT

Saturday, November 19, 2011
Bridgewater State University Conant Science Center

Symposium Theme: "Human and Environmental Health"

The 10th Annual Undergraduate Symposium on Sustainability and the Environment will focus on undergraduate research posters (including completed, in progress, and proposed research) in all environmental disciplines from colleges and universities in the Northeastern U.S. Since its inception in November 2001, the Symposium has averaged 100 attendees and over 45 student poster presentations. This Symposium provides an annual forum for discussion of issues related to environmental research and education particular to the New England region, and has opened doors to collaborations in research and education among the participants.



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Office of the Dean of the College of Science and Mathematics

Office of Undergraduate Research
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The Office of Undergraduate Research (OUR) is dedicated to supporting and expanding the role of undergraduate research at Bridgewater State University. Through the various funding sources on campus, and, in particular, The Adrian Tinsley Program, the OUR and its staff makes mentored research and creative opportunities available to any student with the spark of interest in a project and the commitment to see it through, regardless of discipline or future career.

Center for Sustainability
http://www.bridgew.edu/sustainability/

The Center for Sustainability at Bridgewater State University fosters the study and application of sustainable practices both on campus and throughout the region. The Center views a sustainable society as economically vibrant, environmentally sound, and socially just, now and into the future. The Center's goal is to use the knowledge and abilities of the BSU community to make sustainable practices an integral part of our campus, and to share these efforts with regional and global stakeholders.

Northeastern Section of the American Chemical Society
http://www.nesacs.org/

The Northeastern Section was founded in 1898, and is one of the largest local sections of the American Chemical Society. The Northeast section has a rich history of great chemists who have been trained at the many excellent colleges and universities in the Northeast.

10th ANNUAL UNDERGRADUATE SYMPOSIUM ON SUSTAINABILITY AND THE ENVIRONMENT

Saturday, November 19, 2011
Bridgewater State University Conant Science Center

PROGRAM

8:00 – 10:00 AM: Registration and light breakfast in the Conant Atrium

9:00 AM: Welcoming Remarks in Conant Auditorium
Dr. Arthur Goldstein, Dean of the College of Science and Mathematics

9:15 – 10:15 AM: Guest Speaker

Dr. Roberta F. White, Ph.D.
Professor and Chair, Department of Environmental Health
Associate Dean for Research
Boston University School for Public Health
"Brain effects of prenatal exposure to methylmercury through maternal seafood consumption: Methods, outcomes and public health implications"

10:30 – 12:00 PM – Poster Session I: Boards 1-20, Conant Atrium

12:00 – 1:00 PM – Lunch; take down posters from Session I, put up Session II posters

1:00 – 2:30 PM – Poster Session II: Boards 21-41, Conant Atrium (Informal poster discussions may continue through lunch)

2:00 PM – 10th Anniversary cake and ice cream!

Throughout the day – Self-guided tours of the Conant Science Center!

Poster Session I Titles: Boards 1-20
Conant Atrium (10:30 AM to 12:00 PM)

Board #1: "Farming Wampum: Elucidating the mechanism for pigment deposition in the hard clam *Mercenaria mercenaria*," Jesse Farruggella and Dr. Dale Leavitt, Roger Williams University, Marine and Natural Sciences, 1 Old Ferry Road, Bristol, RI 02908

Board #2: "Still water feeding behavior of the lobate ctenophore, *Mnemiopsis leidyi*," Kristen Kiefer, Christopher Syslo, John Costello and Dr. Sean Colin, Biology Department, Roger Williams University, Bristol, RI 02809

Board #3: "Fluid interactions that enable stealth predation by the upstream foraging hydromedusae *Craspedacusta sowerbyi*," Kelsey Lucas, Jack H. Costello, Kakani Katija and Dr. Sean Colin, Department of Biology, Roger Williams University, Bristol, RI 02809

Board #4: "Analysis of Sr/Ca ratio in fish otolith bones using the technique of neutron activation analysis," Mark O'Brien and Dr. Nancy Breen, Department of Chemistry, Roger Williams University, One Old Ferry Road, Bristol, RI 02809

Board #5: "Investigation of taurine, B vitamins, and caffeine in commercially available energy drinks by high performance liquid chromatography mass spectrometry," Gregory J. Pastore and Dr. Nancy E. Breen, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Board #6: "Influence of diet on lead metabolism and fate: Linking dietary deficits and risk," Phoebe Handler and Dr. Daniel J. Brabander, Environmental Studies, Wellesley College, Wellesley, 02481

Board #7: "Toward identifying mercury (II) compounds in the atmosphere," Matthew J. Zelie and Dr. Theodore S. Dibble, Department of Chemistry, SUNY-College of Environmental Science and Forestry, Syracuse, NY

Board #8: "Mercury bioaccumulation in elasmobranchs," Nicholas Kutil and Dr. David Taylor, Department of Biology, Roger Williams University, Bristol, RI 02809

Board #9: "Mercury in the sediments of the Narragansett Bay Estuary (Rhode Island, USA): Contamination from a historical and spatial perspective," Allison Hall, David Murray, Warren Prell and Dr. David Taylor, Marine Biology, Roger Williams University, Bristol, RI 02809

Board #10: "Mercury in terrestrial dwelling bird species," Gina Dinallo and Dr. Joan Morrison, Biology Department, Trinity College, Hartford CT 06110

Board #11: "Bird Strikes in Urban Hartford, CT," Shawna Altdorf and Dr. Joan Morrison, Trinity College Biology Department, 300 Summit Street, Hartford, CT 06106

Board #12: "Analysis of banding and recovery data for red-tailed hawks (*Buteo jamaicensis*) in the northeastern U.S.," Jason Baird and Dr. Joan Morrison, Environmental Science Program, Trinity College, Hartford, CT 06106

Board #13: "Detection of organic waste water contaminants in effluent entering the Taunton River," Jeffrey C. Monroe, Robert E. Geary and Dr. Stephen A. Waratuke, Bridgewater State University, Department of Chemical Sciences, Conant Science Building, Bridgewater, MA 02325

Board #14: "Sustainable Synthesis of Biodiesel and Recycling Byproducts," Brandon Ackley, John-Paul Burega, Julianne Joy, Chelsea Westgate, Joe Matta and Dr. Edward J. Brush, Department of Chemistry, Bridgewater State University, Bridgewater, MA 02325

Board #15: "Investigating greener and more efficient reactions in the production of 3-bromooxindole-3-acetic acid," Alex Baribeau, Kyle Murphy, David Beaver and Dr. Edward J. Brush, Department of Chemistry, Bridgewater State University, Bridgewater, MA 02325

Board #16: "Taking the "mud" out of the Muddy River: Engaging freshman in chemical analysis," Nina Chen, Andree Sime and Dr. Michael Berger, Department of Chemistry and Physics, Simmons College, Boston, MA 02115

Board #17: "The effects of the small scale biosand filtration system on the removal of arsenic and bacteria in water," Diane Mckiernan, Anh Troung and Dr. Michael Berger, Department of Chemistry and Physics, Simmons College, Boston, MA 02115

Board #18: "30-Year trends in turbidity at Squam Lake in Holderness, NH," Scott Barta, Alex Finn, Amanda Hollenbeck, Mary Lenehan, Corey Miller and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #19: "Water quality assessment through biomonitoring of macroinvertebrates at Glove Hollow Brook in Plymouth, NH," Rebecca M. Jacobson, Jami N. Woodworth, Kate A. Worthen and Dr. Kerry L. Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Board #20: "The bioassessment of environmental conditions at Quincy Bog in Rumney, NH," Holly R. Miller, Paul John Ramberg Pihl, Tyler Remillard and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

Poster Session II Titles: Boards 21-41
Conant Atrium (1:00 to 2:30 PM)

Board #21: "Does an artificial diet contribute to changes in metabolism in the honeybee (Apis Mellifera)?" Emily Taylor and Dr. Jonathan Roling, Biology Department, Bridgewater State University, Bridgewater, MA 02325

Board #22: "Changes in gene expression of honeybees due to methyl parathion," Charnel Byrnes and Dr. Jonathan Roling, Biology Department, Bridgewater State University, Bridgewater, MA 02325

Board #23: "Doing it repetitively: Does repeated chlorine exposure increase bacterial tolerance to chlorine?" Danielle Byer and Dr. Jonathan Roling, Department of Biological Sciences, Bridgewater State University, Bridgewater, MA 02325

Board #24: "MOF for pesticide remediation," Ura Shin, Lawrence Renna, Nicole Francis and Dr. Yongwoo Lee, QinetiQ North America, Inc., Technology Solutions Group, 350 2nd Avenue, Waltham, MA 02451

Board #25: "Characterization of partitioning behavior of sulfonamides: Implications for environmental persistence," Alexa Rice, Dr. Patricia Hogan and Dr. Rachael Kipp, Department of Chemistry and Biochemistry, Suffolk University, Boston, MA 02114

Board #26: "Project SHArK at Suffolk University," Shirley Lu, Katharina Feister, Emily Simnam, Dr. Patricia Hogan and Dr. Rachael Kipp, Department of Chemistry and Biochemistry, Suffolk University, 41 Temple St., Boston, MA 02114

Board #27: "Sustainability & Elementary Engineering: The K5 Project," Eliza Story, Jena Shaw and Dr. Patricia Hogan, Environmental Engineering, Suffolk University, Boston, MA 02114

Board #28: "Shoes and shirts get you more than just food service: Clothes as personal monitoring devices," Jena Shaw and Dr. Patricia Hogan, Environmental Engineering, Suffolk University, Boston, MA 02114

Board #29: "Sustainability peer education Eco Rep program at Stonehill College," Bacall Brooks and Dr. Susan Mooney, Environmental Studies Program, Stonehill College, North Easton, MA 02357

Board #30: "Out of state/out of mind: Cognitive distance and beliefs about global warming and sustainability," Brianne Molloy and Dr. Elizabeth Spievak, Psychology Department, Bridgewater State University, Bridgewater, MA 02325

Board #31: "Planting trees for a better campus," Mary Orlando and Ronald Maribett, Geography Department, Bridgewater State University, Bridgewater, MA 02325

Board #32: "Assessment for a green roof atop Woodward Athletic Center," Jordan Piper, Julie Macadam and Dr. Michael Vorwerk, Department of Environmental Science, Westfield State University, Westfield, MA 01085

Board #33: "A study of the relationship between phytoplankton composition and temperature in a dimictic freshwater ecosystem," Jessica Applin and Dr. David Christensen, Biology Department, Westfield State University, Westfield, MA 01085

Board #34: "Decreased biovolume of zooplankton in correlation with declining biovolume of phytoplankton due to temperature shift," Kelly McGuill and Dr. David Christensen, Biology Department, Westfield State University, Westfield, MA 01085

Board #35: "Historical abundance of early life history summer flounder (*Paralichthys dentatus*) in the Narragansett Bay," Danial Palance and Dr. David L. Taylor, Biology & Marine Biology, Roger Williams University, Bristol, RI 02809

Board #36: "Iron binding affinity of *Entamoeba invadens* alcohol dehydrogenase E (EiADHE) in two varieties of *E. invadens*: VK and IP1," Lauren Salerno, Monichan Phay and Dr. Avelina Espinosa, Department of Chemistry and Department of Biology, Roger Williams University, Bristol, RI 02809

Board #37: "Synthesis of C-glycosyl compounds and the study of its interaction with the plasma protein Bovine Serum Albumin," Lisseth Silva and Dr. Lauren Rossi, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Board #38: "Iron (IV) corrole decomposition of nitrones as a biomemetic model for a source of nitric oxide," Ryan McGuinness and Dr. Stephen O'Shea, Roger Williams University, Department of Chemistry, Bristol, RI 02809

Board #39: "Constructing dye sensitized solar cells using microwave heating to accelerate chemical surface modification of transmissive conducting electrodes," Robert Cotta, Jeffrey P. Allen and Dr. Clifford Murphy, Department of Chemistry and Physics, Roger Williams University, Bristol, RI 02809

Board #40: "Pyrazole and pyrazolone synthesis as an undergraduate laboratory experiment," Christina Fontana and Dr. Lauren Rossi, Roger Williams University, Department of Chemistry, Bristol, RI 02809

Board #41: "Synthesis and characterization of ruthenium-solvento complexes in weakly coordinating solvents," Eden A. Couillard, Travis D. Cournoyer and Dr. Clifford J. Timpson, Chemistry Department, Roger Williams University, Bristol, RI 02809

Poster Session I Titles and Abstracts: Boards 1-20
Conant Atrium (10:30 AM to 12:00 PM)

Board #1: "Farming Wampum: Elucidating the mechanism for pigment deposition in the hard clam *Mercenaria mercenaria*," Jesse Farruggella and Dr. Dale Leavitt, Roger Williams University, Marine and Natural Sciences, 1 Old Ferry Road, Bristol, RI 02908

Suckáuhock beads used by Native Americans in cultural ceremonies are made from a purple substance called wampum that is found in the shells of the hard clam *Mercenaria mercenaria*. The local Mashpee Wampanoag tribe has recently started a quahog farm, but only desires to raise quahogs that will produce wampum. However, the chemical composition of the pigment molecule responsible for wampum and the manner by which quahogs synthesize and deposit wampum are unknown. This study seeks to determine the chemical and biophysiological natures of wampum through inter-site pigment shell deposition pattern analysis as well as pigment extraction and instrumental analysis.

Board #2: "Still water feeding behavior of the lobate ctenophore, *Mnemiopsis leidyi*," Kristen Kiefer, Christopher Syslo, John Costello and Dr. Sean Colin, Biology Department, Roger Williams University, Bristol, RI 02809

The lobate ctenophore *Mnemiopsis leidyi* is considered to be a voracious predator due to its ability to consume large amounts of planktic organisms and its lack of natural predators. As an invasive species in many parts of the Mediterranean Sea, Baltic Sea, and North Sea there is considerable concern about its impact in these ecosystems. The purpose of this study was to observe the selective process that was associated with their feeding behaviors in still water situations. The *Mnemiopsis* were observed and recorded throughout the water column of a target tank. The lengths of the target *Mnemiopsis*, as well as a scale were measured at the start of each observation. The video was then logged and analyzed to determine the contact, capture, and ingestion efficiencies based upon the species type. The results showed that there was no definite selective nature to the type of prey that was ingested in that *Mnemiopsis* was capable of capturing and ingestioning all the different types of prey offered. However, observations suggest that there are different methodologies of prey capture that are determined by the size of the prey.

Board #3: "Fluid interactions that enable stealth predation by the upstream foraging hydromedusae *Craspedacusta sowerbyi*," Kelsey Lucas, Jack H. Costello, Kakani Katija and Dr. Sean Colin, Department of Biology, Roger Williams University, Bristol, RI 02809

Unlike most medusae which forage with tentacles trailing behind their bells, several species forage upstream of their bells using aborally located tentacles. It has been hypothesized that these medusae forage as stealth predators by placing their tentacles in more quiescent regions of flow. Consequently, they are able to capture highly mobile, sensitive prey. In this study, we used digital particle image velocimetry (DPIV) to quantitatively characterize the flow field around *Craspedacusta sowerbyi*, a freshwater upstream foraging hydromedusa, to evaluate the mechanics of its stealth predation. We found that fluid velocities were minimal in front and beside the bell where tentacles are located. As a result, the shear strain rates in these regions were below the threshold strain rate required to elicit an escape response in several species of copepods. Estimates of their encounter volume rates were examined to evaluate the potential feeding impact of individual medusa.

Board #4: "Analysis of Sr/Ca ratio in fish otolith bones using the technique of neutron activation analysis," Mark O'Brien and Dr. Nancy Breen, Department of Chemistry, Roger Williams University, One Old Ferry Road, Bristol, RI 02809

Otolith chemistry serves as a useful way of evaluating fish populations because the trace elements found in the otolith correspond with the trace elements in the water which the fish is living and therefore analysis of these trace elements can be used to determine a fish's point of origin. The technique currently used to analyze otoliths is inductively coupled plasma-mass spectrometry (ICP-MS). This work explores the possible use of neutron activation analysis (NAA) as an

alternative to ICP-MS. If possible, NAA offers the advantage that the sample does not need to be acid digested prior to analysis because NAA is able to obtain just as accurate results as ICP-MS with lower amounts of sample preparation required. Preliminary results on the Sr/Ca ratios of sample otoliths obtainied from Narragansett Bay in Rhode Island as well as on otolith standards indicate that measured Sr/Ca ratios reflect site specificity.

Board #5: "Investigation of taurine, B vitamins, and caffeine in commercially available energy drinks by high performance liquid chromatography mass spectrometry," Gregory J. Pastore and Dr. Nancy E. Breen, Department of Chemistry, Roger Williams University, Bristol, RI 02809

This project utilizes Liquid Chromatography Mass Spectrometry (LCMS) to detect taurine, caffeine, vitamins B3, B6, and B12 in widely consumed energy drinks. Caffeine and B-Vitamins have been studied extensively by various methods without derivatization, but little work has been done on taurine, which readily requires pre-column derivatization for separation and detection. A LCMS method is developed and optimized to simultaneously detect and ultimately quantify these compounds of interest in samples of energy drinks. The method calls for a single dilute injection without the need for pre-column derivatization. The validity of the method will be based on how well the determined concentrations of these compounds compare to the ingredient label.

Board #6: "Influence of diet on lead metabolism and fate: Linking dietary deficits and risk," Phoebe Handler and Dr. Daniel J. Brabander, Environmental Studies, Wellesley College, Wellesley, 02481

Today in the United States, childhood lead poisoning is characterized by chronic low-level exposure. Factors that influence susceptibility to lead exposure and toxicity include race, socio-economic status, educational access, parental education level, housing quality, dietary deficits, and access to healthcare. Of these, dietary deficits are a particularly workable variable and are under-emphasized in most lead poisoning prevention schemes. Diet is unique as both a treatment and prevention pathway that should be handled in a population-specific manner. This project seeks to assess the role of diet in the physiological processing of lead to determine appropriate dietary recommendations in the context of lead exposure. As diet is intrinsically tied to a person's culture, ethnicity and social situation, this work will assess how dietary intervention schemes can be tailored to specific ethnic and cultural groups in order to create a diet-based prevention model for specific at-risk populations.

Board #7: "Toward identifying mercury (II) compounds in the atmosphere," Matthew J. Zelie and Dr. Theodore S. Dibble, Department of Chemistry, SUNY-College of Environmental Science and Forestry, Syracuse, NY

The high toxicity of mercury makes it a serious environmental concern. Mercury enters ecosystems largely through deposition of Hg(II) compounds, but these Hg(II) compounds remain unidentified. Field experiments suggest that oxidation is initiated by reactions with atomic bromine and, to a lesser extent, atomic chlorine. We hypothesized that XHg● compounds (X = Cl, Br) formed in these reactions react with the more abundant atmospheric radicals to form stable XHgY compounds, where (Y) includes the atmospheric radicals NO, NO_2, and HOO. Quantum calculations allowed investigation of the bond energies, ionization energies, electron affinities, and proton affinities for each compound. Most importantly, calculations show that three sets of compounds ($XHgNO_2$, XHgONO, XHgOOH) are thermally stable, and could be key contributors to the Hg(II) compounds. Studies further show that proton affinities are within a moderate range (~6.20-7.25 eV), indicating that the compounds could be analyzed via chemical ionization mass spectroscopy. Funding through the National Science Foundation, Division of Atmospheric and Geospace Sciences

Board #8: "Mercury bioaccumulation in elasmobranchs," Nicholas Kutil and Dr. David Taylor, Department of Biology, Roger Williams University, Bristol, RI 02809

In this study little skate, winter skate, smooth dogfish, and spiny dogfish were collected from the Narragansett Bay, and Hg content (ppm wet wt) of muscle tissue was analyzed. Mean Hg concentrations differed significantly among species,

with highest levels in smooth dogfish (mean Hg = 0.768 ppm), followed by spiny dogfish (mean Hg = 0.324 ppm) and skates (mean Hg = 0.100 ppm and 0.064 ppm, for little and winter skate, respectively). Differences in Hg bioacummulation rates were also assessed relative to stable isotope signatures and dietary preferences. Accordingly, crustacea and osteichthyes were essential to the smooth dogfish diet, while squid was the major food item for spiny dogfish. Crustaceans were important to the diet of skates. Mean d15N = 13.29, 11.82, 12.33, and 12.12 for smooth dogfish, spiny dogfish, little skate, and winter skate, respectively. The enriched d13C values of skates and smooth dogfish indicated benthic foraging (range of mean d13C = -16.39 to -17.42).

Board #9: "Mercury in the sediments of the Narragansett Bay Estuary (Rhode Island, USA): Contamination from a historical and spatial perspective," Allison Hall, David Murray, Warren Prell and Dr. David Taylor, Marine Biology, Roger Williams University, Bristol, RI 02809

This study presents stratigraphic profiles of total Hg concentrations measured in sediment cores collected from the Narragansett Bay. Sediment cores were collected and subsamples were analyzed for total Hg content. All sediment depth profiles indicate total Hg concentrations were low in the deeper portions of the cores (mean Hg = 0.013 ± 0.12 ppm), coinciding with pre-industrial time period. Cores demonstrated a mid-depth maximum in Hg content (mean Hg = 1.52 ± 1.82 ppm) resulting from industrial revolution contaminant inputs. The Clean Water Act was reflected as an Hg concentration decrease in the surface samples (mean Hg = 0.60 ± 0.04 ppm). Sediment total Hg concentrations also varied spatially throughout the Bay, with concentrations greatest in the north and decreasing southward (range Hg = 0.26-6.59 ppm). Sediment Hg concentrations were elevated in developed regions of the Bay, suggesting these areas are the dominant sources of historical and recent contaminant inputs.

Board #10: "Mercury in terrestrial dwelling bird species," Gina Dinallo and Dr. Joan Morrison, Biology Department, Trinity College, Hartford CT 06110

Mercury contamination globally affects both humans and wildlife, but has traditionally been studied in relation to aquatic species because human pollution from various sources leaches mercury into bodies of water. In this study, DMA-80 analysis of feather samples from various songbirds and red-tailed hawks captured in the urban areas of Hartford was used to examine mercury in terrestrial bird species. Due to bioaccumulation, hawks were expected to have the highest mercury concentrations; however, in a pool of over 60 samples, hawks had lower than expected mercury levels. Of the species sampled, Blue Jays and Common Yellow-throats had the highest mercury concentrations by far, for which diet may be responsible. The jay and warbler were unique in that they eat primarily invertebrates, and previous studies suggest that spiders in particular may be introducing mercury to terrestrial food chains.

Board #11: "Bird Strikes in Urban Hartford, CT," Shawna Altdorf and Dr. Joan Morrison, Trinity College Biology Department, 300 Summit Street, Hartford, CT 06106

At approximately one billion deaths per year in the Unites State alone, collisions with glass are the leading human-related cause of death for birds, second only to habitat destruction. Previous studies in New York City have shown that buildings with high glass coverage and a small distance to vegetation have increased bird strikes. This study looked at bird strikes in the urban Hartford, CT area. Between September 14, 2011 and November 10, 2011 bird fatalities due to window strikes were recorded in the downtown area of Hartford, CT, Two Rivers Magnet School in East Hartford, CT, and Trinity College also in Hartford. In total, 22 birds were collected of which 20 were migrants and 2 were resident species. Migrant birds are not accustomed to urban environments as resident birds may be which may account for the increased number of migrant fatalities. The data on characteristics of the buildings are still being collected and processed as this experiment is ongoing.

Board #12: "Analysis of banding and recovery data for red-tailed hawks (*Buteo jamaicensis*) in the northeastern U.S.," Jason Baird and Dr. Joan Morrison, Environmental Science Program, Trinity College, Hartford, CT 06106

Banding is an effective method for evaluating movement and dispersal for some birds, including raptors. We used banding data obtained from the Bird Banding Laboratory to examine distances and directionality between banding and recovery locations for Red-tailed Hawks banded in New England and New York. We investigated relationships between age and distance travelled, discussed implications for understanding natal dispersal and philopatry, and also evaluated relationships between season and latitudinal movement. Adults tended to move shorter distances than younger hawks, and only 33% of adults were recovered outside the state their banding state. Most recoveries took place in colder seasons than corresponding bandings. Hawks recovered in the winter following a summer banding showed a stronger directionality towards the south. Along with limited radio-tagged information on breeding pairs of hawks showing year round residence, information from this dataset contributes to our understanding of movement and migration patterns in this species.

Board #13: "Detection of organic waste water contaminants in effluent entering the Taunton River," Jeffrey C. Monroe, Robert E. Geary and Dr. Stephen A. Waratuke, Bridgewater State University, Department of Chemical Sciences, Conant Science Building, Bridgewater, MA 02325

Recent national studies indicate the presence of organic wastewater contaminants such as personal care products, pharmaceuticals, plastic additives, and insecticides in our natural waters. Our research group has begun to use EPA methods for the detection of semi-volatile organic contaminants in effluent water charge going into the Taunton River from our local Bridgewater Waste Water Treatment Facility. The EPA methods 3510c for liquid-liquid extraction using methylene chloride (derivization was not performed) and 8270c for the analysis of semi-volatile organic compounds by GC/MS are utilized. Our earlier results using an Agilient HP-6890 GC-MS and current efforts using a Clarus 560 GC-MS will be compared. Additionally, our plans to evaluate less hazardous solvents for use in modified EPA 3510c methods will be presented.

Board #14: "Sustainable Synthesis of Biodiesel and Recycling Byproducts," Brandon Ackley, John-Paul Burega, Julianne Joy, Chelsea Westgate, Joe Matta and Dr. Edward J. Brush, Department of Chemistry, Bridgewater State University, Bridgewater, MA 02325

The objective of this project is to determine which of two methods of producing biodiesel is the most efficient. The process of converting waste vegetable oil into biodiesel using a transesterification reaction with methanol and a base catalyst is a process of scientific interest as it is a greener alternative to using petroleum fuels from non-renewable resources. This conversion is part of a scientific transition called sustainability. The byproduct glycerol will be used to create soap and our waste water will become fertilizer for tomato plants. To validate the authenticity of our biodiesel, we performed infrared spectroscopy, flame test, density measurement, and cloud point determinations. This project was supported by the NSF STREAMS program at Bridgewater State University.

Board #15: "Investigating greener and more efficient reactions in the production of 3-bromooxindole-3-acetic acid," Alex Baribeau, Kyle Murphy, David Beaver and Dr. Edward J. Brush, Department of Chemistry, Bridgewater State University, Bridgewater, MA 02325

The objective of this research was to find an efficient and environmentally friendly way to create 3-bromooxindole acetic acid (BOAA). This is important as BOAA is converted into 3-methylene oxindole (MOI), which has been found to act as an inhibitor for cysteine proteases. As these enzymes are suspected contributors in disease such as cancer, if BOAA can be created more efficiently it might be implemented as a potential anti-cancer agent. The standard synthesis for BOAA requires indole-3-acetic acid (IAA), tert-butanol, and N-bromo succinimide (NBS). The main problems include low percent yield and low atom economy. Our work-in-progress includes studying the chemical mechanism for BOAA synthesis and using different reaction conditions for producing BOAA by a more efficient and greener process. This research was supported by the NSF STREAMS grant to BSU, and a spring 2011 grant from the Adrian Tinsley Program.

Board #16: "Taking the "mud" out of the Muddy River: Engaging freshman in chemical analysis," Nina Chen, Andree Sime and Dr. Michael Berger, Department of Chemistry and Physics, Simmons College, Boston, MA 02115

The high levels of contamination in the Muddy River have been an opportunity for increased environmental awareness and hands-on experimentation for students in an introductory freshman chemistry course. The Muddy River, part of the Emerald Necklace park system designed by Frederick Law Olmsted in the late 1800's, is the oldest park system in the United States and the largest in Boston. Students analyzed the sediment for metal contaminants using X-ray fluorescence, and compared their results to previous measurements collected nearly 20 years before by other investigations. The student engagement in the monitoring of these contaminants offers great opportunities for applying their analytical techniques to a real-world problem.

Board #17: "The effects of the small scale biosand filtration system on the removal of arsenic and bacteria in water," Diane Mckiernan, Anh Troung and Dr. Michael Berger, Department of Chemistry and Physics, Simmons College, Boston, MA 02115

One of the world's biggest environmental and health issues today is arsenic poising in humans developed from the contamination of drinking water. Biosand filtration technology has been used to improve cleanliness of drinking water for developing countries. By removing unwanted contaminants such as arsenic, it increases the potability of the drinking water. Recent studies have found that simple biosand filters using layers of sand, which contained iron particles, could remove this harmful toxin and its consequences. Our continuation of this research exams the iron particles ability to remove arsenic. We plan to analyze how the size of the iron particle impacts the efficiency of the biosand filter. On another scale, the particle size of iron could also impact the removal of bacteria from water. Due to the presence of arsenic-resistant bacteria, the amount of arsenic that could filter through could have a direct correlation to any potential bacteria growth.

Board #18: "30-Year trends in turbidity at Squam Lake in Holderness, NH," Scott Barta, Alex Finn, Amanda Hollenbeck, Mary Lenehan, Corey Miller and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

The eutrophication of freshwater systems is a major environmental concern. Increased input of nutrients such as phosphorus can lead to algal blooms and increased turbidity. Thus, an increase in turbidity can be interpreted as an indicator of decreased water quality. Using a data set from a 30-year monitoring program on Squam Lake in New Hampshire, we tested for evidence of significant changes in water turbidity over time at 10 different sites throughout the lake. We also studied the relationship between measures of turbidity (Secchi depth) and algal abundance (chlorophyll), and between algal abundance and phosphorus levels. Studying these relationships provides significant insight into the quality of water at Squam Lake.

Board #19: "Water quality assessment through biomonitoring of macroinvertebrates at Glove Hollow Brook in Plymouth, NH," Rebecca M. Jacobson, Jami N. Woodworth, Kate A. Worthen and Dr. Kerry L. Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

The organisms present in a habitat often reflect the overall ecological integrity of the area. We quantified the abundance of macroinvertebrates known to be sensitive to environmental conditions (i.e., having low tolerance values) in order to determine the water quality of Glove Hollow Brook in Plymouth, NH. This stream is located in a town conservation area and therefore was hypothesized to have high water quality. An order of insects with low tolerance to pollution, *Ephemeroptera* (mayflies), comprised 42% of macroinvertebrate abundance. Overall, organisms with low tolerance values (<4) were more abundant than organisms with high tolerance values. The overall biotic score, as calculated based on the NH Department of Environmental Services guidelines, was 3.49 which further supported that the stream was in excellent condition. Stream condition is important to monitor in order determine if habitat conservation and management is sufficient to protect water quality.

Board #20: "The bioassessment of environmental conditions at Quincy Bog in Rumney, NH," Holly R. Miller, Paul John Ramberg Pihl, Tyler Remillard and Dr. Kerry Yurewicz, Department of Biological Sciences, Plymouth State University, Plymouth, NH 03264

This assessment was performed to evaluate the aquatic health of Quincy Bog, a fen of glacial origin in central New Hampshire. We selected this site because it is a protected natural area that may harbor a unique community of organisms with low tolerance of environmental degradation. We took samples of the water throughout the wetland to estimate dissolved oxygen content, pH, conductivity and temperature in conjunction with a collection of macroinvertebrates from six locations. We identified most invertebrate taxa to the family level using dichotomous keys. From these data, we classified the taxa by their tolerance values which are assigned according to sensitivity to pollution. We found a mean tolerance value of 7.5 (on a scale from 0 to 10), although there was significant variability among organisms. From this we can conclude that the habitat within Quincy Bog supports many different types of organisms and the environment itself is varied.

Poster Session II Titles and Abstracts: Boards 21-41
Conant Atrium (1:00 to 2:30 PM)

Board #21: "Does an artificial diet contribute to changes in metabolism in the honeybee (Apis Mellifera)?" Emily Taylor and Dr. Jonathan Roling, Biology Department, Bridgewater State University, Bridgewater, MA 02325

Colony Collapse Disorder (CCD) has been a serious die-off of colonies. There is not a known cause of CCD. There was a shift in the commercial diet of the honeybee to high fructose corn syrup (HFCS) when this disease came about. The change in diet could be a contributing factor to CCD. This semester I hope to analyze if metabolism gene expression changes due to diet in the honeybee. I will perform literature searches to discover which genes in digestion to focus on. Using those genes I identified from the literature, I will measure gene expression in those selected genes. The goal of this research is to collect honeybees, extract RNA, synthesize cDNA, perform QPCR to quantify gene expression and analyze changes in certain genes. I hope to continue from there to see the affect of HFCS in the honeybees' diet.

Board #22: "Changes in gene expression of honeybees due to methyl parathion," Charnel Byrnes and Dr. Jonathan Roling, Biology Department, Bridgewater State University, Bridgewater, MA 02325

Over the past decade, the honeybee population has been decreasing partly due to pesticide use. Plants, crops, and flowers rely on honeybees to pollinate. Without them, our food supply will diminish and honey production will be put to a halt. We will be testing the effects of Methyl Parathion, a pesticide with high toxicity on honeybees used to control insects on cotton, rice, and fruit trees. We will be looking for alteration in the gene expressions for detecting odors and tasting receptors due to Methyl Parathion. Honeybees will be collected, euthanized, and RNA extracted. Genes will be chosen during literature searches for potentially affected metabolic pathways. Bees will then be exposed to varying concentrations of Methyl Parathion. At the end of the exposure RNA will be extracted, cDNA synthesized, and QPCR performed. QPCR will be used to monitor gene expression differences due to methyl parathion exposure.

Board #23: "Doing it repetitively: Does repeated chlorine exposure increase bacterial tolerance to chlorine?" Danielle Byer and Dr. Jonathan Roling, Department of Biological Sciences, Bridgewater State University, Bridgewater, MA 02325

Triclosan is an antimicrobial agent found in personal care products such as tooth paste, deodorant and household cleaning products. Although 95% of triclosan is removed during the waste water treatment process the remaining amount is released back into river systems. Once a city's waste water is cleaned it is released back into the river system. Downstream, towns may use the same river water for municipal purposes. This water is filtered and chlorinate prior to

distribution for public use. Previous lab work suggests that over exposure of triclosan may increase bacteria's resistances to chorine. The mechanism of action of this chlorine tolerance in bacteria is unknown. I would like to show if bacteria can gain tolerance to chlorine through repeated chlorine exposure. Bacterial growth in LB broth will be monitored using absorbance at 600nm.

Board #24: "MOF for pesticide remediation," Ura Shin, Lawrence Renna, Nicole Francis and Dr. Yongwoo Lee, QinetiQ North America, Inc., Technology Solutions Group, 350 2nd Avenue, Waltham, MA 02451

Metal organic frameworks (MOFs) have been developed for degrading pesticides. MOFs were considered as alternatives to zeolites and activated carbon because MOFs surpass them in terms of open pore sizes (5 to 40u) and surface area (up to 10,000 m^2/g). QNA-TSG has developed technologies to cause adsorbents to chemically breakdown pesticides. The first technique is to use MOFs as a support for enzymes to be active in degrading pesticides. The second technique is to form MOFs though the introduction of a geometric twist to the crystal structure to expose reactive sites. The MOF material itself is inherently adsorptive and reactive in breaking down pesticide agents. They have shown to subsequently capture their breakdown products for safe removal through the open pores of MOFs, making them viable for incorporation into air filtration systems to protect against these harmful agents.

Board #25: "Characterization of partitioning behavior of sulfonamides: Implications for environmental persistence," Alexa Rice, Dr. Patricia Hogan and Dr. Rachael Kipp, Department of Chemistry and Biochemistry, Suffolk University, Boston, MA 02114

Antibiotics are widely used, but only recently has their impact on the environment received attention. Due to their stability in water, they can persist for extended periods of time in natural water systems. This has implications in the prevalence of resistant strains of bacteria in the environment. The complex nature of each molecule determines partitioning between organic biomass, sediments, and water. Sulfadiazine and sulfamethoxazole, two sulfonamides, will be characterized in order to assess their environmental persistence. The molecular properties that determine persistence include degree of ionization, octanol-water partitioning coefficients (Kow), and their ability to absorb onto solids and sediments (Kd). Once these two compounds are fully characterized, the impact of these properties on the degradation of each compound will be assessed.

Board #26: "Project SHArK at Suffolk University," Shirley Lu, Katharina Feister, Emily Simnam, Dr. Patricia Hogan and Dr. Rachael Kipp, Department of Chemistry and Biochemistry, Suffolk University, 41 Temple St., Boston, MA 02114

As a result of human dependence on fossil fuels and the negative environmental impacts associated with them, a renewable and alternative form of energy is needed. Hydrogen obtained through photo-electrolysis of water could be a solution if an efficient and effective electrolysis method can be found. Due to their band gap size and inherent stability, metal oxide semi-conductors seem to be promising candidates for this application. However, there are a large number of possible metal oxide combinations to be evaluated. Therefore, Dr. B. Parkinson, a professor at Colorado State University, created a distributed research project called the Solar Hydrogen Activity Research Kit (SHArK) Project which allows students to test various metal oxides for their effectiveness. This kit uses a combinatorial search strategy and allows the participation of many groups in the discovery of effective metal oxides.

Board #27: "Sustainability & Elementary Engineering: The K5 Project," Eliza Story, Jena Shaw and Dr. Patricia Hogan, Environmental Engineering, Suffolk University, Boston, MA 02114

This new pilot initiative for the 2011-2012 academic year involves the partnering of the Boston AIChE (the Ichthyologists), a Suffolk University engineering professor, undergraduate engineering students, and an elementary public school in the development and execution of an environmental curriculum with an engineering emphasis. The goal of this partnership is to improve elementary school students' understanding of (1) the natural environment and people's impact

on it and (2) what engineers do to protect the environment through green engineering and sustainable practices. The project objectives also include (1) considering the challenges associated with implementing engineering concepts at the elementary level, (2) evaluating possible mechanisms to provide support for elementary school teachers in teaching engineering topics, and (3) investigating current elementary engineering programs and resources already available. This exportable K5 program will provide participants with a better understanding of engineering and environmental resources.

Board #28: "Shoes and shirts get you more than just food service: Clothes as personal monitoring devices," Jena Shaw and Dr. Patricia Hogan, Environmental Engineering, Suffolk University, Boston, MA 02114

With the recent discovery of the Arctic ozone, exposure to ultraviolet radiation (UV) continues to be a health risk to humans. Overexposure of UV radiation causes serious eye and skin damage, and it is one of the leading factors in skin cancer. Monitoring devices, such as handheld UV monitors, are methods to measure human exposure to UV, but these devices can obtrusive and inconvenient for consumer use. This paper presents the construction of wearable "smart jacket" that has a UV sensor embedded into the fabric. The jacket is an example of ubiquitous computing, or the idea of computers integrating into the physical world as acting as invisible forces for constant communication. In this project, the Lilypad Arduino microcontroller is sewn into a jacket and is wired via conductive thread to a UV sensor on the jacket that monitors personal exposure.

Board #29: "Sustainability peer education Eco Rep program at Stonehill College," Bacall Brooks and Dr. Susan Mooney, Environmental Studies Program, Stonehill College, North Easton, MA 02357

The Eco Rep program at Stonehill College has been implemented for the first time this fall as a part of the college's initiative to increase sustainability on campus. This program was designed through the combined efforts of Professor Mooney's Environmental Ethics class and Stephanie Mealey '11, Environmental Studies major. It is a one credit class that is open to freshmen and sophomores who wish to motivate fellow students to act in a more environmentally conscious way. The class meets on a weekly basis and is taught by a Senior Environmental Studies major, Bacall Brooks, in collaboration with the head of the Environmental Studies Department, Professor Susan Mooney. Each week in class the Eco Reps learn about different environmental concerns and discuss possible sustainable solutions. Even though these issues are presented in a global context, peer education about campus sustainability is our main goal.

Board #30: "Out of state/out of mind: Cognitive distance and beliefs about global warming and sustainability," Brianne Molloy and Dr. Elizabeth Spievak, Psychology Department, Bridgewater State University, Bridgewater, MA 02325

The current study used an experimental manipulation to assess bias associated with cognitive distance. Previous research on "border bias" indicated that participants considered a threat within the same state to be a greater risk than one that occurred in a different state, even if it were equidistant in location. The present study is a replication and extension, and used a map manipulation to test the effects of border bias on attitudes towards recent environmental issues. Border bias, along with other perceptual biases, might be partly responsible for documented disconnects between public opinion polls, which find the mainstream views are that global warming is nonexistent, exaggerated, and unrelated to human activity, and mounting scientific evidence of melting glaciers, changes in migration patterns of species, and sea level rise. Poll results might be affected by cognitive biases, which help us to make quick judgment calls without wasting needed time and energy.

Board #31: "Planting trees for a better campus," Mary Orlando and Ronald Maribett, Geography Department, Bridgewater State University, Bridgewater, MA 02325

As a sustainability seminar class, we look for making the environment a more sustainable place to live. Taking a look at what we could do here on campus we decided to try for a grant that will allow us to plant trees. We have created a poster that will demonstrate what trees we want to plant if the bid was permitted to us, as well as the process of how we will go about planting them. Educating people on what we want to do as a class would be very helpful to the overall accomplishment of our goal.

Board #32: "Assessment for a green roof atop Woodward Athletic Center," Jordan Piper, Julie Macadam and Dr. Michael Vorwerk, Department of Environmental Science, Westfield State University, Westfield, MA 01085

This project's purpose is to assess the logical possibility of a green roof system on top of Westfield State's athletics complex, called the Woodward Athletic Center. We evaluated the validity of a green roof based on cost analysis, water retention capability, structural considerations and components, general carbon sequestration, and other elements like shading, benefits and drawbacks, and dead load weight. After research of the weight added to the pre-existing roof, water retention capability, structural security, and final costs, it was concluded that a green roof would benefit Westfield State University. A green roof, if implemented, would lower heating and cooling needs, reduce electricity demand, counter Westfield State's flooding issues, and yield a greater biodiversity.

Board #33: "A study of the relationship between phytoplankton composition and temperature in a dimictic freshwater ecosystem," Jessica Applin and Dr. David Christensen, Biology Department, Westfield State University, Westfield, MA 01085

Phytoplankton are the base food supply for freshwater ecosystems. Monitoring how phytoplankton composition responds to changing temperature is important in understanding how rising temperatures may affect freshwater ecosystems. To observe composition changes relative to temperature, samples were taken, and conditions measured at Russell Pond in Russell, MA. Samples were analyzed at Westfield State University. The results showed that there was a change in phytoplankton composition relative to temperature. There were high biovolumes of *Bacillariophyta* and *Chlorophyta* throughout the season with the highest concentrations found at depths with moderate temperatures. This relationship was also observed throughout the course of the season. As temperatures got higher, *Bacillariophyta* biovolume dropped and *Phyrrophyta* increased. Results tended to coincide with what would be considered normal conditions for dimictic freshwater ecosystems. Further data collection and analysis are necessary to understand how composition will change with rising temperatures and how other trophic levels may become affected.

Board #34: "Decreased biovolume of zooplankton in correlation with declining biovolume of phytoplankton due to temperature shift," Kelly McGuill and Dr. David Christensen, Biology Department, Westfield State University, Westfield, MA 01085

Zooplankton are a proficient indicator of water quality of a lake and a crucial part of the foundation of the worlds food supply. They are heterotrophs that are dependent on phytoplankton. Climate change is a global issue that involves the fluctuation temperature. Knowing how phytoplankton is affected by temperature increase is important to understand how it can alter the composition of ecosystems. In an effort to understand the dynamics of zooplankton relative to phytoplankton composition, samples and temperature readings were taken from two different locations at various depths at Russell Pond, Russell, MA. Samples and data were analyzed in the lab at Westfield State University. Phytoplankton biovolume decreased as temperature increased over the course of the reproductive season. Biovolume of zooplankton also decreased in regards to phytoplankton. Knowing the influence that temperature change has on plankton is important in understanding how it can affect the dynamics of an ecosystem.

Board #35: "Historical abundance of early life history summer flounder (*Paralichthys dentatus*) in the Narragansett Bay," Danial Palance and Dr. David L. Taylor, Biology & Marine Biology, Roger Williams University, Bristol, RI 02809

Anecdotal observations have noted a northward shift in the distribution of early-stage summer flounder (SF) that now encompasses southern New England estuaries. Moreover, the apparent geographic range expansion of SF may be mediated by climate change. In this study, we: (1) determined if larval and juvenile SF abundance has significantly increased over time in the Narragansett Bay (RI/MA), and (2) identified if warmer winter water temperatures have contributed to such an increase. Temporal changes in SF abundance in the Bay and surrounding coastal ponds was synthesized from data provided by government and academic institutions. There has been no change in SF larval abundance, whereas age-0 and age-1 abundances have increased significantly over time. SF abundances were also positively correlated with winter temperature, although this relationship was not significant at $p < 0.05$. Hence, it is likely that a multitude of environmental factors including warmer winter temperatures have reduced the overwintering mortality of SF during the transition to the post-settlement stage.

Board #36: "Iron binding affinity of *Entamoeba invadens* alcohol dehydrogenase E (EiADHE) in two varieties of *E. invadens*: VK and IP1," Lauren Salerno, Monichan Phay and Dr. Avelina Espinosa, Department of Chemistry and Department of Biology, Roger Williams University, Bristol, RI 02809

Little is known about the tertiary structures of the alcohol dehydrogenase E and alcohol dehydrogenase 2 proteins in parasitic protozoans *Entamoeba invadens* and *Entamoeba histolytica*. EiADHE and EiADH2 are key metabolic enzymes in the glycolytic alcoholic fermentation pathways of each species, respectively. These enzymes catalyze the conversions of acetyl-CoA to acetaldehyde and acetaldehyde to ethanol, using iron (II) and NAD^+ as cofactors. Many microorganisms have been shown to require iron for growth and survival, which has led to the proposal of iron chelators for antimicrobial treatment. We have demonstrated that iron is essential for the two EiADHE dehydrogenase activities. The goal of this study is to determine the binding affinity of Fe^{2+} to EiADHE, isolated from strains VK and IP1, both for its evolutionary and clinical significance. Additionally, a theoretical tertiary structure of both EhADH2 and EiADHE and their catalytic mutants will be determined using molecular modeling software.

Board #37: "Synthesis of C-glycosyl compounds and the study of its interaction with the plasma protein Bovine Serum Albumin," Lisseth Silva and Dr. Lauren Rossi, Department of Chemistry, Roger Williams University, Bristol, RI 02809

Glycosylation is one of the most important reactions in biological systems due to its use in the synthesis of pharmaceuticals. Naturally occurring C-β-glycosylflavonoids exhibit antiviral, cytotoxic, hypotensive and DNA binding activities. Moreover, C-glycosylflavonoids can inhibit the proliferation of liver cancer cells, act as free-radical scavengers, and chelate to metal ions forming metal-ion complexes. We sought to investigate and optimize the glycosylation of various flavone precursors with various Lewis acids. Additionally, the binding affinity of non- and C-glycosylated compounds with bovine serum albumin, a crucial protein for regulating the colloidal osmotic pressure of blood, will be investigated to probe the structural determinants of binding.

Board #38: "Iron (IV) corrole decomposition of nitrones as a biomemetic model for a source of nitric oxide," Ryan McGuinness and Dr. Stephen O'Shea, Roger Williams University, Department of Chemistry, Bristol, RI 02809

Nitrogen compounds are controlled by numerous enzymatic pathways in biological systems. Most prevalent are redox reactions with complexed iron of varying oxidation states (II, III, and IV). This work has investigated the redox cascade of iron (IV) corroles with nitrones and characterizations of the Fe corrole nitrosyl products. The nitrone reactant reduces the iron (IV) to lower the oxidation state from +IV to +III and finally +II while liberating NO at varying rates. The varying rates of nitrone decomposition depend upon the initial oxidation state of the iron center and the stability of the organic residue on the release of the nitric oxide. This work has been funded by RI EPSCOR Grant.

Board #39: "Constructing dye sensitized solar cells using microwave heating to accelerate chemical surface modification of transmissive conducting electrodes," Robert Cotta, Jeffrey P. Allen and Dr. Clifford Murphy, Department of Chemistry and Physics, Roger Williams University, Bristol, RI 02809

Dye sensitized solar cells (DSSCs) are an attractive research focus for clean energy that are cheaper and greener than the highly processed silicon photovoltaics. We present our investigations of microwave heating to the construction of DSSCs to produce materials more quickly, reduce solvent use, and consume less power in comparison to traditional heating methods. Electrode substrates are hydroxylated with a basic solution and then functionalized with either amine, ethynyl, or pyridine terminus groups in order to couple to photoactive complexes including 2,2',2"-terpyridyl-2,2'-bipyridylchlororuthenium (II), trans-chloronitrosyltetrapyridylruthenium (II), and the "N3" or cis-bis-4,4'-dicarboxylicacid-2,2'-bipyridyldithiocyanatoruthenium (II) dye. Microwave heating is compared to conventional heating methods in amide bond formation, "Click" coupling to form 1,2,3-triazole linkages, and direct surface-to-metal coordination to bind ruthenium complex dyes. Synthesis of TiO_2 coated substrates will also be investigated. Surfaces are characterized using contact angle, UV-Vis spectroscopy, and cyclic voltammetry. Electrodes are incorporated into prototype DSSCs using commercially available kits from Solaronix SA to assess photocurrent production.

Board #40: "Pyrazole and pyrazolone synthesis as an undergraduate laboratory experiment," Christina Fontana and Dr. Lauren Rossi, Roger Williams University, Department of Chemistry, Bristol, RI 02809

Pyrazole and pyrazolones are five membered heterocyclic compounds that have many biological and synthetic uses. α-ketoesters or β-diketones were combined with hydrazines to generate pyrazole/ pyrazolone compounds using three different conditions: thermal, PSSA (polystyrene supported sulfuric acid), and MW (microwave). Following purification, 1H NMR was used to verify that each reaction condition generated the same product. The isolated pyrazole and pyrazolone compounds have been further analyzed as inhibitors of Glycine max (soybean) lipoxidase in a subsequent biochemistry course.

Board #41: "Synthesis and characterization of ruthenium-solvento complexes in weakly coordinating solvents," Eden A. Couillard, Travis D. Cournoyer and Dr. Clifford J. Timpson, Chemistry Department, Roger Williams University, Bristol, RI 02809

Solvent complexes of ruthenium, in a variety of weakly coordinating solvents, will be investigated to explore their potential use as synthetic precursors. Solvent complexes will be generated from ruthenium-halide complexes using either Tl^+ or Ag^+ ion to abstract the halide thus generating the solvent complex. The complexes that will be studied are cis-[Ru(4,4-dicarboxylic acid, 2,2'-bpy)$_2$(Cl)$_2$]$^{2+}$, [Ru(trpy)(bpy)Cl]$^+$, and trans-[Ru(dppm)$_2$Cl(CCPh)], where trpy is 2,2';6',2''-terpyridine, and bpy is 2,2'-bipyridine, dppm is bis-(diphenyphosphino)methane, and CCPh is phenylacetylide. Once these complexes are generated in-situ, their kinetic stability and potential use as synthetic precursors towards building new complexes will be determined. Authors gratefully acknowledge support from Roger Williams University Center for Economic and Environmental Development (CEED) and Rhode Island Space Grant Consortium (RISG-NASA).