Rochester Academy of Science
41st Annual Paper Session

November 15, 2014

Hosted by:
School of Science and Mathematics
The College at Brockport, SUNY

Schedule

8:30-9:30 AM	Registration – Edwards Hall
9:30-11:15AM	Oral Presentations–Edwards Hall Session I Astronomy and Physics, Room 101 Session II Biology I, Room 106 Session III Biology II, Room 105 Session IV Environmental Science and Ecology, Room 104 Session V Chemistry and more, Room 103 Session VI Meteorology and Anthropology, Room 107
11:15-12:25 PM	Poster Presentations – Edwards Hall
12:30 PM	Lunch – Seymour College Union, Ballroom
1:00 PM	Larry King Memorial Lecture "A Reply to the Man Who Made Toilet Paper: On the Value of 'Basic' Scientific Research" by Dr. Christopher Norment Seymour College Union, Ballroom

ORAL PRESENTATIONS
9:30-11:15AM

SESSION 1: PHYSICS and ASTRONOMY
Room 101 Moderator: Eric Monier

9:30 AUGER ELECTRON SPECTROSCOPY FROM METAL-OXIDE SUPPORTED NANOPARTICLES.
John Califf Collini, Joshua Gild, Michael S. Pierce, and Alan Raisanen

9:45 POINT CONTACT SPECTROSCOPY ON $FeTe_{0.55}Se0.45$, Pb, AND YFe_2Al_{10}: AN UNDERGRADUATE INVESTIGATION INTO QUANTUM CRITICALITY.
Amanda M. Landcastle

10:00 MAGNETIC PROPERTIES OF NON-STOICHIOMETRIC NI_2MNGA_{1-X} HEUSLER ALLOYS.
Ian Ferralli and Linda Barton

10:15 BREAK

10:30 IMAGING OF PT NANOCRYSTALS ON $SRTIO_3$ SUBSTRATE: COHERENT X-RAY DIFFRACTION AND SCANNING MICROSCOPY STUDIES.
Travis Douglas, Michael Pierce, Joshua Gild, Andi Barbour, Vladimir Komanicky, Hoydoo You

10:45 MORPHOLOGY OF THE LARGE AND SMALL MAGELLANIC CLOUDS USING FUNDAMENTAL MODE CEPHEIDS.
Daniel Wysocki, Sukanta Deb, Shashi M. Kanbur, and Harinder P. Singh

11:00 MODELING THE BLACK HOLE OF THE MILKY-WAY.
Ingo H. Leubner

SESSION 2: BIOLOGY I
Room 106 Moderator: Michael Pelletier

9:30 THE EFFECTS OF ADIPOCYTE MORPHOLOGY DUE TO MELANIN CONCENTRATING HORMONE AND ITS RECEPTOR CO-LOCALIZATION TO CAVEOLAE.
Colin King and Laurie Cook

9:45 REPLICATION-COMPETENT INFLUENZA A AND B VIRUSES EXPRESSING A FLUORESCENT "TIMER" PROTEIN.
Michael Breen, Aitor Nogales, and Luis Martinez Sobrido

10:00 MODELING THE EXTRACELLULAR MATRIX AS A DOUBLE NETWORK HYDROGEL.
S. Kearns and M. Das

10:15 BREAK

10:30 PREVALENCE OF *BATRACHOCHYTRIUM DENDROBATIDIS* AND RANAVIRUS IN AMPHIBIANS SAMPLED FROM 2012–2014 IN OSWEGO COUNTY, NY.
Rachel Corin, Jennifer Olori, Sofia Windstam, and Rachel Cary

10:45 ISOLATION OF A *slk19* ^{ts} STRAIN OF THE BUDDING YEAST S. *cerevisiae*.
Ashley Smith, Shannon Cotter and Cynthia R. Davis

11:00 PROPER REGULATION OF RAC1 ACTIVITY IS REQUIRED DURING *DROSOPHILA* DORSAL VESSEL FORMATION.
Melisa DeGroot, David Swope, and Sunita Kramer

SESSION 3: BIOLOGY II

Room 105 Moderator: Adam Rich

9:30 ANOCTAMION 1 CONTRIBUTES TO REGULATION OF GASTROINTESTINAL MOTILITY IN THE ZEBRAFISH.
Maxwell O. Denora, Ian Shannon, Clayton Brady, Jeffery Amack, and Adam Rich

9:45 MITE REPELLENT FOR THE PROTECTION OF BEES BASED ON DIOXOLANES OF 2-HEPTANONE IN THE PRESENCE OF FORMIC ACID.
Amber M. Kudla, Thomas D. Allston, Gregory M. Glenn, Artur P. Klamcyzynski, and Massoud J. Miri

10:00 STRESS DOES NOT INTERFERE WITH GI TRANSIT IN THE ZEBRAFISH.
Clayton Brady, Ian Shannon, Maxwell O. Denora, Karl Clark, and Adam Rich

10:15 BREAK

10:30 THE ROLE OF THE *VAN GOGH* GENE IN OLFACTORY CIRCUIT CONSTRUCTION IN *DROSOPHILA MELANOGASTER.*
Noah Reger and Huey Hing

10:45 MEASURING MORPHOLINO OLIGONUCLEOTIDE EFFICACY WITH POLYMERASE CHAIN REACTION.
Ian Shannon, Clayton Brady, Maxwell DeNora, and Adam Rich

11:00 MIGRATION AND SEGREGATION IN CELLULAR CO-CULTURES: ROLE OF DIFFERENTIAL CELL ADHESION AND ELASTICICTY.
Daniel Kolbman and Moumita Das

SESSION 4: ECOLOGY and ENVIRONMENTAL SCIENCE

Room 104 Moderator: Jacques Rinchard

9:30 DETENTION PONDS AS ECOSYSTEMS IN DEVELOPED LANDSCAPES: BIODIVERSITY AND THE EFFECT OF BIOTURBATING INVERTEBRATES ON THE BIOGEOCHEMISTRY OF MAN-MADE PONDS.
Kerry Kuntz and A. Christy Tyler

9:45 SPATIOTEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE ONTARIO PREY FISH.
Robert Pattridge, Jacques Rinchard, and Maureen Walsh

10:00 DOMINANT BENTHIC COMMUNITIES FOUND IN 42 LAKES.
K. M. Stewart

10:15 BREAK

10:30 USE OF REMOTE CAMERAS TO INDEX CANADA GOOSE MIGRATION AND DAILY MOVEMENTS IN CENTRAL NEW YORK.
Jeffrey Benjamin, Michael Schummer, and Tyler Pelle

10:45 COMPARISON OF MOVEMENT PATTERNS IN CAPTIVE-RELEASED EASTERN HELLBENDERS (*CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS*) USING THREE DIFFERENT RELEASE METHODS.
Julie Boerner

11:00 LOCAL MUSEUM SPECIMEN SCREENING FOR THE ARRIVAL OF *BATRACHOCHYTRIUM DENDROBATIDIS* IN CENTRAL NEW YORK.
Calee Wilson

SESSION 5: CHEMISTRY and MORE
Room 103 Moderator: Markus Hoffmann

9:30 COMPUTATIONAL STUDY OF IONIC LIQUID SOLVATION.
J.O. Ellison and M.P. Heitz

9:45 FITTING AND COMPARING EXCESS MOLAR VOLUME DATA.
Markus M. Hoffmann

10:00 INVESTIGATION OF TGA FOR THE DETECTION OF ISOLATED ENZYME ACTIVITY ON LIGNOCELLULOSE.
Erick J. Braham and Robyn E. Goacher

10:15 BREAK

10:30 2013 STATEWIDE SURVEY OF PUBLIC SCHOOLS PEST MANAGEMENT POLICIES AND PRACTICES.
Lynn Braband

10:45 THE FIRST USE OF THE MEASUREMENT OF THE ACCEPTANCE OF THE THEORY OF EVOLUTION SURVEY AT D'YOUVILLE COLLEGE.
Martin Kelly, Laura Hechtel, and Clara Davie

11:00 EFFECTIVE *DANIO RERIO* EXERCISE TRAINING MODEL.
Kevin Bronson, Kathleen Savage, Michael Boller, and Edward Freeman

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SESSION 6: METEOROLOGY and ANTHROPOLOGY
Room 107 Moderator: Michael Grenier

9:30 COLD SURGES ALONG THE AFRICAN HIGHLANDS.
Caitlin C. Crossett and Nicholas D. Metz

9:45 THE EFFECTS OF EXTREME PRECIPITATION EVENTS ON CLIMATOLOGY.
Pamela Eck and Nicholas Metz

10:00 CLIMATOLOGY OF LAKE ONTARIO LAKE-EFFECT SHORELINE BANDS: LAKE-TO-LAKE CONNECTION.
Neil F. Laird, Lauriana C. Gaudet, and Coltin D. Grasmick

10:15 BREAK

10:30 POLLEN INDICATORS OF LATE HOLOCENE NATIVE AMERICAN VEGETATION IMPACTS IN THE FINGER LAKES REGION, NY.
Albert E. Fulton II

10:45 RITUALS OF THE RED SPEAR MOVEMENT: SPIRIT POSSESSION, BATTLE MAGIC AND COMMUNITY DEFENSE IN NORTHERN CHINA, 1916-1949.
Benjamin N. Judkins

11:00 NAVAJO RUGS: RITUAL MEANINGS WOVEN IN WOOL.
Russell A. Judkins

POSTER PRESENTATIONS
11:15 AM - 12:25 PM

ASTRONOMY AND PHYSICS

1. CSTAR ANALYSIS AT DELHI UNIVERSITY, INDIA.
   Michael Leone, Kenny Roffo, Shashi Kanbur, H.P. Singh, and Lucas Macri

2. QUASAR EMISSION LINE VARIABILITY FROM HUBBLE SPACE TELESCOPE ARCHIVE DATA.
   Kasey Hogan

3. CONDITIONAL ENTROPY METHOD TO DETECT PERIODS ON VARIABLE STAR.
   Gabriel L. Ramos, Earl Bellinger, Matthew Granham, Ashish Mahabal and Shashi Kanbur

4. IMPLEMENTATION OF STORED WAVEFORM INVERSE FOURIER TRANSFORM (SWIFT) AT THE LEBIT FACILITY.
   Daniel Burdette

5. ENERGY CONVERSION: SMART MAGNETIC NANOMATERIALS.
   Martin Dann, Dylan McIntyre, and Carolina C. Ilie

6. ADSORPTION OF WATER ON POLY(METHYL METHACRYLATE).
   Mateusz Zuba, Patrick Howard, and Carolina C. Ilie

7. CAPILLARY CONDENSATION TRANSITIONS FOR CYLINDRICAL GEOMETRY.
   Julia R. D'Rozario and Carolina C. Ilie

8. CAPILLARY CONDENSATION: WEDGE-LIKE GEOMETRY.
   Mozart Guedes Duarte and Carolina C. Ilie

9. A LOW FREQUENCY ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY STUDY OF THE FIRING TEMPERATURE OF REDART CLAY.
   Lauren Switala, Emma I. Hornak, William J. Ryan, Nicholas Zumbulyadis, and Joseph P. Hornak

10. USING SYNCHROTRON RADIATION TO STUDY THE BEHAVIOR OF C_N^- CARBON CLUSTERS.
    Candace Carducci

11. STYLE OR HEALTH: THE IMPORTANT QUALITIES OF SUNGLASSES.
    Christopher Demas and Jeff Rizza

CHEMISTRY AND BIOCHEMISTRY

12. RATIONAL DESIGN OF SURFACE-ENHANCED RESONANCE RAMAN SCATTERING-NANOPROBES WITH ATTOMOLAR LIMITS OF DETECTION.
    Matthew Bedics, Stefan Harmsen, Matthew Wall, Ruimin Huang, Moritz Kircher and Michael Detty

13. EVALUATING OIL DISPERSANT SYSTEMS VIA EMULSION STABILITY AND OPTICAL MICROSCOPY.
    William Fagan, William Ervin, Yi Zhang, and Marina Tsianou

14. SOLUBILITY OF MINERAL SALTS IN BINARY SOLVENT SYSTEMS OF NONIONIC SURFACTANTS AND WATER.
    Peter W. McGarvey and Markus M. Hoffmann

15. PALLADIUM CATALYZED REACTIONS: A SEARCH FOR A GREENER OXIDATION PATHWAY.
    David Tse, Amber Hendricks, and Karen E. Torraca

16. ELECTRO- AND SPECTROELECTROCHEMICAL CHARACTERIZATION OF REDOX ACTIVE N-HETEROCYCLIC CARBENES.
    Kenneth Nguyen, Renjith Maracheril, Kuppuswamy Arumugam

17. AN ELECTROCHEMICAL APPROACH TO CONTROL RING SIZE OF CYCLIC POLYESTERS.
    Eric Helenbrook, Megan Cross, and Kuppuswamy Arumugam

18. SYNTHESIS AND CYTOTOXICITY OF VARIOUS FERROCENYLATED GOLD(I) N-HETEROCYCLIC CARBENE COMPLEXES.
    Kevin Sidoran, Jonathan Arambula, and Kuppuswamy Arumugam

19. VANADIUM AND TITANIUM-SEQUESTERED XEROGEL COATINGS FOR THE CATALYTIC PRODUCTION OF HYPOHALOUS ACIDS.
    Corey Damon and Michael R. Detty

20. ELECTROCHEMICAL CHARACTERIZATION OF TRIHEXYLTETRADECYLPHOSPHONIUM CHLORIDE AND DECYLMETHYLIMIDAZOLIUM CHLORIDE MEASUREMENTS IN MEOH.
    Colby Raymond and Mark P. Heitz

21. SOLVATION DYNAMICS OF COUMARIN 153 IN BINARY SOLVENTS.
    S. M. Robillard and M. P. Heitz

22. METALLOPHTHALOCYANINE-CATALYZED WITTIG OLEFINATION OF ALDEHYDES AND KETONES.
    Dominic L. Ventura, Tara D. Noworyta, Scott J. Heller, and Brandon M. Belz

23. STUDIES TOWARD A CONVENIENT AND INEXPENSIVE SYNTHESIS OF D-VINYLGLYCINE.
    Ethan DeCicco and Luis Sanchez

24. MICROWAVE SYNTHESIS OF MULTIPLY BONDED DIRHENIUM COMPLEXES.
    Callen Feeney, Marcy A. Merritt, and Carly R. Reed

25. STUDIES TOWARD THE TOTAL SYNTHESIS OF APLYDACTONE: A MODEL STUDY.
    Andrew Streit, Rachael Hamlin, Austin Kelly, Katherine Valentine, and Christina Goudreau Collison

26. DEVELOPING A SYNTHETIC ROUTE TO CARAMBOXIN, A BIOACTIVE NON-PEPTIDIC AMINO ACID.
    Andrea Pascucci and Luis Sanchez

27. CYCLIC L-TRYPTOPHAN-BASED BUILDING BLOCKS FOR THE SYNTHESIS OF MEDICALLY RELEVANT COMPLEX MOLECULES.
    Janine Cubello, Stephanie Scharmach, and Luis Sanchez

28. THE EFFECTS OF OSMOLYTES ON THE STABILITY OF GNRA HAIRPINS.
    Kaethe N. Leonard and Joshua M. Blose

29. COMPARISON OF INSTRUMENTAL METHODS FOR MEASURING ENZYME ACTIVITY ON WOOD.
    Nicholas Zerby and Dr. Robyn E. Goacher

30. PROBING THE MOLECULAR INTERACTIONS OF BOVINE GAMMA B CRYSTALLINS THROUGH NMR SPECTROSCOPY.
    Angel Payan, David Barnard, George Thurston, and Lea Vacca Michel

31. TUNING CHEMOSELECTIVITY TOWARD AN AFFORDABLE SYNTHETIC APPROACH TO AURANTIOCLAVINE.
    Zachary Mariani, Stephanie Scharmach, and Luis Sanchez

32. SYNTHESIS OF POLYARYL PRECURSORS FOR THE BOTTOM-UP FABRICATION OF GRAPHENE NANORIBBONS AND THEIR INCORPORATION INTO THE ORGANIC LABORATORY CURRICULUM.
    Lori Kim, Sameer Singha, Sarbajit Banerjee, David Hilmey

33. EXPLORING *ALFALFA* HAY'S POTENTIAL AS AN ALTERNATIVE NON-FOOD SOURCE OF BIOFUEL.
    Jasmine Beloy and Barnabas Gikonyo

34. SAWDUST: A SOURCE OF LIGNOCELLULOSIC BIOMASS FOR BIOFUEL PRODUCTION.
    Maíra Ferreira and Barnabas Gikonyo

35. CONVERSION OF CELLULOSE TO GLUCOSE FOR BIOETHANOL: A COMPARATIVE STUDY OF MICROWAVE HEATING AND ACID HYDROLYSIS.
    Shikha Gautam and Barnabas Gikonyo

36. TOWARD COST EFFECTIVE BIOFUEL PRODUCTION: DEVELOPING A RECYCLING METHOD FOR IONIC LIQUIDS USED AS BIOMASS PRETREATMENT SYSTEMS.
    Shikha Gautam and Barnabas Gikonyo

37. TOWARD BIOFUEL PRODUCTION: EVALUATING THE POTENTIAL OF RICE HUSKS.
    Wilson Cardoso and Barnabas Gikonyo

38. DECHLORINATING POLLUTANTS VIA ENVIRONMENTALLY FRIENDLY PALLADIUM CATALYSIS.
    Joseph Hennig, Shawn Dirx, and M. Logan

EARTH SCIENCES

39. PREDECESSOR SNOW EVENTS ASSOCIATED WITH EXTRATROPICAL CYCLONES.
    Matthew C. Sanders, and Nicholas D. Metz

40. DOWNWARD TRANSPORT OF OZONE DUE TO CONVECTION NEAR MANAUS, BRAZIL.
    Randy J. Chase, Jose D. Fuentes , Tobias Gerken , Marcelo Chamecki

41. SURFACE ENERGY BUDGET CLOSURE IN SAGEBRUSH LANDSCAPE.
    Raleigh Grysko, Eric Russell, and Heping Liu

42. ANALYSIS OF TEMPERATURE CHANGE SIGNATURES FOR A TRANSECT ALONG EASTERN NORTH AMERICA.
    Randy Chase, Aidan Kuroski, Kristian Oliver, Katelynn Groh, Emily Noonan, and Melissa Olday

43. EIGHTEEN YEAR TREND IN SUMMER SURFACE WATER TEMPERATURES (C°) OF CANANDAIGUA LAKE, NEW YORK.
    Bruce Gilman and Kevin Olvany

44. INFLUENCE OF PRECIPITATION PATTERNS ON SURFACE WATER AND GROUNDWATER IN THE SANDY CREEK WATERSHED, NY.
    Skylar J. Francis and Mark R. Noll

45. CO_2 FLUX FROM A SINGLE MAPPED SOIL UNIT UNDER DIFFERENT MANAGEMENT PRACTICES.
    Sarah E. Welch and Mark R. Noll

46. A SURVEY OF TRACE METALS AND INORGANIC IONS IN RICE CREEK AND GLIMMERGLASS LAGOON WATERSHEDS, OSWEGO, NY.
    Kristen Harrigan, Angelo Messina, Austin O'Neill, and C. Eric Hellquist

47. VARIATIONS IN GROUNDWATER AND SURFACE WATER CHEMISTRY IN THE SANDY CREEK (NY) WATERSHED: NATURAL OR ANTHROPOGENIC IMPACTS.
    Owen Cowling and Mark Noll

48. THE SEDIMENTARY RECORD OF LAKE LEVEL CHANGE: GEOCHEMICAL CLIMATE PROXY DEVELOPMENT IN THE MONO BASIN, CALIFORNIA.
    Martha Miller, Paul Tomascak, and Sidney Hemming

49. DEVELOPMENT OF A RAPID SOIL PHOSPHORUS FIELD ANALYSIS METHOD AND APPLICATION TO ARCHAEOLOGICAL SITES.
    Nicholas Smith, Elizabeth Kreppel, Aimee Mitchell, and Mark R.Noll

50. EURYPTERIDS AND THE ORIGIN OF THE LATE SILURIAN AKRON FORMATION OF WESTERN NEW YORK AND SOUTHWESTERN ONTARIO, CANADA.
    Samuel J. Ciurca, Jr.

ENVIRONMENTAL SCIENCE AND ECOLOGY

51. BIOASSESSMENT OF THE WATER QUALITY OF THE TIOUGHNIOGA RIVER IN RELATION TO SURROUNDING LAND USE, CORTLAND COUNTY, NY.
    Kathryn E. Sweeney and Niamh O'Leary

52. HAS THE BENTHIC MACROINVERTEBRATE COMMUNITY OF SOUTHWESTERN LAKE ONTARIO CHANGED FROM 1983 TO 2014?-A LONG-TERM PERSPECTIVE.
    Katherine Bailey and James M. Haynes

53. SPATIO-TEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE MICHIGAN FISH.
    Matthew Futia, Jacques Rinchard, Sara Creque, Sergiusz Czesny

54. DIETARY TRANSFER OF FATTY ACIDS IN LAKE TROUT.
    Sage Hallenbeck, Austin Happel, Sergiusz Czesny, Jacques Rinchard

55. THE ABUNDANCE AND CHARACTERISTICS OF AQUATIC TREE HOLE COMMUNITIES IN THREE GERMAN FOREST.
    Roodline Cineus, Anastasia Roberts, and C. Eric Hellquist

56. EFFECT OF FORESTED CONDITIONS ON VERNAL POOL RESTORATION IN THE NORTHEASTERN UNITED STATES.
    Elizabeth Bruen and A. Christy Tyler

57. SEARCH FOR ANCIENT CONIFERS IN NORTHERN NEW YORK ALVAR PLANT COMMUNITIES.
    Bruce Gilman

58. HISTORICAL OCCURANCES OF THE EASTERN HELLBENDER, *CRYPTOBRANCHUS ALLEGANIENSIS*, IN NEW YORK AND PENNSYLVANIA.
    Emily Boivin, Robin Foster and Amy McMillan

59. BIOLOGICAL SURVEY FOR INVASIVE SPECIES IN LOON LAKE AND THE SURROUNDING WATERSHED, STEUBEN COUNTY, NEW YORK.
    Bruce Gilman, John Foust, Tyler Barber, Jason Hanselman and Ryan Niemiec

60. WHAT'S HAPPENING TO ZEBRA MUSSELS (*DREISSENA POLYMORPHA*) IN HONEOYE LAKE?
    Bruce Gilman, Jason Hanselman and Nadia Harvieux

61. SURVEY AND MANAGEMENT OF INVASIVE SPECIES ON RIT CAMPUS.
    Jordan Bailey, Charles Border, Caitlin Dailey, and Rachel Saless

62. INVASIVE SPECIES OFFERS FEWER RESOURCES TO NATIVE INSECTS.
    Lauren Grunzweig and Robert Warren

63. SWALLOWWORT: ANALYZING THE EFFECTS OF A TWINING INVASIVE FORB IN TWO MONROE COUNTY PARKS.
    Scott Ward

64. TRENDS OF INVASIVE *TYPHA* (CATTAIL) COLONIZATION FOUND IN SILVER LAKE FEN (OSWEGO COUNTY, NY).
    Faith Page, Samantha Manicone, and C. Eric Hellquist

65. ABUNDANCE AND REPRODUCTION OF HERBACEOUS VEGETATION OF WELLS COLLEGE, AURORA, NEW YORK.
    Niaome Hickman, Kathryn Sweeney and Jaclyn Schnurr.

66. TERRITORIAL AND DEFENSIVE BEHAVIOR IN THE LARVAL STAGES OF THE EUROPEAN GRAPEVINE MOTH (TORTRICIDAE: *LOBESIA BOTRANA*).
    Carrie Preston, Hannah Nadel, and Karen Sime

67. CAN EASTERN BLUEBIRD NESTLINGS BE AGED ACCURATELY WITH GUIDES OF DIGITAL IMAGES?
    Nikki Wilkins and Bill Brown

68. WHAT BIRDS SHOULD EAT AND WHY: NUTRITIONAL DIFFERENCES IN FRUITS AMONG SITES AND GROWING SEASONS.
    Harshita Sood, Charmaine R. Merchant, Rachel Saless, Morgan Bida, Todd Pagano, and Susan B. Smith

69. SEASONAL VARIATION IN PLASMA TRIGLYCERIDE LEVELS IN THREE SPECIES OF MIGRATORY SONGBIRDS.
    Meghan Oberkircher, Calvin Carrington, and Susan B. Smith

70. RESPONSE OF SONG SPARROWS (*MELOSPIZA MELODIA*) TO VARYING LEVELS OF ANTHROPOGENIC NOISE IN WESTERN NEW YORK STATE.
    Juliana Merluccio

71. DOES PLANT IDENTITY, LEAF CONDITION, AND WATER QUALITY INFLUENCE HERBIVORY BY *GAMMARUS* SP.*?*
    Samantha Boben, Mackenzie Stone-Sweeting, and C. Eric Hellquist

72. ABUNDANCE AND DISTRIBUTION OF BLACK-LEGGED TICKS (*IXODES SCAPULARIS*) RELATIVE TO DEER EXCLOSURES AT RICE CREEK FIELD STATION, OSWEGO NY.
    Allysa Swilley, Katrina DeBaun, Katey Hilburger, and C. E. Hellquist

73. CHARACTERISITICS RELATED TO THE PREVALENCE OF LYME DISEASE IN DOGS IN ONEIDA COUNTY, NEW YORK.
    Robert Harney, and Karen Sime

74. DISTRIBUTION AND ABUNDANCE OF *RICKETTSIELLA* IN TERRESTRIAL ISOPODS IN CENTRAL NEW YORK.
    YaDong Wang and Christopher Chandler

75. EFFECT OF SAMPLING TIME ON CAMERA TRAP RESULTS.
    Joseph M. Beck and John VanNiel

76. STOMATAL DENSITY USE AS AN INDICATOR OF AIR QUALITY ASSOCIATED WITH THE PEACE BRIDGE PLAZA IN BUFFALO, NY.
    Laura Hechtel, Clara Davie, Sumeye Abdulkadir, Sarah Grant, William Harlock, Garatt Kerr, Cecelia Lignos, Molly Minkiewicz, Megan Morris, JuMan Park, Mary Pokorski, Countess-Jai Richards, Shane Scoons, and Christina Ventresca.

77. ECOLOGICAL IMPACTS OF NANO-IRON PHOSPHATE RELEASED FROM WASTE LITHIUM-ION BATTERIES.
    Charles Border, Callie Babbitt, Christy Tyler, Gabrielle Gaustad, and Elizabeth Wronko

78. ABUNDANCE AND DISTRIBUTION OF PLASTIC AND ORGANIC WRACK ALONG THE SOUTHEAST SHORE OF LAKE ONTARIO.
    Lora Benjou, Erin Earl, and C. Eric Hellquist

BIOLOGY

79. COMPARISON OF MOLECULAR AND MORPHOLOGICAL ANALYSES OF IGUANID EVOLUTION.
    Melissa Santonocito

80. DO EGGSHELLS CHANGE DUE TO EMBRYONIC DEVELOPMENT? AN EXAMINATION OF RED-SHOULDERED HAWK EGGS.
    Bill Brown

81. PRESENCE OF PATHOGENIC MICROBES IN RED-EARED SLIDER TURTLES.
    Morgan Devaney and Maryann Herman

82. EFFECTS OF MAGNESIUM DEFICIENCY ON MOUSE ELECTROLYTE BALANCE.
    Valerie Courtright and Bernardo Ortega

83. ZEBRAFISH (DANIO RERIO) AS A MODEL FOR SPRINT INTERVAL TRAINING.
    Steven Debattista and Kathleen Savage

84. FUNCTIONAL ROLE OF ANOCTAMIN-2 IN ZEBRAFISH OLFACTION.
    Brittany Buell, Breanna Hummel, Katrine Madsen, Collin Skawienski, Noah Reger, and Adam Rich

85. ANALYSIS OF THE BEHAVIOR OF THE *DROSOPHILA MELANOGASTER WNT5* MUTANT TO CARBON DIOXIDE.
    Kendra Andrew, Amanda Dragonette, Christine Pham, Anandasankar Ray, and Huey Hing

86. SPF NATURAL SELECTION: THE EVOLUTION OF *CAENORHABDITIS ELEGANS* IN AN ULTRAVIOLET LIGHT INTENSE ENVIRONMENT.
    Joshua Drake and Christopher Chandler

87. THE EFFECT OF LOW LEVEL LIGHT THERAPY ON DEVELOPMENT AND BEHAVIOR OF *C. ELEGANS*.
    Olivia Edens and Dary Hurd

88. PHOTOBIOSTIMULATION IN *C. ELEGANS* AS A MODEL FOR LIGHT THERAPY.
    Michael Spoto, Daryl Hurd and Max Rempel

89. CHARACTERIZATION OF NEURONS EXPRESSING *BEN-1* IN *C. ELEGANS* WORMS.
    Gretchen Dykes and Daryl Hurd

90. PHAGOCYTE GROWTH AND SURVIVAL IN SILICONE MICROCHAMBERS.
    Niecy Cameron and Fernando Ontiveros

91. MUTATIONS IN ATKIN11 AND ATKIN10 AND THEIR EFFECTS ON GLUCOSE SIGNAL SENSING AND PHOSPHORYLATION PATTERNS.
    Vanya Aggarwal and Xiao-Ning Zhang

92. A PHOSPHOGLYCOLATE PHOSPHATASE VIRULENCE FACTOR FROM *STAPHYLOCOCCUS AUREUS*.
    Jasmine Edwards, Austin Gehret, and Suzanne O'Handley

93. THE TWO FACES OF PAL: ELUCIDATING THE TWO ORIENTATIONS OF PAL PROTEIN IN *E.COLI.*
Brooke D'Arcy, Juliana Shaw, Michael Pichichero, and Lea Vacca Michel

94. SHEDDING LIGHT AND WORMING AROUND WITH *PSEUDOMONAS AERUGINOSA*: INVESTIGATING THE MOLYBDENUM COFACTOR SYNTHESIS PATHWAY AND ITS IMPLICATIONS FOR VIRULENCE.
Jaisree Iyer, Aayushi Sardana, Nicholas Gregorio, Danny Lee, and Johanna Schwingel

95. EXPRESSION OF ANOCTAMIN-2 IN ZEBRAFISH USING WHOLE MOUNT IMMUNOHISTOCHEMISTRY.
C. King, S. Gill, S. Gertz, L. Nguyen, and A. Rich

96. APOPTOTIC INDUCTION OF HERBAL SUPPLEMENT EXTRACTS IN THE JURKAT CELL LINE.
Ariel Masiello and Edward C Kisailus

97. ANOCTAMIN 2 EXPRESSION IN ZEBRAFISH.
Christopher Prevost, Nikole Van Wie, Alison Guyette, Maxwell DeNora and Adam Rich.

98. FUNCTIONAL DOMAINS OF FUN30 CHROMATIN REMODELER AND FUNCTION OF FUN30 IN REGULATING DNA DAMAGE RESPONSE.
Ali Khan

100. THE ROLE OF *DNM1* IN MITOCHONDRIAL GENOME STABILITY.
Christopher Prevost, Deanna Pedeville, and Rey Antonio L. Sia

101. THE ROLE OF THE NUCLEAR GENES *KU70* AND *KU80* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE.*
Allyson Burkhart, Amber Blidy, and Rey A. Sia

102. THE ROLE OF THE NUCLEAR GENES *RAD1* AND *RAD10* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE.*
Christina Seger, Amber Altrieth, and Rey A. Sia.

103. THE SIGNIFICANCE OF THE NUCLEAR GENE, *SGS1,* IN MITOCHONDRIAL GENOME STABILITY IN *SACCHAROMYCES CEREVISIAE.*
Kathryn Wershing, Christopher Prevost, and Rey A. Sia

104. STUDIES TOWARDS THE TOTAL SYNTHESIS OF TROCHELIOPHOROLIDE A.
Hannah Simpson, Kelsey Haines-McLaughlin, Anthony Carestia, William Spencer, and Christina Collison

105. ISOLATION OF A *slk19* ^{ts} STRAIN OF THE BUDDING YEAST S. *cerevisiae*.
Ashley Smith, Shannon Cotter, and Cynthia R. Davis

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ABSTRACTS

MUTATIONS IN ATKIN11 AND ATKIN10 AND THEIR EFFECTS ON GLUCOSE SIGNAL SENSING AND PHOSPHORYLATION PATTERNS.

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SR45 is a serine-arginine rich protein that serves as a splicing activator for spliceosome assembly of *Arabidopsis thaliana*, and is orthologous to RNPS1 in humans. A null mutant, *sr45-1*, has been shown to have late flowering, altered leaf and flower morphology, smaller plant size, and delayed root growth. It also shows hypersensitivity to 3% glucose treatment, as demonstrated by slower root growth. A mutation (*atkin11-2*) in an AMP kinase homologous gene *AtKIN11* has been found to be an enhancer of *sr45-1*, by demonstrating higher levels of sterility as well as hypersensitivity to glucose, and a plant stress hormone abscisic acid (ABA), when compared to the *sr45-1* and *atkin11-2* single mutants and the wild type. In *AtKIN11*, a point mutation in the 1456th nucleotide changes a guanine to adenine, causing a missense mutation at alanine^{195} to threonine^{195}. Predicted protein structures suggest that $A^{195}\rightarrow T^{195}$ has a negative effect on the phosphorylation at threonine^{176}, which is required for the AtKIN11 activity.

AtKIN10 is homologous to *AtKIN11* and its mutant, *atkin10-1*, also shows hypersensitivity to glucose. This is a point mutation at the 1301st nucleotide changing a cytosine to a thymine, causing a missense mutation changing the serine^{152} to a phenylalanine^{152}. Predicted protein structures suggest that $S^{152}\rightarrow F^{152}$ changes the orientation of the 175T, whereas $S^{152}\rightarrow F^{152}$ +$A^{194}\rightarrow T^{194}$ double mutations cause the 194T to be more exposed. We are currently creating the following constructs: AtKIN11, AtKIN11F^{153}, AtKIN11T^{195}, AtKIN11F^{153}+T^{195}, AtKIN10, AtKIN10F^{152}, AtKIN10T^{194}, AtKIN10F^{152}+T^{194}. Our next step is to express these protein variants in insect cell lines and to purify these proteins for *in vitro* analyses.

ANALYSIS OF THE BEHAVIOR OF THE *DROSOPHILA MELANOGASTER WNT5* MUTANT TO CARBON DIOXIDE.

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Diseases such as malaria and dengue cause tremendous human suffering. The sense of smell, or olfaction, plays a key role in the spread of these diseases by insect vectors, including mosquitoes. Carbon dioxide is key motivating odorant that attracts blood-seeking insects to their hosts. Drugs that disrupt the development of the olfactory circuit could provide a way to control these diseases. Our lab studies the fruit fly, *Drosophila melanogaster*, to elucidate the mechanisms by which the olfactory circuit develops. Previous work from our lab has shown that mutations in the *wnt5* gene result in severe defects in the olfactory circuit. In the experiments discussed here, we examined the *wnt5* mutant to determine if its olfactory behavior was impaired. We chose the odorant carbon dioxide because it is strongly repulsive to flies. Flies were given a choice between air and 0.37% carbon dioxide in a T-maze apparatus. Two sets of behavioral experiments were completed. In one set of experiments, the *wnt5* mutant failed to respond to carbon dioxide, while in another set of experiments the *wnt5* mutant was repelled by carbon dioxide like wild-type animals. Anatomical analyses showed that there were severe defects in the carbon dioxide responsive circuit of the *wnt5* mutant. This research suggests that drugs directed against the *wnt5* gene could provide a solution to worldwide diseases like malaria and other diseases transferred by insect vectors. Further research is continuing to explore the response of the *wnt5* mutant to other odorants.

SURVEY AND MANAGEMENT OF INVASIVE SPECIES ON RIT CAMPUS.

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We conducted a survey of invasive plants present in the natural areas of the Rochester Institute of Technology campus. In eight nature areas, two 30-meter transects were randomly surveyed. We cataloged specific invasive plants within one meter to either side of the transect line. Coordinates and images were entered into the

iMapInvasives website, which keeps locational records of invasive species throughout New York State. We observed common buckthorn (*Rhamnus catharica*), Morrow's honeysuckle (*Lonicera morrowii*), and multiflora rose (*Rosa multiflora*) within the transects. We identified additional invasive species outside the transects. Our data indicates that immature buckthorn and multiflora rose should be prioritized for eradication. Future efforts will focus on expanding the survey, removal of plants, and creating an invasive species handbook to assist with continued management.

HAS THE BENTHIC MACROINVERTEBRATE COMMUNITY OF SOUTHWESTERN LAKE ONTARIO CHANGED FROM 1983 TO 2014?-A LONG-TERM PERSPECTIVE.

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Accidental aquatic species introductions, especially dreissenid mussels and the round goby, in the Great Lakes may have adverse immediate effects and long-term impacts on native benthic macroinvertebrate community structure and ecosystem functioning. We quantified, using SCUBA and dome suction sampling, benthic macroinvertebrate abundances at a natural cobble habitat and an adjacent artificial reef in the nearshore of Lake Ontario near Olcott, New York. Abundances, diversity, and community similarity of the communities sampled in 2014 were compared with those sampled in 1999-2000, 1991-1992, and 1983. Multivariate techniques such as non-metric multi-dimensional scaling (nMDS) showed distinct grouping of the communities for the four sampling years. Our abundance estimates revealed the absence of gastropods in 2014 that were historically present at our sites from 1983 to 2000, a decline in the native amphipod *Gammarus fasciatus*, a sharp increase in the exotic amphipod *Echinogammarus ischnus*, and dominance of oligochaetes. Dreissenid abundances also declined from 1999-2000 to 2014. Although not quantified, we observed high abundances of round gobies at the artificial reef and cobble site in 2014. Our goal is to distinguish between immediate and long-term positive and negative effects of aquatic invaders, and to establish relationships between changes in the benthic community with the presence of dreissenid mussels and round gobies.

EFFECT OF SAMPLING TIME ON CAMERA TRAP RESULTS.

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Ten weeks of camera trap data from a single location was analyzed for mammal species richness, latency to detection and capture frequency for each species. The camera trap was placed in a wetland area at the FLCC Muller Field Station. Analyses were completed for the entire ten week period as well as sub-sampling for two- and one-week periods in order to compare results and recommend duration of placement for future studies. A total of ten species were captured with raccoon (*Procyon lotor*), Eastern chipmunk (*Tamias striatus*), and North American river otter (*Lontra canadensis*) being observed most frequently, in that order. The species with the shortest latency to detection was the deer mouse (*Peromyscus sp.*) which was viewed on the first day. The species with the longest latency to detection was American black bear (*Ursus americanus*), having been first viewed on the last day of the study.

RATIONAL DESIGN OF SURFACE-ENHANCED RESONANCE RAMAN SCATTERING-NANOPROBES WITH ATTOMOLAR LIMITS OF DETECTION.

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High sensitivity and specificity are two desirable features in biomedical imaging. Raman imaging has surfaced as a promising optical modality that offers both. By adsorbing molecules on the surface of noble metal nanoparticles, the normally weak Raman signal is greatly enhanced, and the unique vibrational modes of each molecule give the technique multiplexing capabilities. Additionally, if the adsorbed molecules have a resonant absorption with the light source, the signal is enhanced to a greater degree. This leads to surface enhanced resonance Raman scattering (SERRS) nanoprobes.

There is a need to develop nanoprobes that are resonant with near-infrared (NIR) light sources, since most biological imaging is done at longer wavelengths. Chalcogenopyrylium dyes are a novel class of Raman reporters that can be tailored to absorb light in the NIR region, and can be substituted with a wide variety of functionality. Specifically, 2-thienyl groups were incorporated into the dye structure to create increased affinity for gold. The SERRS signal was shown to increase with the number of 2-thienyl groups, the optimized structure giving an exceptionally low limit of detection, 100 aM (600 nanoparticles in absolute terms).

EXPLORING *ALFALFA* HAY'S POTENTIAL AS AN ALTERNATIVE NON-FOOD SOURCE OF BIOFUEL.

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The race to find alternative energy has become an important issue in today's scientific world. Scientists have realized that fossil fuels and other natural resources cannot sustain our growing population. In response, they have been trying to find new energy sources that won't deplete or exhaust natural resources nor harm the environment. One of the most promising alternative methods include biofuels. Biofuels are fuels derived from organic materials such as plants. Plants contain cellulose, hemicellulose, and lignin. The cellulose and hemicellulose can be broken down into glucose, and can be fermented into ethanol. However, the process of breaking down cellulose is the most challenging part. In this study, 3 ionic liquids (ILs) were tested to determine their effectiveness in breaking down the cellulose of alfalfa hay (an inedible biomass), thus increasing the glucose yield, prior to acid hydrolysis. ILs tend to have appealing solvent properties and are miscible with water or organic solvents. The ILs are: 1-ethyl-3-methylimidazolium chloride [(Emim)Cl], 1-butyl-3-methylimidazolium chloride [(Bmim)Cl], and 1- hexyl-3-methylimidazolium chloride [(Hmim)Cl]. These three specifics ILs were chosen based on their carbon chain lengths. Using ILs as pretreatment to the biomass also has its advantages. ILs were cleaner and reusable, as well as effective. After using ILs as pretreatment, samples were then centrifuged to remove ILs, then analyzed for their glucose content using glucose refractometry and DNS UV- spectrophotometry.

USE OF REMOTE CAMERAS TO INDEX CANADA GOOSE MIGRATION AND DAILY MOVEMENTS IN CENTRAL NEW YORK.

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The Atlantic Population of Canada Geese (*Branta canadensis*) migrate from northern Quebec through central New York each autumn. To index the seasonal migration and daily movements, we used Reconyx PC 900 Professional Wildlife Cameras equipped with temperature sensors to take pictures hourly during daylight hours at Junius Ponds. Peak timing of migration was 6 December. Number of daily foraging flights varied negatively with temperature. Average timing of morning and evening foraging flights occurred at 0995 hrs and 1595 hrs, respectively, when temperatures averaged 7.28 ºC. Average timing of single mid day flights was at 1135 hours when temperature averaged 5.72ºC.

ABUNDANCE AND DISTRIBUTION OF PLASTIC AND ORGANIC WRACK ALONG THE SOUTHEAST SHORE OF LAKE ONTARIO.

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Plastics possess many manufacturing advantages due to their durability and low production cost. However, when not recycled properly plastics can accumulate in bodies of water. Although much work has been conducted on marine plastic pollution, relatively few studies have examined plastic accumulation in the Laurentian Great Lakes. We sampled four different locations along Lake Ontario in Oswego and Cayuga Counties, NY to analyze the abundance and proportion of plastic and organic matter in shoreline wrack. Locations included the shoreline along SUNY Oswego's campus (Oswego Town, NY), Mexico Point Park (Mexico, NY), Sterling Nature Center (Sterling, NY), and Oswego Beach (Oswego Town, NY). Large, visually-evident coarse plastics were collected randomly within 2x5 m plots. These plots situated along 60-110 m transect lines (n=10 plots per transect) per location. Within each 2x5 m plots, two 0.25 m^2 quadrants were used to quantify embedded and subsurface plastic and organic deposits. In both plots, collection occurred in two minute intervals to standardize sampling intensity. To date, data has been collected and analyzed for three of the four sites. We sorted organic wrack from plastic refuse and

categorized plastics by origin, weight and size. Preliminary results for the smaller quadrants (n=12 quadrants/site, to date) indicate that the percentage of plastics within cobbles was 2.15% (SUNY Oswego), 1.71% (Oswego Beach), and 13.59% (Mexico Point Park). The average mass of surface plastic wrack from the 2x5 m plots was 5.5g/m^2 (SUNY Oswego), 10.86 g/m^2 (Oswego Beach), and 22.35 g/m^2 (Mexico Point Park).

DOES PLANT IDENTITY, LEAF CONDITION, AND WATER QUALITY INFLUENCE HERBIVORY BY *GAMMARUS* SP.*?*

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Members of the genus *Gammarus* inhabit a wide range of freshwater habitats in the United States. As one of the larger genera of amphipods, *Gammarus* are important bio-indicators for ecosystem health. *Nasturtium officinale* (watercress) is known for its use of stored glucosinolate and myrosinase. These two chemical compounds when hydrolyzed, create volatile phenylethyl isothiocyanate. This reaction causes the watercress plant to exhibit a spicy taste that is distasteful to many amphipods including *Gammarus* spp. We conducted a series of feeding choice experiments using young green leaves of *Nasturtium* (presumed high glucosinolate levels) and old senescent leaves of *Nasturtium* (presumed low glucosinolate levels). We also tested the feeding preferences of *Gammarus* when presented *Nasturtium* leaves and *Ludwigia palustris* (marsh primrose-willow) which does not contain glucosinolates. Lastly, we tested whether water quality would influence *Gammarus* mortality rate. Results of the water quality treatment studies suggest a strong effect of water quality on *Gammarus* mortality. At 5 ppt salinity there was a 100% *Gammarus* mortality. In contrast, *Gammarus* mortality was 20% at Rice Creek, 20% at Lake Ontario, and 30% in tap water. Our preliminary food choice experiments indicate that *Gammarus* sp. preferred to consume yellow *Nasturtium* leaves compared to green *Nasturtium* and *Ludwigia*.

COMPARISON OF MOVEMENT PATTERNS IN CAPTIVE-RELEASED EASTERN HELLBENDERS (*CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS*) USING THREE DIFFERENT RELEASE METHODS.

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The Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) has declined throughout much of its range. Previous captive-release programs have resulted in minimal success, presumably due to movement of translocated animals away from the release site. This study aimed to increase the success of future hellbender headstarting programs by implementing three different release methods and gauging the effectiveness of each method. Releases were conducted in two stream sites within the Allegheny River drainage. Both sites were similar, however Stream A contained a higher boulder density. Each site received identical study treatments. Three salamanders were placed in cages (one animal per cage), three salamanders were placed in nest boxes (one animal per box) with the entrance blocked over with screen, and three salamanders were released directly under cover rocks. Study animals were monitored between 18 June, 2013 and 12 October, 2013 using radio telemetry. Results showed little difference in total movement and survivorship between stream sites or treatments. Overall survival was low; 11 transmitters were recovered from either dead or eaten animals, four animals were not recovered, and only three animals survived for longer than six months. Movement was most dependent on the phase of the moon. Both distance and frequency of movement increased with greater moon illumination. Similar to what has been observed in previous studies, captive-released study animals generally moved further than wild hellbenders, with an average cumulative distance moved of 653±138 m. The information received from this study could aid further captive-rearing projects, as well as inform monitoring and survey efforts.

HISTORICAL OCCURANCES OF THE EASTERN HELLBENDER, *CRYPTOBRANCHUS ALLEGANIENSIS,* IN NEW YORK AND PENNSYLVANIA.

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Historically, anglers in New York and Pennsylvania have reported catching large aquatic salamanders, known as hellbenders. Recent findings have shown a significant decline in populations of these animals in one area of New York, however, little is known about their historic abundance and distribution in the rest of the region. Data was collected on sightings, natural history, and human interactions with hellbenders from historic newspapers, databases, historical societies, and museums for a period between 1850 - 1980. Reports that gave specific locations of hellbenders or key words that suggested relative abundance were of specific interest. Historic locations were compared to present day sites in the New York and Pennsylvania Allegheny and Susquehanna Watersheds. Although not all known historic and present day sites were included in the results due to the reliability of some of the data, the comparison showed that through time the Allegheny Watershed had a greater abundance of hellbenders than the Susquehanna Watershed. Different periods of time also showed variation in abundance. Furthermore, Pennsylvania historically had more hellbender sightings than New York. These results are important in developing a crude baseline of historic hellbender populations, developing a historic model, and also in aiding current conservation and restoration efforts in New York and Pennsylvania.

ECOLOGICAL IMPACTS OF NANO-IRON PHOSPHATE RELEASED FROM WASTE LITHIUM-ION BATTERIES.

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Engineered nanomaterials are increasingly adopted in renewable energy systems, as in the case of nano-iron phosphate used to enhance performance of lithium-ion batteries. However, the potential ecosystem-level impacts of nanomaterial release to the environment when these batteries are disposed or recycled is poorly understood. To address this knowledge gap, this study has developed a microcosm-based approach to analyze the effect of nano-lithium iron phosphate (LFP) on the biogeochemistry and ecosystem health of a freshwater ecosystem. These impacts were assessed by measuring sediment-water column fluxes of oxygen, nitrogen and phosphorus, microalgal photosynthesis and benthic ecosystem metabolism in microcosms with lithium iron phosphate in both nano and non-nano forms, relative to control microcosms. No acute (48-hour) or chronic (30 days) impacts on sediment oxygen consumption or gross primary production were observed at environmentally relevant or extreme concentrations of LFP. Results to date suggest that dissociation of LFP in anoxic sediments does not have an impact on the benthic microbial communities. The lack of significant impact on ecosystem metabolism is likely due to poor solubility of nano-iron phosphate in water. Long-term dissociation in anoxic sediments did not appear to have an impact on the benthic communities. This poster will report the development of the novel microcosm approach, the variable aqueous solubility resulting from two material preparation methods, and the potential acute and chronic impacts to ecosystem health. These experiments will elucidate the environmental implications of nanomaterial production and use, and contribute to a greater understanding of their fate and impact on the natural environment.

2013 STATEWIDE SURVEY OF PUBLIC SCHOOLS PEST MANAGEMENT POLICIES AND PRACTICES.

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In 2013, the NYS IPM Program of Cornell University, the NYS Department of Health, and the NYS Education Department collaborated to survey all public school districts, including Boards of Cooperative Educational Services districts, in the state. The goals of the survey were to evaluate the status of integrated pest management programs in NYS public elementary and secondary schools, provide guidance for research and outreach activities to assist schools in improving pest management, gauge changes since a similar survey in 2001, and ascertain the impacts of the state's Pesticide Neighbor Notification Law (NNL) and the Child Safe Playing Fields Act (Laws of 2010, Chapter 85; hereafter referred to as Chap. 85).

This presentation will focus on comparing the results of the 2013 and 2001 surveys and on the impact of the NNL and Chap. 85. Persistent pest management challenges in schools and possible future trends will also be discussed.

INVESTIGATION OF TGA FOR THE DETECTION OF ISOLATED ENZYME ACTIVITY ON LIGNOCELLULOSE.

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The use of discrete enzymes and enzyme combinations in lignocellulose degradation is a powerful tool in biofuel and bioproduct production and research. The ability to accurately detect and assess the nature and extent of degradation caused by an enzyme or system of enzymes is important in development of more efficient degradation methods. This study investigates the power of Thermogravimetric analysis (TGA) in assessing wood degradation. While TGA has been used previously for the description of fungal degradation of wood, this is the first application of TGA for treatments using isolated enzymes. Using analytical methods of first derivative peak fitting and principal component analysis (PCA) the ability to uniquely identify degradation effects of various enzymes and synergistic enzyme systems is explored using birch wood and various enzyme (e.g. cellulase, xylanase, laccase) . Preliminary results show that TGA analyzed through PCA is a useful tool in the detection of enzyme activity.

EXPRESSING A FLUORESCENT "TIMER" PROTEIN.

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Influenza A and B viruses -IAV and IBV, respectively- belong to the family *Orthomyxoviridae* and are important human respiratory pathogens that cause annual epidemics and occasionally pandemics of great consequence. Like most viruses, studying influenza *in vitro* or *in vivo* requires the use of secondary methodologies to identify infected cells. To circumvent this requirement, replication-competent viruses expressing an easily traceable fluorescent reporter protein, such as the green fluorescent protein (GFP), have been used. "Timer" is a newer class of fluorescent protein that undergoes slow conversion of fluorescence color from green to red over time. The rate of color conversion is independent of protein concentration and can be used to trace time-dependent viral infections. Using plasmid-based reverse genetics techniques, we have generated and characterized replication-competent fluorescent Timer-expressing IAV and IBV, where the viral non-structural protein 1 (NS1) of influenza A/California/04/2009 or B/Brisbane/60/2008, was fused to the fluorescent Timer protein. The recombinant fluorescent Timer-expressing IAV and IBV proved to be stable and displayed similar growth kinetics to wild-type viruses in tissue cultures. Upon infection with fluorescent Timer-expressing IAV and IBV, cells changed fluorescence from green to red that can be assessed by fluorescence microscopy, offering a more accurate understanding of the rate of viral spread and infections. These Timer-expressing IAV and IBV represent an excellent option to evaluate the dynamic of viral infections and to better evaluate therapeutic options for the treatment of both IAV and IBV. Likewise these novel fluorescent Timer-expressing IAV and IBV are an excellent choice to evaluate the dynamic of viral infections and dissemination *in vivo* as compared to previously described static fluorescent proteins with the hope to gain a better understanding of IAV and IBV tropism, spread and pathogenesis using animal models of infections.

EFFECTIVE *DANIO RERIO* EXERCISE TRAINING MODEL.

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Exercise training induce muscle remodeling in vertebrate skeletal muscle, creating more aerobic muscle expression. In ectothermic species, such as zebrafish, exercise training is a specific stimulus for phenotypical change. The purpose of this research was to establish a minimum exercise training threshold responsible for contraction-induced muscle conversion, examining an ectothermic vertebrate. Two separate groups of 3 adult zebrafish (*Danio rerio*) were swim trained for 14 days. To assess the whole-animal performance outcomes of the training regiment, Maximum absolute sustained swimming speed (U_{crit}) was measure pre and post training of the exercise group. The group experienced an increase in the maximum absolute sustained swimming speed. The average initial max absolute sustained swimming value (U_{crit}) was 56.8. The average post training max absolute sustained swimming value (U_{crit}) was 63.4. The 11.7% increase in absolute sustained swimming value is statistically significant (paired Ttest 0.002). the current exercise training design is an effective training model for increase of aerobic muscle capacity illustrated by the increase.

DO EGGSHELLS CHANGE DUE TO EMBRYONIC DEVELOPMENT? AN EXAMINATION OF RED-SHOULDERED HAWK EGGS.

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Red-shouldered Hawk (*Buteo lineatus*) eggs were examined to determine if thickness, a commonly used index of thickness (mass / (length * width)), and mass changed as embryos developed. Four different stages of embryonic development (fresh, slight, large, and advanced) were described, or inferred from blowhole diameter measurements, for 286 Red-shouldered Hawk eggs collected in the late 1800's and early 1900's in central New York by C.F. Stone. Changes in eggshell thickness, the thickness index, and mass were explored with linear mixed models with year of egg collection and clutch size specified as random variables. Thickness nominally decreased by 7.5% between eggs with fresh and advanced embryos at the time of collection but this finding was not significant ($F_{3,119} = 2.1$, $P = 0.11$). The thickness index did not change due stage of embryonic development. There was an 8.8% decrease in mass between eggs with fresh and advanced embryos ($F_{3,242} = 3.4$, $P = 0.02$). When possible, ornithologists should control for the state of embryonic development during studies of eggshell characteristics.

EFFECT OF FORESTED CONDITIONS ON VERNAL POOL RESTORATION IN THE NORTHEASTERN UNITED STATES.

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Vernal pools in the Northeastern United States are small, forested wetlands characterized by periodic flooding, most often in spring and fall, and are unique ecosystems comprised of both terrestrial and aquatic organisms. To combat extensive loss of wetlands, vernal pools may be created to mitigate losses in area and function of existing vernal pools. In many instances, however, created pools do not mimic the natural ecological functions found in extant vernal pools due to shortcomings in the restoration process, especially susceptibility to invasive plant species, lower soil organic matter, altered carbon cycling, shorter hydroperiod and lower diversity of macroinvertebrates. Because of the importance of these systems to regional biodiversity of both terrestrial and aquatic species, gaining a better understanding of conditions required for adequate ecosystem function is imperative. We are using both comparative and experimental studies to determine the importance of forest cover and subsequent litter input to vernal pool communities. To evaluate function relative to natural vernal pools, we will compare 8 created vernal pools with natural pool at High Acres Nature Area in Fairport, NY. We will also experimentally manipulate forest cover conditions to test the hypothesis that forested conditions increase hydroperiod and diversity of the biological community. To imitate forested conditions, we added leaf litter and increased shading using shade cloth installed over the pool. Shade cloth installation reduced irradiation by 80% in all treatment pools, though it is still above the irradiance measured in the natural pools. We hypothesize that forest conditions, i.e. shade and leaf litter, will increase macroinvertebrate diversity by providing an allocthonous carbon source for food, will reduce invasive plant species cover by decreasing light availability, increasing the soil carbon to nitrogen (C: N) ratio, and will increase canopy tolerant amphibian populations but may negatively impact canopy intolerant amphibians.

FUNCTIONAL ROLE OF ANOCTAMIN-2 IN ZEBRAFISH OLFACTION.

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The main objective for this project is to determine Anoctamin-2 (Ano2), a calcium-gated chloride channel, expression in zebrafish and to develop a functional assay. The zebrafish is an appropriate model for human disease and physiology because it enables the study of organ function and development in an intact organism. We are developing an assay to measure olfactory behavior in zebrafish to learn if Ano2 is required for olfaction. Fish will be exposed to an attractant (L-alanine) or a repellant (fish skin extract) and behavior will be assessed using a T-maze. The requirement for Ano2 in olfaction will be tested in normal fish using an Ano2 antagonist, niflumic acid. Future experiments will use morpholino oligonucleotides to specifically knock down Ano2 expression and the effects on olfaction will be determined.

IMPLEMENTATION OF STORED WAVEFORM INVERSE FOURIER TRANSFORM (SWIFT) AT THE LEBIT FACILITY.

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Penning traps are one of the most important recent developments in mass spectrometry. They were first used for measurements of stable particles, but have proven themselves useful in the study of short-lived, rare isotopes due to

their accuracy, efficiency and sensitivity. Their utility in measuring these isotopes has resulted in Penning traps being installed at low-to-medium energy radioactive beam facilities around the world. The Low Energy Beam and Ion Trap facility (LEBIT) at the National Superconducting Cyclotron Laboratory (NSCL) is the first to implement Penning trap mass spectrometry at a high-energy, rare-isotope facility using projectile fragmentation. LEBIT was designed to be fast, efficient and sensitive in order to make optimal use of the most exotic beams available at NSCL. One thing that affects measurements is other isotopes of similar masses entering the Penning trap with the species under study. To isolate the desired species in the trap, the group was required to individually identify all contaminants in the trap. This used a limited amount of time with these exotic beams which could be used for recording data. To optimize the amount of time taking measurements the group implemented the stored waveform inverse Fourier transform (SWIFT) to quickly clean contaminants from the trap. This method increased efficiency by removing the need to individually identify specific contaminants in the trap by application of a broadband cleaning RF excitation. The excitation is provided by an RF field applied to one of the ring electrodes on the Penning trap. The ion of interest will only respond to a very narrow band excitation, and by applying an RF field at all other frequencies, every contaminant will be cleaned from the trap. This study was carried out to characterize the application of SWIFT to high-precision Penning trap mass spectrometry. In off-line test with ^{39}K ions, a resolving power of 7,400 was demonstrated and resolving powers of $>10^5$ are possible.

THE ROLE OF THE NUCLEAR GENES *KU70* AND *KU80* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE*.

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The purpose of this research is to determine the role of the nuclear genes, *KU70* and *KU80*, in maintaining mitochondrial DNA stability in the budding yeast, *Saccharomyces cerevisiae*. The mitochondrion is an organelle in eukaryotes that produces much of the ATP used by a cell. ATP, or adenosine-triphosphate, is a molecule within a cell that provides energy for cellular functions via its high energy holding phosphate bonds. Mitochondria have their own genomes, separate from nuclear DNA, which encodes many proteins needed for cellular respiration. Mutations can occur in the mitochondria of humans that could result in decreased or loss of mitochondrial function, which leads to neuromuscular or neurodegenerative diseases. The KU heterodimer consists of the Ku70p and Ku80p proteins. The complex has been shown to function during DNA double-strand break (DSB) repair through non-homologous end-joining (NHEJ) and telomere maintenance in the nuclear genome. The goal of this lab is to determine the effects caused by the loss of *KU70* and *KU80* genes on mitochondrial DNA stability. The major focus of this research is to investigate at what frequency *ku70*Δ and *ku80*Δ deletion strains will lose the ability to respire that directly relates to the loss of mitochondrial function. These strains will also be used to monitor the affect loss of these genes have on homologous recombination in the mitochondrial genome. By completing two different assays, respiration loss and direct repeat-mediated deletion (DRMD), the role of these genes can be determined. In regard to *KU70*, the respiration loss assay showed a 1.4 fold decrease in spontaneous respiration loss compared to the wild type strain. Likewise, *KU80* was found to have a 1.5 fold decrease. The rate of DRMD events in the nuclear and mitochondrial genomes showed an increase in the *KU70* mutant strain compared to the wild type; however, more trials of this assay must be completed to verify the validity of the results.

PHAGOCYTE GROWTH AND SURVIVAL IN SILICONE MICROCHAMBERS.

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The integration of cell culture chambers into microfluidics chips presents both challenges and opportunities for the development of next generation diagnostic and controlled release biodevices. Small sample volume, molecular specificity and threshold of detection are key considerations for the design of devices built to work with biological samples. Macrophages posses a large array of receptors with a high degree of sensitivity, which makes them capable of detecting low amounts of target molecules. Here we present an initial attempt to develop simple tissue culture microchambers amenable to integration with microfluidic devices. Mouse macrophages were cultured for several days in small volume, custom-made silicone chambers. Growth and cell viability were measured over time using standard techniques. Our results show that tissue culture of the test cells is a viable option, and we seek to integrate our chambers with more complex microfluidic networks.

TOWARD BIOFUEL PRODUCTION: EVALUATING THE POTENTIAL OF RICE HUSKS.

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Currently, research for alternative sources to fossil fuels is growing fast. As an approach to this replacement there is the biofuel, fuel produced from biomass, it is a bigger source of cellulose that it can be reduced to glucose, and the glucose fermented to ethanol. However, with food-biofuel crops expansion, such as corn, soybeans and sorghum, besides increasing the use of water supplies and deforestation, it will alter the access to low-priced food. Accordingly to this problem, the study of non-food crops as a substitute is necessary. The base of this study is to find an efficient path to break down cellulose and hydrolysis to glucose. Rice hulks (hulls) were used as non-food crops in this study, the hulls were pretreated with recyclable and nonflammable chemicals called ionic liquids (ILs), 1-ethyl-3-methylimidazolium chloride ([EMIM]Cl), 1-butyl-3-methylimidazolium chloride ([BMIM]Cl), and 1-hexyl-3-methylimidazolium chloride ([HMIM]Cl), to break the rigid biomass ligations. Hence, hydrolysis acid was used to reduce cellulose to glucose after complete wash of ILs in mode to avoid interferences in the glucose analysis. The time of pretreatment-hydrolysis was 3-3, 3-6, 3-9, 6-3, 6-6, 6-9, 9-3, 9-6, and 9-9 hours. The samples were analyzed through UV Absorbance. The results show that cellulose can be extracted from the non-food crops by ionic liquids and converted to glucose by hydrolysis acid. The study presented shows that the procedure extracted approximately 9% of the cellulose total. As future considerations study how changing the methodology may affect the result. The first point, perhaps powering the sample would improve the cellulose extraction. The second point, if washing out the ionic liquid washed out the cellulose precipitated. A glucose analyze of the water pulled out from the tube should confirm this supposition. Likewise, a scanning electron microscope (SEM) analyze before and after the extraction and hydrolysis would confirm those hypothesis.

USING SYNCHROTRON RADIATION TO STUDY THE BEHAVIOR OF C_N^- CARBON CLUSTERS.

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Clusters are the bridge between gas phase and solid phase and have been studied using mostly laser techniques. Investigation of cluster negative ions using synchrotron radiation is a novel direction. Studies of neutral as well as ionic clusters allow us to understand the complex behavior of bulk materials.

By using the synchrotron radiation, a process called photodetachment occurs whereby a negative ion interacts with a photon resulting in the formation of a neutral atom and a free electron. When enough energy is absorbed by a negative ion an electron from the inner shell is ejected. An electron from a higher energy level will sometimes drop into the empty space where the inner electron left and cause another electron to be ejected, otherwise known as Auger Process. Inner-shell photodetachment from small carbon negative ion clusters followed by Auger Decay will produce positive ions that are detected as a function of photon energy.

The experiment was performed at the Lawrence Berkeley Laboratory, Berkeley, CA. The negative small carbon cluster C_n (n = 1, …,10) were produced by a cesium sputter source. The negative ion beam and the photon beam overlap using the merged beam technique in the interaction region. The inner-shell photodetachment cross section of small carbon clusters was measured in the photon energy range of 25 – 90 eV. The poster presents experimental results on the size evolution of the electronic properties of small C_n (n = 1, …,10) clusters.

DOWNWARD TRANSPORT OF OZONE DUE TO CONVECTION NEAR MANAUS, BRAZIL.

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Estimating changes in greenhouse gas concentration in the troposphere can assist the development of more accurate numerical models designed to determine the radiative effects and influences on the climate. This study investigates the downward transport of ozone, a greenhouse gas, by the process of convection near Manaus, Brazil. Ozone data were recorded at a site located southwest of Manaus as part of the GOAmazon project. Ground-level ozone measurements were made during the months of February and March 2014. Infrared satellite imagery and legacy radar images were analyzed to determine convective storms associated with downward ozone transport. Satellite imagery is used to create two subcategories of spatial extent (large and small) as well as two subcategories of storm type (squall and individual). Average ozone enhancements due to convection (all categories of convection) on a 5-min resolution reached ~4 ppb and ranged from 2 to 11 parts per billion (ppb). The mean ozone change for

large events was 7 ppb and for small events was 5 ppb. Large and small mesoscale convective events showed no significant difference (p=.0806) in the magnitude of ozone transported when a two sample t-test was run. Similar inconclusive results were found with the study of the type of storm (squall: 6 ppb, individual: 5 ppb, p-value: .5136). This new understanding of the magnitude of downward ozone transport within tropical convection will assist in the development of more accurate predictions of the climate.

ANALYSIS OF TEMPERATURE CHANGE SIGNATURES FOR A TRANSECT ALONG EASTERN NORTH AMERICA.

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Climate change signatures are recognized throughout the globe, with trends of increasing temperatures. Often, the changes are most pronounced in the transitional seasons, spring and fall. In this study, we examined records from 16 cities along a north-south transect of eastern North America. The transect begins in Kuujjuaq Quebec, Canada, ending in Atlanta GA, USA. Selection criteria included cities with data that had a minimal range 1950-2012, and had moderate distance the Atlantic Ocean or Lake Ontario. If cities along the transect were close to bodies of water, a second city with similar latitude was selected for comparison. Results show that many of the cities have significant increases in March mean temperatures, but there were signs of latitudinal influence. June, September and December typically did not show significant temperature trends with time with the exception of a few cities in September. An additional analysis looked at the average monthly temperature over time. This data was plotted to show the mean for the entire period and one standard deviation above and below the mean. In March, a change occurred between 1972 and 1973, with a greater number of warm years post 1972. This pattern was significant for all cities in March, but rarely for the other months studied.

THE ABUNDANCE AND CHARACTERISTICS OF AQUATIC TREE HOLE COMMUNITIES IN THREE GERMAN FORESTS.

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Tree holes are water-containing depressions that occur between branches, at the base of tree trunks, or occasionally in decomposing tree stumps. Tree hole communities are known to be habitats to many organisms, such as bacteria, midges, spiders, mites and slugs. We sampled tree hole communities at three different forests (SchwabisheAlb , Hainich and Schorfheide) throughout Germany. Within each forest we sampled twenty-five different plots. Trees containing tree holes were surveyed both at ground level and within the canopy. We recorded the tree species identity, and measured the dimensions of length, width, depth, and potential volume of each hole we censused. We also measured the pH and water temperature at each hole. We found that the Hainich forest had greater tree species richness than the other two sampling sites. Beech trees were the most abundant at all three sites. The standing water depth of tree holes was more in Schorfheide than the other two sites. We found that there was no difference in pH of water in the tree holes between the three sites. However, the average water temperature in Schorfheide was higher than the other two sites. We also found that there was no correlation between temperature and pH in Hainich and in Schorfeide, though SchawaebischeAlb had a positive correlation between pH and temperature.

EURYPTERIDS AND THE ORIGIN OF THE LATE SILURIAN AKRON FORMATION OF WESTERN NEW YORK AND SOUTHWESTERN ONTARIO, CANADA.

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Eurypterid horizons represent some of the most unusual stratigraphic events in the geologic history of the Paleozoic of New York and adjacent regions. While many of the horizons are actively under study (viz. Bertie Group), little attention is being paid to intervening strata – that is, the sedimentary rocks occurring between (or sandwiched in) eurypterid horizons.

Within one important sequence (the Bertie Group as redfined by Ciurca, 1990), the massive and geographically extensive Akron Formation separates the eurypterid faunas of the Williamsville Formation from the stratigraphically higher fauna of the Moran Corner Waterlime.

Here, I suggest that the Akron Formation (primarily dolostone), as it occurs in western New York and southwestern Ontario, Canada, represents a shelf deposit created by microbialites (thrombolites, stromatolites/algal mats). Carbonaceous bedding planes (often stylolitic), usually quite irregular, seem to present interlocking and overlapping microbialites that trapped carbonate sediment, building up the shelf. Stromatolites are rare to absent in this facies. However, overlying waterlimes (e.g. Moran Corner) appear to have been formed in a stromatolitic (shallowing-up) environment.

Westward (e.g. southwestern Ontario), the Akron Fm. appears to become more finer-grained and almost completely recrystallized and exhibits, more than other sites seems to, extreme bioturbation while still preserving microbial mats that show intense burrowing with scant fauna preserved (ostracods, high-spired gastropods and a few brachiopod species). A peculiar bluish clay, origin unknown, is common in this facies associated intimately with the carbonaceous material.

No eurypterid remains are definitely known from most of the Akron Fm. However, with numerous facies changes occurring eastward (Syracuse to Forge Hollow), eurypterids are found at several levels within both the limestone and dolostone facies (e.g. Martisco Reef Complex, Cobleskill Formation at Forge Hollow and Oriskany Falls, etc.). Also see New York State Geological Association Field Trip guidebooks for 2011 (pages 139 -151) and 2013 (pages 154 -179).

MEASUREMENT OF FGF-2 AND TENASCIN-C IN THE WOUND BED OF CHRONIC WOUNDS.

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The purpose of the study is to evaluate the level of basic fibroblast growth factor (FGF-2) and Tenascin-C in chronic wounds over time. It is expected that over the course of healing the relative amounts of FGF-2 and Tenascin-C will increase in the inflammation and migration stage, peak in the proliferation and granulation stage, and decrease as remodeling and contraction occur. This study will measure the amounts of FGF-2 and Tenascin-C of multiple wound types over the course of four weeks. Samples will be collected from the wounds of subjects with swabs. Levels of FGF-2 and Tenascin-C will be analyzed using an enzyme-linked immunosorbent assay (ELISA). In addition to fluid collection, photographs will be taken to measure the area of various tissue types over the course of healing. Wound tissue type and outcome will be compared with levels of FGF-2 and Tenascin-C.

AUGER ELECTRON SPECTROSCOPY FROM METAL-OXIDE SUPPORTED NANOPARTICLES.

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Auger Electron Spectroscopy is a useful experimental procedure which can be used to determine many physical and chemical properties of a material's surface with sensitivity of fractions of a monolayer. By measuring the spectrum of electron energies emitted from the sample's surface, we are able to find stoichiometric properties, chemical binding properties, and obtain elemental depth profiles. We have repaired and upgraded an Auger Electron Spectrometer and have begun studies of the surface properties of several metals, films, and substrate supported nanoparticles. With this newly repaired system, we hope to study the effects of CO and O gas binding on metal-oxide supported nanoparticles.

PREVALENCE OF *BATRACHOCHYTRIUM DENDROBATIDIS* AND RANAVIRUS IN AMPHIBIANS SAMPLED FROM 2012–2014 IN OSWEGO COUNTY, NY.

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The global decline in amphibian populations has been linked to the pathogens chytrid fungus (*Batrachochytrium dendrobatidis*, *Bd*) and ranavirus. Prior to 2011 there was little evidence about the prevalence of these pathogens in the Northeastern United States that may have contributed to amphibian declines. An initial investigation began in 2012 with undergraduates and faculty at SUNY Oswego to determine if *Bd* and ranavirus was present, using field samples from toe clips and skin swabbing to later perform DNA extraction and PCR diagnostics. Over three years, a

total of 389 amphibians from 14 species have been sampled by undergraduates and faculty. In 2012, the prevalence of *Bd* and ranavirus was 30% and 25%, respectively. The confirmation of pathogen presence fueled further study focusing on detection of patterns of pathogen prevalence among species, gender, life stage, habitat, seasons, and climatic differences. In 2013, the prevalence of *Bd* dropped to 3.4%, whereas ranavirus remained similar. In 2014 only the *Bd* samples have been analyzed so far, with a prevalence of 6.3%. Overall trends suggest an association of pathogen prevalence with seasonal and weather changes. In addition to learning how to collect data on emergent amphibian diseases, undergraduates also learn the importance of field protocols for obtaining an uncontaminated sample and working in teams, a critical aspect of undergraduate research training.

EFFECTS OF MAGNESIUM DEFICIENCY ON MOUSE ELECTROLYTE BALANCE.

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Magnesium (Mg^{2+}) is the second most abundant ion in the body but its regulation is poorly understood. Mg^{2+} deficiency is known to interfere with the physiological regulation of other electrolytes, such as calcium (Ca^{2+}) and phosphate (P_i), and a number of hormones have been implicated in mediating such disturbances. Here we use a mouse model to understand how these changes occur over time. We show that in as little as one week mice experienced a dramatic decrease of plasma Mg^{2+} levels, accompanied by increased excretion of phosphate and decreased excretion of Ca^{2+} in urine. Our ultimate goal is to unravel the precise mechanism by which Mg^{2+} deficiency affects the regulation of Ca^{2+} and P_i, and understand the involvement of hormones such as PTH, FGF-23, and vitamin D in mediating these changes.

VARIATIONS IN GROUNDWATER AND SURFACE WATER CHEMISTRY IN THE SANDY CREEK (NY) WATERSHED: NATURAL OR ANTHROPOGENIC IMPACTS.

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Surface water and shallow water table aquifers may be impacted by human activity. In the lake plain region of western New York natural influences on shallow groundwater and surface water chemistry may come from upwelling of deeper groundwater. Within the Sandy Creek watershed, human impact may be due to road salt application or a closed regional municipal waste landfill. In this study, we completed a detailed sampling of Sandy Creek and of groundwater wells in the area around the closed landfill. Both well and stream sampling locations include up gradient sites. Samples were analyzed for major cations and anions, and trace metals by ICP and colorimetric methods. Chloride results are typical and likely one of the best indicators. Results of analyses surface water samples range from 116 to 207 mg L^{-1} chloride. The spatial distribution found that the western branch had the highest concentrations, decreasing from 207 mg L^{-1} at the up gradient location in the Village of Albion to 167 mg L^{-1} where it meets the east branch. Concentrations in the east branch are lower, averaging 140 mg L^{-1}. Groundwater samples range from 228 to 495 mg L^{-1}. The up gradient wells and one located immediately down gradient from the landfill vary little with concentrations ranging from 228 to 238 mg L^{-1}. The well with the anomalous concentration is located further downstream and on the opposite side of the stream from the landfill. Furthermore, it is not located near any major roads. This suggests that upwelling groundwater that has interacted with regional evaporite beds and road salt from a local urban center are the cause of elevated dissolved solids within the watershed.

COLD SURGES ALONG THE AFRICAN HIGHLANDS.

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Equatorward moving cold surges are ubiquitous features along the lee of high terrain, especially during the cold season. These cold surges have been studied along many mountain ranges including, the Andes, Appalachians, Rockies, and Himalayas. However, even though the east coast of Africa features high terrain, a dearth of research exists on cold surges along the African Highlands despite the fact that the surges could have potentially large agricultural effects. The purpose of this presentation is to examine these African Highlands cold surges from both a climatological and case study perspective.

A five-year climatology of African Highlands cold surges was created spanning the 2008 to 2012 period. This climatology revealed that African Highlands cold surges had a climatological maximum in September, and the strongest events were featured throughout the Southern Hemisphere winter. These cold surges feature temperature

drops of between 2°C and 11°C, as 925-hPa meridional flow averaging 35 knots advected Antarctic air equatorward. Cold surges along the African Highlands last from one, to fifteen days, with the highest frequency of events spanning a three day period. A representative case study reveals that during a cold surge event, a surface anticyclone forms near the southern coast of Africa in a favorable region of subsidence, associated with quasi-geostrophic forcing for descent. As the anticyclone progresses eastward, 925-hPa winds become southerly and ageostrophic as they advect cold air equatorward along the lee of the African Highlands.

CYCLIC L-TRYPTOPHAN-BASED BUILDING BLOCKS FOR THE SYNTHESIS OF MEDICALLY RELEVANT COMPLEX MOLECULES.

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A large number of natural products of current biomedical significance contain structural units based on amino acids. These units typically exhibit molecular modifications not observed in common peptides, such as halogenations, oxidations, or unusual linkages, which have an impact on their biological activities. Using amino acids as the starting point—an uncommon approach—could result in the development of an affordable synthetic route toward these valuable compounds. Many bioactive molecules based on L-tryptophan contain an oxidized form of this molecule. The main goal of our project is to utilize L-tryptophan, a widely available and inexpensive material, as a starting point and to *unnaturally* recreate the types of transformations that tryptophan-based units undergo in biosynthetic pathways. By combining methods involving cyclized tryptophan units and taking advantage of cyclic stereocontrol, we aim to manipulate its structure in order to produce complex building blocks that resemble the expensive, hard-to-obtain natural products. Our plans and preliminary results will be discussed.

THE TWO FACES OF PAL: ELUCIDATING THE TWO ORIENTATIONS OF PAL PROTEIN IN *E.COLI*.

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Escherichia coli (*E. coli*) bacteria contain the lipoprotein Pal (ie, Peptidoglycan associated lipoprotein). The exact function of Pal in *E. coli* is unknown; however, Pal has been well studied for its interactions in the periplasmic space, more specifically in the Tol-Pal complex. We have used biotinylation, flow cytometry, and confocal microscopy to elucidate the novel dual orientation of Pal. In other words, we have shown that Pal is exposed on the surface of the cell and also faces into the periplasmic space. Fluorescently labeled antibodies and confocal microscopy allowed us to visualize how Pal is surface exposed in an "all or nothing" fashion, with some cells fluorescing completely and others not at all. We also utilized a biotinylating reagent to label surface Pal, and found that only about 20% of total Pal is surface exposed. We consider the biological implications of Pal's dual orientation.

VANADIUM AND TITANIUM-SEQUESTERED XEROGEL COATINGS FOR THE CATALYTIC PRODUCTION OF HYPOHALOUS ACIDS.

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Biofouling is a worldwide economic issue which costs the marine industry up to $60 billion annually due to increased drag on ship hulls, which decreases the vessel's hydrodynamic performance and increases fuel consumption. Traditionally, biofouling is combated by coating ships with antifouling or foul-release paints. In a new approach to antifouling, xerogel films incorporating varying concentrations of V_2O_5, $VO(OR)_3$, $VOSO_4$, $VO(acac)_2$, and $Ti(OR)_4$ ($R=CH_2(CH_3)_2$) have been prepared via the sol-gel and Stöber processes.

It is thought that hydrogen peroxide binds to the vacant coordination sites of V or Ti in the xerogels, producing hypohalous acids upon reaction with halide salts and forming a surface that is chemically hostile to biofouling organisms. Rates up to 238x the uncatalyzed reaction were achieved using 5 mol% 1:5 $Ti(OR)_4$:$VO(OR)_3$ in buffered aqueous solution. Organic precursors including C8, C12, C18, and PEG have been incorporated into coatings to tune surface morphology; including increasing hydrophobicity and permeability of hydrogen peroxide and aqueous halides. Contact angle analysis indicates that covalently binding V or Ti does not significantly alter

surface energy; thus previously studied hybrid xerogel coatings may be improved by the incorporation of these transition metals. Settlement and removal studies with *Ulva linza* and *Amphibalanus amphitrite* are currently underway with collaborators to determine antifouling capability of these coatings.

ENERGY CONVERSION: SMART MAGNETIC NANOMATERIALS.

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We present herein the work started at SUNY Oswego as a part of a SUNY 4E grant. The SUNY 4E Network of Excellence has awarded SUNY Oswego and collaborators a grant to carry out extensive studies on magnetic nanoparticles. The focus of the study is to develop cost effective magnetic materials that will enhance energy transmission performance of various electrical devices (solar cells, electric cars, hard drives, etc.). The SUNY Oswego team has started the preliminary work for the project and graduate students from the rest of the SUNY 4E team (UB, Alfred College, Albany) will continue the project. The preliminary work concentrates on analyzing the properties of magnetic nanoparticle candidates, calculating molecular orbitals and band gap, and the fabrication of thin films.

STAPHYLOCOCCAL COLONIZATION RATES OF HEALTHY VOLUNTEERS ENROLLED IN HEALTHCARE OR HEALTHCARE-ASSOCIATED DEGREE PROGRAMS.

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Background: Undergraduate and graduate students preparing for careers in healthcare or healthcare-associated fields frequently complete clinical rotations as part of their education or hold part- or full-time employment while remaining members of the general college community. This suggests that these students have a greater likelihood of being colonized with pathogenic Staphylococci, such community-acquired or healthcare-acquired methicillin resistant *Staphylococcus aureus* (CA-MRSA and HA-MRSA, respectively).

Methods: From Fall 2012 to Summer 2014, a total of 182 healthy individuals enrolled in Biology, Healthcare or Allied Health majors at a state-accredited college in Western New York consented to the sampling and characterization of bacterial isolates from either their skin or anterior nares. Staphylococci were selected for by incubating specimen swabs in mStaph broth incubated at 37C. Presumptive species identification was determined from biochemical tests, including mannitol fermentation and hemolysis assays. Antibiotic sensitivity profiling and 16S rRNA gene-sequencing was performed for selected isolates

Results: 31 putative *S. aureus* (17.0%), 126 putative *S. epidermidis* (69.2%), and 25 putative *S. saprophyticus* (13.7%) isolates were characterized. Nasal carriage of putative *S. aureus* exceeded skin colonization (70.9% vs. 29.1%). Skin colonization exceeded nasal colonization by putative *S. epidermidis* (61.1% vs. 38.9%). Putative *S. saprophyticus* distribution was approximately equal (56.0% nasal, 44.0% skin). Antibiotic sensitivity profiles were completed for all 31 putative *S. aureus* isolates, identifying multiple isolates exhibiting antibiotic resistance, including intermediate-level resistance to the methicillin-equivalent antibiotic, oxacillin. Selected non-*S. aureus* isolates were also profiled.

Conclusion: Approximately 17% of participants were colonized with *S. aureus*, at the time of sampling. A limited number of students were identified to harbor antibiotic-resistant Staphylococci, including oxacillin-resistant strains. Transient carriage of these organisms by students preparing for or returning from clinical training rotations underscores the importance of emphasizing infection control protocol to students prior to their entry into healthcare or associated fields. Further studies to ascertain the effect of season, year, major, outside employment, and molecular mechanisms of antibiotic resistance on colonization rates are ongoing.

ZEBRAFISH (DANIO RERIO) AS A MODEL FOR SPRINT INTERVAL TRAINING.

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Extensive research has been performed to determine what organism can most efficiently be used as a model for human exercise physiology and training adaptations. These studies often include rodents, but these can be costly and labor and time intensive. Large fish have been used in the past by aquaculturists to examine fish health or to improve

them for gaming purposes. While the sprinting performance of Zebrafish is known, what remains unknown is the extent to which the sprinting ability can be improved by interval training. Therefore, the present study will use the little that is known about fish swimming exercise to determine if Zebrafish can be used as models for human sprint training. Due to the novelty of this research, the protocol for the study will be modeled off previous human studies. Twelve fish will initially be acclimatized to the testing environment, at which time they will have a "pre-training" sprint test to determine their initial abilities. The fish will then undergo a training regimen that consists of training three times a week for two weeks at a 1:2.5 work to rest ratio, for a total of 30 minutes a day. Each fish will then take part in a "post-training" sprint test to determine if the training had any significant effect on their sprinting ability. Future biochemical analysis will be performed shortly after to determine if there were any physiological adaptations at the cellular level. If significant changes are measured, the future use of Zebrafish as an effective and efficient model organism for human sprint training exists as a viable opportunity.

STUDIES TOWARD A CONVENIENT AND INEXPENSIVE SYNTHESIS OF D-VINYLGLYCINE.

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While life on earth is exclusively based on L-amino acids and D-sugars, it has been found that D-amino acid-containing molecules do exhibit important bioactivities. Antibiotics involving D-amino acids units have been isolated from bacteria and many reports have revealed the participation of D-amino acids in certain biological processes. D-amino acids possess "unnatural" chiral centers that make them attractive as building blocks for the synthesis of bioactive compounds. Incorporation of D-amino acids into open-chain and cyclic peptides severely affects their interactions with biological targets and their slower degradation compared to the corresponding L isomers can be of great use in therapeutics.

D-amino acids are most commonly obtained via racemization of *natural* L-amino acids followed by chiral separation; however, production of commercially viable amounts is still complicated and expensive. In the specific case of vinylglycine, racemization is not a viable option due to isomerization. This project aims at developing an inexpensive approach to synthesizing D-vinylglycine from L-serine. Given the exploitable reactivity of vinylglycine, ready synthetic access to the D enantiomer will provide the material needed to study its incorporation into peptides for late-stage site-specific structural modification and the synthesis of complex D-branched amino acid-like moieties.

PROPER REGULATION OF RAC1 ACTIVITY IS REQUIRED DURING *DROSOPHILA* DORSAL VESSEL FORMATION.

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Cardiogenesis is a complex process that requires a series of specifically synchronized cellular events leading to the formation of a fully functional heart tube. Cardioblasts (CBs) must migrate towards the midline of the developing embryo and undergo cell shape changes to facilitate lumen formation. This event is conserved between insects and vertebrates, making *Drosophila melanogaster* an ideal model system to study heart development. The Rho GTPase family, particularly Rac, Rho, and Cdc42, have previously been shown to mediate cell movement, shape, and adhesion through the actin cytoskeleton[1]. Moreover, Cdc42 has been shown to be specifically required in *tinman*-expressing (*tin+*) CBs for proper cell migration during heart tube formation[2]. However, the role of Rac1 in dorsal vessel (DV) formation remains unclear. To address this, we expressed Rac1 gain-of-function (GOF) and loss-of-function (LOF) mutants specifically in the *Drosophila* DV and examined embryos for cardiac abnormalities. When constitutively active Rac1 was expressed in the entire DV, we observed misalignment of CBs, gaps between CB pairs, and overall abnormal morphology of the CBs, while pericardial cells were not affected. In contrast, overexpression of wild-type and dominant negative Rac1 did not cause any significant morphological defects. Restricted overexpression of constitutively active Rac1 to *seven-up*-expressing (*svp+*) CBs only caused CB clusters and misalignments, however gaps were not present as seen in entire DV mutants. These findings suggest that proper regulation of Rac1 signaling activity is required in all CBs for proper DV formation. Future genetic enhancer/suppression screens will help identify additional components involved in the Rac1 signaling pathway that modify heart development.

STYLE OR HEALTH: THE IMPORTANT QUALITIES OF SUNGLASSES.

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Exposure to Ultra Violet radiation from the sun can be particularly damaging to our health. Our research strived to determine what characteristics of sunglasses provide the greatest protection for our eyes from ultraviolet radiation. Simultaneously, we hope to bring awareness in our community about the importance of wearing sunglasses.

A Czerny-Turner Spectrometer was constructed to distinguish properties of sunglasses that are most effective. The spectrometer has a wide spectral rage of 390-825nm with a resolution of .67 nm/pixel. Our research results indicated that all sunglasses attenuate 80 – 95% of all visible light and significantly blocked close range Ultra Violet radiation (390 – 400nm). Tinting has the greatest effect on attenuation across the entire visible and UV light with darker tinting providing greater protection. Based on our results, the price of the sunglasses did not have any significant correlation with protection.

This project was the first place winner of the National Student Solar Spectroscopy Competition held in May 2014 at Montana State University, Bozeman, MT. We would like to thank Montana Space Consortium for funding the project and Richardson Grating for their donation of the diffraction grating.

ANOCTAMION 1 CONTRIBUTES TO REGULATION OF GASTROINTESTINAL MOTILITY IN THE ZEBRAFISH.

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Background: Anoctamin 1 (Ano1) codes for a calcium activated chloride channel and is expressed on gastrointestinal (GI) stromal tumors. In healthy GI tissues Ano1 is expressed on interstitial cells of Cajal that contribute to the regulation of GI motility. Our lab studies gastrointestinal motility and uses the zebrafish model system and is now focused on determining the physiological and developmental roles for Ano1.
Aims: Determine the physiological role of Ano1 on GI transit.
Methods: Ano1 expression was knocked down using morpholino oligonucleotides. Knockdown was verified using molecular techniques. Fluorescent microspheres were added to larva food. Immediately after feeding larva were imaged to identify fish that spontaneously ate. GI transit was measured at 4 and at 24 hours after feeding.
Results: The frequency of spontaneous feeding was reduced in Ano1 MO injected larva compared to control larvae that were injected with Danieau buffer. GI transit time appeared to increase in Ano1 MO injected larva. Retrograde transit was observed in some Ano1 MO injected larva but never in control larva.
Conclusion: Ano1 is expected to contribute to the ICC mediated regulation of GI motility, and therefore Ano1 knockdown is predicted to interfere with coordinated GI smooth muscle motor patterns. Ano1 knockdown resulted in increased transit time and retrograde transit. These data show that Ano1 contributes to the regulation of coordinated GI motility. Supported by NIH DK07158801 and SUNY Research Foundation

PRESENCE OF PATHOGENIC MICROBES IN RED-EARED SLIDER TURTLES.

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Red-eared slider turtles (*Trachemys scripta elegans*) less than four inches in length are illegal to sell and purchase in the U.S. because of the likelihood of passing on *Salmonella* spp. to humans. Turtles larger than this may also have the same risk of spreading microbes. Cloacal swabs were taken from Seneca Park Zoo and pet red-eared sliders to test for the presence of *Salmonella* and other bacterial species. In addition, tank water samples and habitat surface swabs were collected. A total of 220 bacterial strains were isolated and frozen. Samples were Gram-stained and PCR amplification of the *invA* gene in Gram (-) bacillus isolates was performed to identify *Salmonella* species.

IMAGING OF PT NANOCRYSTALS ON $SRTIO_3$ SUBSTRATE: COHERENT X-RAY DIFFRACTION AND SCANNING MICROSCOPY STUDIES.

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Imaging of nano-scale structures, particularly those in *real-world* environments, presents a significant challenge. X-ray Coherent Diffractive Imaging (CDI) provides one avenue of accessing the structural information of a nano-scaled sample in a harsh environment. However, while this problem has been solved for Au and Pb nano-crystals in clean, vacuum environments, much work remains before it can be rapidly employed in other systems. Our efforts center on determining the real-space structure of Pt nanocrystals grown on a $SrTiO_3$ substrate using a combination of CDI and atomic force scanning microscopy (AFM). X-ray speckle patterns are produced by coherent diffraction of the crystals at different orientations. In principal these speckle patterns can be transformed back to real space coordinates to calculate the crystal structure using CDI algorithms. Microscopy provides complementary information allowing us to simulate the speckled diffraction patterns from real-space images of the actual particles. This dual approach of using both real and reciprocal space information to solve the structures should lead to a practical set of algorithms and procedures whereupon the samples can be imaged quickly in the environments and conditions

SPF NATURAL SELECTION: THE EVOLUTION OF CAENORHABDITIS ELEGANS IN AN ULTRAVIOLET LIGHT INTENSE ENVIRONMENT.

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The annual dose of ultraviolet (UV) light received by the earth's surface has increased dramatically over recent decades. Pollutants such as aerosols have contributed to a weakening of the protective ozone layer which shields the earth from this harmful source. The implications of the evolutionary effects of this form of radiation on life are great. This experiment sought to determine these effects through the use of the model organism *Caenorhabditis elegans*. Populations of *C.elegans* were grown were grown under chronic doses of UV radiation for fifty generations. We tested for an evolutionary response to the effects of UV irradiation by using real time PCR to measure the expression of genes involved in the nucleotide excision repair pathway. Expression was measured in both ancestral and evolved populations in either irradiated or non-irradiated states. This way, evolutionary changes in expression could be quantified as could the plastic response to UV radiation itself. Results indicate that there is no change in the expression of DNA repair genes in response to UV exposure. Furthermore, the level of expression was not grossly different between ancestral and evolved populations. A lack of change in expression upon irradiation could indicate that the nucleotide excision repair pathway is not actively transcribed following UV irradiation. Ongoing work will determine the phenotypic effect of chronic radiation through a measurement of lifespan in ancestral and evolved populations with and without exposure to UV light. Preliminary results have shown not only a change in lifespan of those *C.elegans* exposed to radiation, but also developmental abnormalities in response to this radiation

CAPILLARY CONDENSATION TRANSITIONS FOR CYLINDRICAL GEOMETRY.

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When vapor inside of confined geometry condenses on the surface and forms either a liquid film or liquid bridge, then capillary condensation occurs. Under specific thermodynamic conditions, an adsorbate film may be present on the internal surface of the substrate. We investigated the phase transitions between empty, film and full configurations for cylindrical geometry and we obtained the triple point. The shape of the liquid meniscus is also discussed. Some applications consist of medical diagnostics in the medical field and hypobaric food storage and even water extraction from diesel exhaust.

CAPILLARY CONDENSATION: WEDGE-LIKE GEOMETRY.

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As solid surfaces can have their shape controlled at a nanoscale level, the understanding of the phenomena that emerge in this scale is fundamental in order to develop new technologies. The goal of this work is to describe the capillary condensation in a wedge focusing on two aspects. The first is the shape of the meniscus formed by filling, which can be influenced by Van der Walls' forces or electrostatic interaction between the substrate and the material

inside it. The second is the phase transition between the empty and filled phase, which gives the evolution of the system through the effective interfacial potential difference.

The wedge geometry shows a behavior very unlike the planar geometry, which have been explored in previous research at SUNY Oswego. This fact can be relevant on ongoing technologies such as super-repellent surfaces, microfluidics or self-assembly of three dimensional structures. The shape of the meniscus considering both cases was obtained as well as the phase transition diagram.

CHARACTERIZATION OF NEURONS EXPRESSING *BEN-1* IN *C. ELEGANS* WORMS.

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Microtubules play a vast and diverse role in the animal kingdom. They are involved with structure and support, have a crucial role a role in intracellular transport, and also play an imperative role in cell division. Microtubules are composed of α and β tubulin heterodimers that self-assemble into polar chains. In the *Caenorhabditis elegans* genome there are nine α-tubulins, six β-tubulins, and one ϒ-tubulin. Many of these tubulins are redundant in the *C. elegans* genome, including *ben-1*. *Caenorhabditis elegans* are nematode worms approximately the size of a comma. Their manipulability makes them an excellent model organism for research in cellular biology. Other nematodes are found in the natural environment. Some are parasitic to humans and plants, for example, roundworms. In general, benzimidazoles are used as an anti-parasitic or anti-fungal agent. Benzimidazoles are part of a class of anti-microtubule drugs. Prior research by Driscoll *et al.* determined that *C. elegans* with deletions in the *ben-1* locus are resistant to benzimidazoles (hence the name *ben-1*.) They found that unlike wild-type worms that are paralyzed and do not exhibit normal growth and viability, *ben-1* worms are able to function normally. The *ben-1* tubulin is expressed in chemosensory, mechanosensory, motor, and interneurons in *C. elegans*. To further explore the role of *ben-1* in *C. elegans* worms I have identified several individual neurons and ganglia that express *ben-1* tubulins by fluorescent confocal microscopy. Further research will involve determining a phenotypic role of *ben-1* in *C. elegans.*

THE EFFECTS OF EXTREME PRECIPITATION EVENTS ON CLIMATOLOGY.

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Extreme weather events can drastically affect the local climate. For example, in September 2010, Albany, New York received 0.76 inches of rain over the first 29 days of the month. On 30 September, 2.68 inches of rain fell in association with a quasi-stationary boundary, resulting in a 0.13-inch precipitation surplus for the month. On paper, the total precipitation recorded for this month appears to be nearly normal. However, this "normal" month resulted from a singular extreme event. During May 2007 in Albany, NY, relatively small amounts of precipitation fell on 8 separate days, resulting in a cumulative monthly rainfall total of 3.51 inches, near the mean of 3.67 inches. Despite the extreme variation in these two monthly precipitation distributions, both of these months appear on paper to be "normal".

While statistical analyses were performed on ten geographically different cities across the United States, this presentation will focus only on Denver, Colorado and Tampa Bay, Florida. For each city, a 30 year summertime climatology of daily precipitation totals spanning 1981-2010 precipitation will be presented to show whether "normal" monthly cumulative precipitation is typically made up of several days of little precipitation, or a few days of extreme precipitation. Additionally, representative case studies will be highlighted illustrating how meteorological conditions can result in a "normal" month of precipitation comprised of an extreme precipitation event.

THE EFFECT OF LOW LEVEL LIGHT THERAPY ON DEVELOPMENT AND BEHAVIOR OF *C. ELEGANS*.

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Exposure to near infrared light is known to increase ATP production and cell proliferation due to an excitation process of the chromophore cytochrome c in the electron transport chain. This low level light therapy has been used in the medical field since its healing properties were discovered in the late 1960s. It was recently found that *Caenorhabditis elegans* regularly exposed to near infrared light with a wavelength of 940 nm grew to be adult size

at a quicker rate and had an increased number of progeny. Although they are a less derived invertebrate, many orthologous genes are found between *Caenorhabditis elegans* and humans and they prove to be a great tool in studying medical biology because their entire genome has been sequenced and the developmental fate of each cell has been mapped. We exposed wild type nematodes to 940 nm light at 5 J/cm² to determine the effect of irradiation lifepan, activity level, and muscle structure to gain a better understanding on the overall effect of near infrared irradiation on *C. elegans*.

A PHOSPHOGLYCOLATE PHOSPHATASE VIRULENCE FACTOR FROM *STAPHYLOCOCCUS AUREUS*.

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Methicillin Resistant *Staphylococcus aureus* (MRSA) is the bacteria responsible for staph infections; one of the most prevalent hospital acquired infections. Since its initial discovery, *Staphylococcus aureus* (*S. aureus*) has developed multidrug resistance making infection extremely difficult to treat. One avenue of pursuit in identifying new drug targets against staph infections might be found through the study of Haloacid Dehalogenase (HAD) superfamily phosphatases. A HAD phosphatase in *S. aureus* has been shown to serve as both a virulence factor and possess the ability to dephosphorylate 2-phosphoglycolate. If not catabolized, 2-phosphoglycolate accumulates in cells and inhibits triose phosphate isomerase (TPI). In *S. aureus*, TPI also serves as an adhesion molecule that can bind to host cells via sugar-side chains. To confirm physiologically that the *S. aureus* HAD phosphatase is indeed a phosphoglycolate phosphatase (PGPase), the enzyme will be expressed in a PGPase *Saccharomyces cerevisiae* knockout. We have identified a potential growth phenotype for this PGPase knockout in response to hyperosmotic (1M NaCl) shock compared to wild-type cells. We hypothesize that the *S. aureus* PGPase should be able to complement this growth phenotype if it is a true functional ortholog. Studies are currently underway to clone the *S. aureus* PGPase into a yeast expression vector for subsequent complementation work. This research has been supported by an NIH AREA grant, the RIT McNair Scholars Program, and an NTID FEAD grant.

COMPUTATIONAL STUDY OF IONIC LIQUID SOLVATION.

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Ionic liquids are of particular interest because they offer an "environmentally friendly" alternative to volatile organic hydrocarbon (VOC) solvents. One principle of green chemistry promotes the use of innocuous solvents in chemical processing. The overall goal of our research is to determine the solvation energetics of ionic liquids when dissolved in conventional solvents such as methanol (MeOH) and water. The ionic liquids used in this work are based on the trihexy(tetradecyl)phosphonium ($P_{[14,6,6,6]}^{+}$, PIL) and 1-decyl-3-methylimidazolium (C_{10}MIM) cations. To date we have studied the solvation of PIL with chloride and bromide anions and C_{10}MIM with the chloride anion. The PIL and C_{10}MIM systems were modeled computationally using Spartan14® software using different levels of theory and basis sets, including AM1, PM3, and PM6 semiempirical methods and Hartree Fock ab initio methods with 3-21G and 6-31G basis sets. Solvation was computed using continuum dielectric solvents with SM5.4 and SM8 solvent models. The optimum cation/anion separation (energy minimum) was determined by calculating the interaction energy in both vacuum and dielectric continuum. In vacuum PIL-Cl has an optimum separation of 0.359 nm compared to PIL-Br which has an optimum separation of 0.365 nm, consistent with the trend in anion radius. The optimum distance for C_{10}MIM-Cl was found to be 0.268 nm in vacuum. Solvation energies of solvated ion pairs and solvent separated ions were computed for all solvents studied and are discussed in this work.

OPTIMIZING THE PURIFICATION OF LGN PROTEIN FOR X-RAY CRYSTALLOGRAPHY.

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LGN protein, also known as G-protein signaling modulator 2 (GPSM2), is a critical component for the division of mammalian cells, as it functions in the maintenance of cell polarity and the alignment of mitotic spindles during mitosis. The protein is expressed in *E. coli* cells, and then is purified using various chromatographic techniques. Purity is assessed using SDS-PAGE analysis, and the presence of LGN is verified by Western blotting. The goal is to attain at least 95% pure LGN protein before crystallization conditions are tested. LGN has been verified by

Western blot analysis using an anti-GPSM2 antibody following preliminary purification and the purification scheme is currently being optimized.

EVALUATING OIL DISPERSANT SYSTEMS VIA EMULSION STABILITY AND OPTICAL MICROSCOPY.

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Though chemical dispersants are employed to minimize the deleterious effects of oil spills, their diverse composition of organic solvents, surfactants, and additives may bestow further detrimental effects on marine environments. This study is part of a larger effort to engineer a novel dispersant that replaces surfactant molecules with mineral particles, thus allowing surfactants and particles to work in tandem to optimize oil slick degradation and emulsion stabilization efficacy. By homogenizing various combinations of synthetic clay particles, surfactants, and salt, emulsion stabilization of oil-water mixtures was tested by employing two different Laponite preparation methods: the Dispersed Particle Method (DPM) and the Powdered Particle Method (PPM). Several conditions were tested such as mixing time, homogenization speed, clay concentration, salt concentration, and water-to-oil ratio. Optical microscopy was also employed to determine the size distribution of the stabilized oil droplets. The PPM resulted in more stable emulsions for both the clay-only system, and clay/NaCl system. However, the PPM didn't perform as expected when AOT surfactant is utilized. This research sets the stage for future emulsion stabilization work involving clays and surfactants.

MICROWAVE SYNTHESIS OF MULTIPLY BONDED DIRHENIUM COMPLEXES.

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Microwave irradiation has proved to be an effective synthetic tool for organic, inorganic, and organometallic compounds as well as solid-state and inorganic nanomaterials. The irradiation and thereby direct heating of the sample often leads to shorter reactions times and higher yields sometimes with reduced reactants and solvents, making microwave synthesis a green synthetic pathway.

A series of multiply bonded dirhenium complexes have been synthesized via microwave synthesis. In all cases, the reaction times were reduced from hours to minutes and for many the yields exceeded those of the traditional synthetic pathways. The complexes were characterized using infrared and UV-Vis spectroscopies as well as elemental analysis.

MAGNETIC PROPERTIES OF NON-STOICHIOMETRIC NI_2MNGA_{1-X} HEUSLER ALLOYS.

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Heulser alloys of the general type Ni_2MnGa exhibit an interesting set of bulk magnetic properties with varying temperature. These properties are related to a phase transition within the crystalline structure of the material. In low temperatures, these alloys have a tetragonal lattice structure in the martensite phase. At warmer temperatures, the metal transitions to a cubic lattice in the austenite phase. This phase transition has been shown to have shape memory properties. In addition to the structural transitions, the material also undergoes a transition from high temperature paramagnetic phase to a lower temperature ferromagnetic phase.

Our work investigates these phase transitions in non-stoichiometric, gallium deficient, Ni2MnGa1-x alloys. Samples were fabricated in our laboratory using high temperature induction heating. By adjusting the degree of non-stoichiometry (x), we have placed the martensite transition near room temperature. A vibrating sample magnetometer with a thermal control apparatus was used to characterize the magnetic properties as a function of applied field and temperature. The temperature control apparatus, designed and built in the lab, used nitrogen flow-by gas to adjust the sample's temperature over a range +/-100C from ambient. Additional magnetic characterization utilized various thermal and mechanical treatments. Noticeable changes were found in the samples coercivity after annealing but not after mechanical grinding. Neither treatment affected the martensite transition temperature. These results are discussed in terms of the local stresses and electron concentrations within the alloys.

SAWDUST: A SOURCE OF LIGNOCELLULOSIC BIOMASS FOR BIOFUEL PRODUCTION.

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Biomass; or better still, lignocellulosic biomass is a renewable resource derived from all organic matter that can be used to produce energy. Primary forest biomass, such as sawdust, is largely available as a product of wood processing or manufacturing. The potential of Douglas fir (Pseudotsuga menziesii) sawdust as a lignocellulosic biomass for biofuel production after pretreatment with a series of ionic liquids (IL's) is investigated in this study. Lignocellulose is a complex matrix, comprising many different polysaccharides, phenolic polymers and proteins. The breakdown of this matrix into glucose presents significant challenges. In this study, 3 IL's of varying carbon chain lengths were used followed by acid hydrolysis. The percentage of glucose obtained was compared to the ionic liquid carbon chain lengths and the time of pretreatment

INFLUENCE OF PRECIPITATION PATTERNS ON SURFACE WATER AND GROUNDWATER IN THE SANDY CREEK WATERSHED, NY

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Predictions for future climate in the Northeastern United States is for greater total precipitation but more and longer drought periods. This equates to fewer but larger precipitation events. In an effort to better understand the response of small watersheds to drier and wetter than normal precipitation events, a study is underway on the Sandy Creek watershed. The Sandy Creek watershed drains a rural portion of the Lake Ontario lake plain. During the summer of 2013, the 7-day running average discharge was correlated with the 7-day running average precipitation and found to be significant using the Spearman's rho test. During the summer of 2014, the study focused on the eastern branch of the watershed to avoid complications with seiche from Lake Ontario. The 2014 study also included monitoring of a the local shallow water table aquifer, and qualitative evaluation of the 2013 hydrograph showed some relationships between precipitation events and baseflow. To date, results of the 2014 data show a correlation between precipitation and discharge. Monitoring a conductivity in both surface and groundwater show that during a long drier than normal period in late spring, groundwater conductivity steadily decreased from 980 μS cm^{-1} to 840 μS cm^{-1}, approaching the upper limit of surface water values which vary within a range of 460 to 760 μS cm^{-1}. As expected, groundwater contributions to stream discharge increase during the drier than normal periods, but it remains unclear as to the impact of the frequency of rain events to stream discharge and groundwater recharge.

POLLEN INDICATORS OF LATE HOLOCENE NATIVE AMERICAN VEGETATION IMPACTS IN THE FINGER LAKES REGION, NEW YORK STATE, USA.

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Historically, the Finger Lakes region of New York was home to three of the five nations comprising the Iroquois Confederacy (Seneca, Cayuga, and Onondaga), and the region possesses a high density of archaeological sites associated with Late Woodland (A.D. 950 – 1600) and Contact Era (A.D. 1600 – 1800) Iroquoian agricultural groups. Pollen extracted from the sediments of Heath-Markham Pond, a 1.5-ha glacial kettle basin located in the northwestern portion of the Finger Lakes region, have provided a high-resolution record of local vegetation change corresponding to periods of known Native American settlement and maize agriculture. Six Contact-era Seneca village sites have been excavated within a 6-km radius of the pond, including the Lima Site (occupied A.D. 1620 – 1640), Powerhouse (A.D. 1640 – 1655), Dann (A.D. 1655 – 1673), Kirkwood (A.D. 1675 – 1687), Rochester Junction (A.D. 1675 – 1687), and Warren (A.D. 1620 – 1640).

Vegetation changes associated with Iroquoian forest clearance and agriculture include decreased abundance of late-successional beech (*Fagus*) and maple (*Acer*); increased early- and mid-successional aspen (*Populus*), ash (*Fraxinus*), pine (*Pinus*), and oak (*Quercus*); higher frequencies of hard mast taxa including *Juglans* (walnut/butternut), *Carya* (hickory), and *Castanea* (chestnut); increased abundance of herbaceous taxa including *Ambrosia* and grass (Poaceae); and presence of *Zea mays* (maize) pollen.

Iroquoian agricultural populations of the Finger Lakes region transformed late-successional beech-maple forests into a mosaic of cleared cropland, fallow fields, early- and mid-successional forests, open woodlands, oak savannas, and nut groves through a variety of landscape management practices including forest clearance, burning, and silviculture. Long-term trends in pollen taxa abundance in the Heath-Markham core suggest possible Native American vegetation disturbance extending back to at least 2500 cal. yr B.P., coinciding with the earliest appearance of maize in the regional archaeological record.

SPATIO-TEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE MICHIGAN FISH.

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To better understand the nearshore food web structure in Lake Michigan, spatio-temporal variation in fatty acid signatures (FAS) of seven fish species (e.g., alewife, round goby, spottail shiner, yellow perch, white sucker, rainbow smelt, and sand shiner) collected along the southwestern shore of Lake Michigan during spring, summer and fall 2013 were analyzed (n=311). There were three sampling sites and each differed in regard to habitat complexity; their substrates were characterized as sand (site A), rocky (site B) and coarse sand with intermittent cobble and random boulders (site C). Significant differences in FAS among fish species were detected (ANOSIM, overall R = 0.796), with alewife and round goby presenting the most distinct FAS (25.5% dissimilarity). Fatty acids responsible for the most variation among species included 16:1n-7, 18:1n-9, 20:5n-3 and 22:6n-3. Spatial and temporal variations in FAS were also observed within species. Fatty acid signatures of round goby collected at site B in spring and summer differed significantly (overall R 0.693 and 18.8% dissimilarity), which implies seasonal dietary shifts. Spatial differences in yellow perch FAS were also observed, indicating habitat driven plasticity in yellow perch diets. Although within species spatio-temporal FAS variations were observed, among species FAS differences were consistently larger.

CONVERSION OF CELLULOSE TO GLUCOSE FOR BIOETHANOL: A COMPARATIVE STUDY OF MICROWAVE HEATING AND ACID HYDROLYSIS.

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Inedible parts of plants contain cellulose that can be broken down into biofuels, specifically bioethanol. Two methods reported to be effective as a pretreatment system for accomplishing this conversion include the use of ionic liquids (ILs) and acid hydrolysis. A comparative study was carried out to determine which, if any, is more effective as a pretreatment system. A series of imidazolium derived ILs, with varying carbon chain lengths were used in this study. Published results suggest a correlation between the carbon chain length and the glucose yields. This too was investigated.

TOWARD COST EFFECTIVE BIOFUEL PRODUCTION: DEVELOPING A RECYCLING METHOD FOR IONIC LIQUIDS USED AS BIOMASS PRETREATMENT SYSTEMS.

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The main hindrance to the cosmopolitan use of biofuel is cost; the most prohibitive of which is in the breakdown of biomass; termed pretreatment. Ionic liquids (IL's), a unique class of non-volatile and non-flammable chemicals, were used as a pretreatment system for the breakdown of lignocellulosic biomass. This conversion method allows for the inedible parts of plants to be made into glucose which can be made into bioethanol. IL's are expensive, however, and once they have been used in the pretreatment system, they become contaminated. A cost effective recycling method was developed to purify the used IL's. This method required columns filtration using activated charcoal. The resulting filtrate was then distilled to remove the water. Each sample was run through a series of column filtrations to remove color. The resulting residual fragments were analyzed through NMR and IR spectroscopy. The spectroscopic data from the recycled IL's were found to be very similar to that of pure ILs and indicated that all other carbon sources were removed.

SEARCH FOR ANCIENT CONIFERS IN NORTHERN NEW YORK ALVAR PLANT COMMUNITIES.

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Alvar landscapes, outcrops of glaciated limestone or dolostone with a thin discontinuous soil mantle, are not conducive to arboreal vegetation but ancient conifers have been found on sites in Ontario, Canada. In this study of trees growing in similar northern New York State habitats, 36 conifers from six different sites had ages ranging from 36 to 277 years, with most less than 100 years old. Environmental conditions, human disturbances, and catastrophic events are all indicated by tree-ring patterns of these conifers in the northern New York alvar landscapes.

BIOLOGICAL SURVEY FOR INVASIVE SPECIES IN LOON LAKE AND THE SURROUNDING WATERSHED, STEUBEN COUNTY, NEW YORK.

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Managing invasive species first requires knowledge of their local presence, frequency of occurrence and population abundance. With limited existing information available for Loon Lake and its watershed, this project was undertaken to fill gaps in knowledge by surveying the fish and littoral communities in the lake, and terrestrial plants in the surrounding upland landscape. Fieldwork was conducted during fall 2014 and invasive species with an earlier phenology may not have been detected, so these survey results should be considered a working inventory.

Lake fisheries were assessed through afternoon and evening electro-shocking and detected 13 species with yellow perch (*Perca flavescens*) being most common. A regionally uncommon species, the creek chubsucker (*Erimyzon oblongus*) was present. The only invasive fish species was the common or European carp (*Cyprinus carpio*).

Lake macrophytes and other littoral organisms were documented by raking in deeper waters and wading in shallower areas. Twenty seven macrophytes were present, including submerged (n=13), floating leaved (n=9) and emergent (n=5) species. Invasive macrophytes included Eurasian water milfoil (*Myriophyllum spicatum*), curly leaf pondweed (*Potamogeton crispus*) and yellow iris (*Iris pseudoacorus*). Invasive dreissenid mussels, including regionally abundant zebra mussels (*Dreissena polymorpha*), were not detected in Loon Lake but the introduced banded mystery snail (*Viviparous georgianus*) was common.

Visual survey of the watershed from municipal roads, farm lanes and otherwise accessible areas helped determine the extent of terrestrial invasive plants. Notable invasive species observed included Norway maple (*Acer platanoides*), goutweed (*Aegopodium podagraria*), common mugwort (*Artemisia vulgaris*), Japanese barberry (*Berberis thunbergii*), Canada thistle (*Cirsium arvense*), crown vetch (*Coronilla varia*), autumn olive (*Elaeagnus umbellata*), Japanese knotweed (*Fallopia japonica*), dame's rocket (*Hesperis matronalis*), everlasting pea (*Lathyrus latifolius*), Tartarian honeysuckle (*Lonicera tatarica*), moneywort (*Lysimachia nummularia*), reed canary grass (*Phalaris arundinacea*), European buckthorn (*Rhamnus cathartica*), black locust (*Robinia pseudoacacia*), sweetbrier rose (*Rosa eglanteria*), multiflora rose (*Rosa multiflora*), and garden valerian (*Valeriana officinalis*).

This research study was supported by the Finger Lakes Partnership for Regional Invasive Species Management (FL-PRISM).

WHAT'S HAPPENING TO ZEBRA MUSSELS (*Dreissena polymorpha*) IN HONEOYE LAKE?

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In 2001, unusually large foam streaks appeared on the surface of Canandaigua Lake while at the same time zebra mussel (*Dreissena polymorpha*) shells were washing up in great numbers along the shoreline. It was hypothesized that a mussel die-off had occurred and that their dead remains were contributing to the foam. The following year, a PONAR dredge was used to sample the lake bottom at several locations. Using shell length as a proxy for mussel age, dredge data indicated that nearly all of the living mussels were less than a year old, verifying that a die-off had indeed taken place the prior year. To compare the Canandaigua Lake "recolonizing" population age-class structure

to a normal one composed of multiple year cohorts, the Honeoye Lake zebra mussel population was also sampled in the summer of 2002.

During fall 2013, Honeoye Lake residents reported that they were finding very few zebra mussels on their docks when they were removed in preparation for the winter. Had a die-off of mussels also occurred in Honeoye Lake? There were no tell-tale foam streaks or large wrack lines of empty shells, but perhaps those conditions should not have been expected. With most of the Honeoye lake bottom composed of soft substrates, the zebra mussel populations were never as large as in neighboring Canandaigua Lake. Perhaps they had declined due to lack of palatable algae brought on by their own selective filter feeding on the phytoplankton community. The best way to verify a zebra mussel population decline would be to resample the same locations studied in 2002, and compare results. This would also provide an opportunity to discover if other benthic invasive species had entered the lake, especially Asian clams (*Corbicula fluminea*) and quagga mussels (*Dreissena rostriformis bugensis)*.

In summer 2014, the zebra mussel population in Honeoye Lake was again sampled at the same locations. Samples were processed by tallying and weighing the mussels. Overall, the zebra mussel density declined by about 30% (from 1647/m^2 in 2002 to 1199/m^2 in 2014). Total mussel biomass declined by about 35% (from 292 g/m^2 in 2002 to 188 g/m^2 in 2014). Indeed the perception of the public was correct. And about the other benthic invasive species, both good news and bad news – no quagga mussels or Asian clams were found in the dredge samples but four European fingernail clams were collected on gravelly substrates along the northeastern shore of the Honeoye Lake.

EIGHTEEN YEAR TREND IN SUMMER SURFACE WATER TEMPERATURES (C°) OF CANANDAIGUA LAKE, NEW YORK.

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Perhaps no other factor has as strong an influence on the limnology of Canandaigua Lake as water temperature. Nutrient solubility, water density, water circulation patterns, photosynthesis and biological respiration are all directly regulated by water temperature regime. Monthly temperature profiles through the water column have been collected April to November at two mid-lake monitoring stations since 1996. These depth profiles track the change from nearly isothermal conditions in late April, to periods of strong stratification in summer, then finally a return to nearly isothermal conditions in late November that drive the fall turnover typical of this warm, monomictic lake.

Summer surface water temperatures from the top of these depth profiles may be a good indicator of long-term atmospheric temperature tendencies due to the high specific heat of water. Simply put, lakes are less susceptible to the daily fluctuations reported from terrestrial weather monitoring stations because they buffer atmospheric temperature extremes. Average summer surface water temperatures, calculated as the mean of surface water temperatures during the end of June, July and August at the Deep Run and Seneca Point mid-lake stations, document a variable but gradual increase over the 18 years of record. A trend line fit to the mean temperature data indicates a 2.2°C increase since 1996 thus providing information on the extent of recent climate change in western New York. Warmer summer surface water likely alters biological relationships among lake organisms and may, in part, contribute to the recent dominance of blue-green algae within the phytoplankton community.

INVASIVE SPECIES OFFERS FEWER RESOURCES TO NATIVE INSECTS.

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Biodiversity is a critical component in keeping a habitat functional. A well-functioning habitat requires interdependency among species to keep relationships such as predator-prey interactions in balance. High biodiversity, especially at the lowest trophic levels, increases the number of possible interactions between plant and animal species. This allows nutrients to cycle to the highest trophic levels most efficiently. It is widely accepted that the presence of exotic plant species reduces the biodiversity of insects because it creates deficiencies of palatable food sources for native leaf eating organisms. My research focused on determining the abundance and species richness of *Lepitoptera* larvae (caterpillars) on common buckthorn (*R. cathartica*), an invasive species, and various woody native species (i.e. oak, hickory, hackberry, maples, etc.) to test how the presence of invasive organisms compares to native species in promoting high biodiversity. Through my research, I learned that there was less diversity and less abundance of *Lepidoptera* on common buckthorn than on the native woody trees by a large

margin. This further supports that invasive plants harbor fewer insects than native plant species. The results indicate that the effort to control invasive organisms could potentially provide great ecological value to a habitat by promoting biodiversity through the removal of invasive species and the planting of native species.

SURFACE ENERGY BUDGET CLOSURE IN SAGEBRUSH LANDSCAPE.

Raleigh Grysko, Eric Russell, and Heping Liu

The eddy-covariance technique was used to measure the components of the surface energy budget at 30-minute means for two eddy covariance tower sites located in Birch Creek Valley, Idaho from June 24, 2013 to September 15, 2013. The two towers were located eight miles apart north-south on opposite sides of the valley. The differing factors between the two sites were the distributions and concentrations of the sagebrush in each area, the elevation above sea level of the towers, and the terrain undulations. The surface energy budget consists of four main components: latent heat flux (LE), sensible heat flux (H), ground heat flux (G), and net radiation (R_n). In ideal situations net radiation equals the sum of the latent, sensible, and ground heat flux values causing the energy budget to "close" (i.e., R_n=H+LE+G). When calculating the ground heat flux, corrections were made to account for needing to bury soil sensors at a deep enough depth so they are not significantly disturbed and the absolute depth in the soil is not significantly altered due to erosion, compaction or expansion of the soil layer. Meteorological and turbulent variables were analyzed during periods where the surface energy budget was closed in an attempt to determine the main factors that contributed to surface energy budget closure. Meteorological and turbulent variables were also analyzed in instances where the surface energy budget was not closed. One instance of particularly high closure rates was identified from August 15, 2013 to August 19, 2013 and analyzed extensively.

DIETARY TRANSFER OF FATTY ACIDS IN LAKE TROUT.

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Fatty acid signature (FAS) analysis is a powerful tool to investigate foraging ecology and food web dynamics. However, the use of FAS to infer diets is influenced by lipid metabolism in predators. Therefore, we investigated how fatty acids were transferred from prey to predator and metabolized by that latter. Juvenile lake trout (average weight 6.6 g) were fed rainbow smelt for 16 weeks and were sampled prior to the beginning of the experiment and after week 4, 8, 12, and 16. Lake trout mass increased by 250% over the course of the experiment. During the first 8 weeks, 18:2n-6 and 22:6n-3 decreased in concentration whereas 16:1n-7 and 18:1n-9 increased significantly. No major change in lake trout FAS was observed thereafter. Our results suggest that only 8 weeks of exclusive diet of rainbow smelt was enough to change FAS in juvenile lake trout. However, due to the species specific fatty acid metabolism, lake trout FAS was still distinguishable from the one of rainbow smelt.

CHARACTERISITICS RELATED TO THE PREVALENCE OF LYME DISEASE IN DOGS IN ONEIDA COUNTY, NEW YORK.

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Borrelia burgdorferi, the bacterium that causes Lyme disease, is commonly vectored by deer ticks, *Ixodes scapularis.* Deer ticks can vector Lyme disease to canines as well as humans. This disease can cause many health issues for dogs, and is becoming an increasing concern for veterinarians and dog owners. In this study, a *SNAP® 4Dx®* Plus test was used to test 163 dogs for Lyme disease. Each patient's weight, age, breed, coat length and color were documented. The data were analyzed to determine if any of these characteristics were associated with Lyme disease. Among the findings was that sport breeds were significantly more likely than household dogs to test positive for Lyme disease. For Labrador retrievers, younger dogs were significantly more likely to have Lyme disease than older dogs. There was no general association between coat length and coat color among the Lyme positive findings. Understanding trends of host preference of *Ixodes scapularis* can lead to advances in the veterinary medicine field.

A SURVEY OF TRACE METALS AND INORGANIC IONS IN RICE CREEK AND GLIMMERGLASS LAGOON WATERSHEDS, OSWEGO, NY.

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The Rice Creek and Glimmerglass Lagoon watersheds are located on the SUNY Oswego campus. Glimmerglass Lagoon is surrounded by parking lots, mowed lawns, and other anthropogenic influences. The lower Rice Creek watershed is surrounded by forests, wetlands, and old fields. We sampled each watershed for the presence of pollutants including trace metals as well as ions linked to eutrophication. We predicted that due to the prevalence of anthropogenic disturbances around Glimmerglass Lagoon, there would be higher levels of trace metals and ions associated with eutrophication (nitrates and phosphates) in comparison to the Rice Creek watershed. We also hypothesized that our data will show an increase in trace metals, nitrates, and phosphates as the watersheds traversed areas of greater human interaction. In order to test our hypothesis, we collected water from different locations along the Rice Creek (n=3, n=10 replicates per site) and Glimmerglass Lagoon (n=3 sites, n=10 replicates per site) watersheds. We used an inductively coupled mass spectrometer and an ion chromatograph to observe pollutant trends associated with each watershed. Out of the 12 trace metals analyzed, (Li, Be, Cr, Fe, Ni, Cu, As, Se, Cd, Sb, Ba, Pb) we found that Ni, Cu, Sb, and Pb had higher quantities in Glimmerglass Lagoon as opposed to Rice Creek. We also found that Ni showed an increase in concentration downstream towards Lake Ontario in each watershed. Based on algal blooms observed in Glimmerglass Lagoon, we predict this watershed will have high levels of nitrates and phosphates. To date, our data indicate that anthropogenic influences may influence water quality in these watersheds.

STOMATAL DENSITY USE AS AN INDICATOR OF AIR QUALITY ASSOCIATED WITH THE PEACE BRIDGE PLAZA IN BUFFALO, NY.

Laura Hechtel, Clara Davie, Sumeye Abdulkadir, Sarah Grant, William Harlock, Garatt Kerr, Cecelia Lignos, Molly Minkiewicz, Megan Morris, JuMan Park, Mary Pokorski, Countess-Jai Richards, Shane Scoons, and Christina Ventresca.
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Increased cases of asthma on the lower west side of Buffalo have been associated with high Peace Bridge traffic. Although several epidemiological studies have supported this association, a New York State DEC report conducted from 2012-13 indicated air quality at the Peace Bridge meets national standards and other contributing factors, such as smoking, household conditions and poverty, could explain the increased asthma cases. Therefore, it is necessary to use other biological indicators for air quality that would not be influenced by social / economic factors. Increased stomatal density has been used extensively as an indicator of increased air pollution in urban settings. In this study, stomatal density in the Sugar Maple (*Acer saccharum*) was determined for several city parks in Buffalo NY over a two year period from 2013-2014. Impressions of the lower epidermis were made using clear nail polish, mounted on a slide and then counted using a compound microscope at 400x. Results were analyzed using a One Way ANOVA for each year of study. The 2013 study indicated a significant increase in stomatal density for Front Park (located adjacent to the Peace Bridge) when compared to Masten Park and Conway Park ($p < 0.001$). More parks were compared in 2014 and similar results were found: stomatal density was significantly higher in Front Park than in South Park, Conway Park, Masten Park and MLK Park ($p<0.025$) but not for Cazanovia Park ($p=0.44$). These results indicate that the Peace Bridge traffic is likely contributing to poor air quality.

AN ELECTROCHEMICAL APPROACH TO CONTROL RING SIZE OF CYCLIC POLYESTERS.

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Zwitterionic ring-opening polymerization (ROP) of lactones catalyzed by N-heterocyclic carbenes (NHC's) has proven to yield cyclic polyesters. Currently, ring size is dependent on careful monomer addition. Although polymerization occurs with NHC catalysts, little is known about a more efficient control using electrochemical techniques. Exploration of such polymerization is underway with metal bis(dithiolene) NHC adducts since they present a promising method to obtain cyclic polyesters with specialized cyclic architectures, control of ring size, and retain recyclability of NHC catalysts. This electrochemical approach for precision polyester synthesis may provide utility in industrial and biomedical purposes.

DECHLORINATING POLLUTANTS VIA ENVIRONMENTALLY FRIENDLY PALLADIUM CATALYSIS.

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Carcinogenic table dusters, lubricants, and pesticides are some of the most widespread toxins in the United States and fall under the category of Poly Chlorinated Biphenyls (PCBs). Since the 1760's, these compounds have been in production for various applications, from household uses, which have since been banned, to industrial processes. Due to the once widespread usage of these materials, and little to no proper disposal methods, it is of key importance to de-chlorinate these compounds and thus detoxify them. This research focuses on palladium-catalyzed hydro-de-chlorination of these compounds.

ABUNDANCE AND REPRODUCTION OF HERBACEOUS VEGETATION OF WELLS COLLEGE, AURORA, NEW YORK.

Niaome Hickman, Kathryn Sweeney and Jaclyn Schnurr.
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Herbaceous vegetation found in forests has been described many times in plant ecology research projects, but all that has really shown us is how little we know about it. One major question is how often herbaceous plants flower, and if patterns of abundances are consistent throughout the growing season. To start to answer these questions, we established a long-term research project in the summer of 2014. We established 25 permanent 1x1 m research plots in each of 2 habitat types; 25 plots in an upland area and 25 plots in a lowland area on the Wells College campus in Aurora, NY. The plots were censused every 2 weeks throughout the summer and early fall. Flowering rate was extremely low – throughout the summer only 1% of the plants flowered (a total of 83 flowers out of 7205 plants), with the about 80% of the flowering occurring in the lowland site. Based on preliminary soil analysis that site also had the greatest amount of nitrate in the soil ($t=2.45$, $P=0.04$), and significantly higher pH (upland = 6.5, lowland = 5.8; $t=1.7$, $P=0.01$) while nitrite, soil moisture and photosynthetically active radiation were the same between the sites. In addition, there were notable differences between the two sites in the distributions of plant species over the sampling period; data from key species were isolated from each site to calculate percent of total population. In the lowland site, garlic mustard (*Alliaria petiolata)* was the dominant species, to be replaced by members in the Urticaceae in early August, with gradual increases in importance of white ash (*Fraxinus americana).* Similarly, the upland site featured a dominance of garlic mustard; however, it was gradually replaced by pale swallow wort (*Cynanchum rossicum)*, with stable populations of European buckthorn *(Rhamnus cathartica)* and white ash. These baseline data demonstrate that flowering of herbaceous species are very low, and give us a baseline to compare future species abundances.

FITTING AND COMPARING EXCESS MOLAR VOLUME DATA.

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Excess molar volumes are defined as the difference between the real, measured molar volume of a binary liquid system and its ideal molar volume, which is the mole fraction weighted average of the pure component molar volumes. Excess molar volumes are derived from density measurements as a function of composition. It has become a standard procedure to fit the composition dependence of excess molar volumes data with the so-called Redlich-Kister polynomials. However, given that densities are typically measured with a vibrating tube density meter at fixed compositions over a range of temperatures, we propose to first fit the temperature dependence at fixed compositions, which tend to display simple linear relationships. The obtained composition dependent slopes and intercepts are then fitted by polynomial fits to yield a universal temperature and composition dependent fit of the entire data set. This approach was tested with a total of 167 data sets concerning binary systems of ionic liquids and molecular solvents. Ionic liquids are salts that are liquid below 100°C. It will be shown that this fitting approach not only facilitates the comparison of experimental data sets but also leads to interesting general insights.

QUASAR EMISSION LINE VARIABILITY FROM HUBBLE SPACE TELESCOPE ARCHIVE DATA.

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Using the Hubble Space Telescope Archive (HST), flux variations in low-redshift ($z < 1.7$) quasar spectra were measured and analyzed. Flux variations were measure for the Lyα λ1216 broad emission line (BEL), CIV λ1549 BEL, and continuum emission from the central ionizing source. Quasars and active galactic nuclei (AGN) that have spectral data for at least two points in time to obtain flux ratios were used. Custom Python scripts were written to quicken the process of analyzing raw HST spectral data. The results show a strong correlation to the flux variations for the Lyα BEL and the CIV BEL, and less so for the continuum emission and each BEL. By using this statistical approach and continuing to build up a database of flux variability, information can be obtained that will be useful to modeling quasar activity.

SHEDDING LIGHT AND WORMING AROUND WITH *PSEUDOMONAS AERUGINOSA*: INVESTIGATING THE MOLYBDENUM COFACTOR SYNTHESIS PATHWAY AND ITS IMPLICATIONS FOR VIRULENCE.

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Pseudomonas aeruginosa is a prevalent bacterium in the environment found to cause a wide array of diseases in humans. *P. aeruginosa* exhibits a substantial burden to patients with cystic fibrosis and other pulmonary disorders, in addition to being a common cause of nosocomial infections. *P. aeruginosa* uses a molybdenum cofactor (MoCo) in its nitrate reductase pathway. This pathway and cofactor are important in biofilm growth. Biofilm formations increase the virulence of *P. aeruginosa*. Levels of virulence can be ascertained by investigating mutants of this pathway. By injecting *Galleria mellonella waxworms* with mutant strains of *P. aeruginosa* the relative virulence was measured. CsdA (cysteine desulfurase) and PA1006 (sulfur-trafficking protein) mutants appear to have killed the waxworms slower and thus appear to be less virulent than PAO1, our wild type. Whereas another protein involved in this pathway, MoaD, did not seem to have a reduced virulence. Nitrate reductase consists of a series of proteins associated with the membrane. We hypothesized that these membrane associations may serve as a docking site to other proteins in the MoCo pathway. To examine this association we used green-fluorescent protein fragment complementation, GFP-PFCA. GFP-PFCA is when one protein is tagged with the C-terminus of GFP and the other protein of interest is tagged with the N-terminus of the cleaved GFP. Separately these GFP-fragments will not fluoresce unless the proteins they are attached to interact in the cell. Therefore, a GFP signal can only be observed if the two proteins of interest interact. In a NarGH (nitrate reductase) mutant, we were able to observe localized GFP signal resembling pinpoints when NarH was associated with NarJ, PA1006, MobA, and MoaD. These proteins are all involved in nitrate reduction or MoCo biosynthesis, suggesting a larger protein complex may be associated with the membrane. Determining the arrangement, interaction, and localization of proteins in the cell may identify more potential proteins of this complex. By testing different mutant strains of *P. aeruginosa* in waxworms, the proteins important in the nitrate reductase pathway or the MoCo it requires can be examined for their ability to contribute to virulence.

RITUALS OF THE RED SPEAR MOVEMENT: SPIRIT POSSESSION, BATTLE MAGIC AND COMMUNITY DEFENSE IN NORTHERN CHINA, 1916-1949.

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China's Republic era (1912-1949) was a time of immense social change. Some of these shifts took the form of increased modernization, urbanization and secularization while others manifest themselves as warlordism, government corruption and crushing banditry. Red Spear defensive societies became the most important means by which local leaders attempted to provide physical security while effectively staving off the financial and political demands of outside actors such as the Nationalists, the Communists and later the invading Japanese.

The most remarkable feature of the Red Spear Movement was their reliance on complicated ritual systems which employed both magical talisman and spirit possession techniques in the quest for battlefield invulnerability. When discussing these groups other scholars have tended to focus on the Red Spears as a political or revolutionary movement. This paper instead examines the social function of their ritual system to reveal how it aided in the creation of a surprisingly effective fighting force. The sudden flowering of these martial and magical practices in an area where they had not traditionally been common, and in an era characterized by increased modernization and secularization, provides us with a unique opportunity to study how northern China's traditional village structures responded to stress in the modern era.

NAVAJO RUGS: RITUAL MEANINGS WOVEN IN WOOL.
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While the generally accepted – in fact, the established and predominant - explanation of variation in Navajo rug styles from the early twentieth century onward is trading post operator and retail market preference and demand, it is the hypothesis of this study that certain rug weaving categories (namely Storm Pattern, Sandpainting, Yei, Pictorial and - to a degree - Two Grey Hills pattern as well) may have other origins. It is also suggested that anthropological analysis will be productive of an enhanced understanding of these rug types, in comparison with the standard (i.e., outside the Navajo world) historical-developmental and economic explanations

A revised approach to certain, specific Navajo weaving styles can also have the advantage of employing Navajo-centered perspectives and points of view - as opposed to seeing this work of Navajo art, mind, and spirit as being solely caused and determined by forces in the Anglo world. In this more comprehensive and culturally faithful analysis, there is also an opportunity to revisit and re-consider standard gender characterizations about Navajo weavers and the range of cultural roles of these weavers.

MODELING THE EXTRACELLULAR MATRIX AS A DOUBLE NETWORK HYDROGEL.
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Rochester Institute of Technology

This project aims to study the structure-function relations in the extracellular matrix (ECM) surrounding cells. The ECM is able to bear stresses mainly due to its supportive nature. As a model system, our study focuses on the ECM in cartilage tissue which has two major mechanobiological components: a network of the stiff biopolymer collagen the flexible network of Proteoglycans. We will model this system as a double network hydrogel made of these interpenetrating networks and study the biomechanical response of the model to shear and compression forces, comparing our results with experiments done by our collaborators. This study will provide useful insights into the design principles for the ECM as well as biomimetic hydrogels that are mechanically robust and can, at the same time, easily adapt to cues in their surroundings which has vast applications including cartilage and bio-robotics.

THE FIRST USE OF THE MEASUREMENT OF THE ACCEPTANCE OF THE THEORY OF EVOLUTION SURVEY AT D'YOUVILLE COLLEGE.
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Evolution both explains what biologists have observed and predicts what biologists might observe through research. Because of its power to scientifically explain and predict, science organizations have called for a level of instruction on evolution that matches its central, unifying status in biology. The Measurement of the Acceptance of the Theory of Evolution (MATE) survey has 20 statements that a respondent evaluates (by agreement or disagreement). We transcribed the MATE into an online survey that was delivered to each student by e-mail. Five items intended to capture descriptive demographic information were added at the front of the MATE: gender, ethnicity or race, religious identity, academic major, and academic class. The average acceptance score for evolution was 72.7 (s=16.16, N=77) out of a possible 100 points. The three survey items where students were most undecided about evolution were: *The theory of evolution cannot be tested scientifically*, *The available data are unclear as to whether evolution actually occurs*, and *With few exceptions, organisms on earth came into existence at about the same time*. Statistical analysis found that the overall acceptance of evolution was dependent on the student's religious identity. By using this survey in Introductory Biology, we identified the evolutionary concepts that our Introductory Biology students have difficulty accepting and formed a strategy in teaching to address student misconceptions.

FUNCTIONAL DOMAINS OF FUN30 CHROMATIN REMODELER AND FUNCTION OF FUN30 IN REGULATING DNA DAMAGE RESPONSE.
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Dr. Xin Bi's lab at the University of Rochester has recently identified an intriguing functional interaction between the Fun30 chromatin remodeler and Rad5, a protein involved in an error-free DNA damage tolerance (DDT)

pathway. Fun30 deletion suppresses the defect of *rad5*Δ cells in resistance to replicative stress. We postulate that Fun30 inhibits a backup mechanism for responding to DNA damage caused by replicative stress. We have started to elucidate this putative alternative pathway. Moreover, we have also started to investigate how the three functional domains of Fun30 may participate in the regulation of cellular tolerance to genotoxic stress.

Fun30 is known to repress the expression of 260 genes in yeast. It is possible that one or more of these genes is involved in the putative DNA damage mechanism inhibited by Fun30. Of the 260 genes, eight have known functions related to DNA damage repair. We set out to test if deleting any of these eight genes prevents *fun30*Δ from suppressing *rad5*Δ sensitivity to genotoxic stress.

To examine the functions of Fun30 domains in DNA repair, we mutated or deleted the CUE motif and ATPase domain of Fun30 (carried on the plasmid vector pRS414). We then introduced the plasmids coding for mutated Fun30 alleles into *rad5*Δ*fun30*Δ cells to test for cellular tolerance to replicative stress. We found evidence that the Fun30-ATPase domain is required for inhibiting cellular tolerance to replicative stress. In contrast, we found evidence that the Fun30-CUE motif is not required. Interestingly, however, deletion of the CUE motif made *rad5*Δ cells more sensitive to replicative stress, suggesting that the CUE motif restricts the ability of Fun30 to inhibit the alternative DNA repair pathway.

For future work, we plan to test the role of Fun30-helicase domain in DNA damage response. We also propose to examine if the phosphorylation of Fun30 is involved in its function in regulating DNA repair. This work is significant because both Fun30 and Rad5 are evolutionarily conserved proteins; therefore, our research may yield findings that have potential for shedding light on the functions of homologous proteins in humans.

SYNTHESIS OF POLYARYL PRECURSORS FOR THE BOTTOM-UP FABRICATION OF GRAPHENE NANORIBBONS AND THEIR INCORPORATION INTO THE ORGANIC LABORATORY CURRICULUM.

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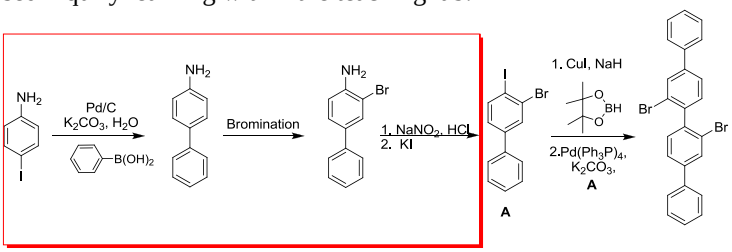
Nanotechnology is becoming increasingly important in scientific applications, especially in electronics. There is a need to determine nanochemical physical properties and how they affect function in nanstructures. A graphene nanoribbon (GNR) is an extremely thin, single layer of graphite less than 10 nm wide which has properties ranging from metallic to semiconducting depending on the edge patterns and width. Precise fabrication of width and edge requires bottom-up fabrication. Our approach utilizes dibrominated precursors which are prepared through basic aromatic chemistry. These polyaromatics can then be converted to potential nanoribbons of different widths and edge properties through surface-assisted coupling and subsequent cyclodehydrogenation.
These chemical reactions provide an excellent intersection of research and organic instruction. A three step sequence, part of a larger synthesis of a nanoribbon precursor, was incorporated into the second semester organic laboratory. Students received exposure to the Suzuki coupling, electrophilic aromatic substitution, diazotization, and Sandmeyer reaction within this sequence. Utilization of reaction optimization strategies and database searches provided a research-based inquiry learning within the teaching lab.



EXPRESSION OF ANOCTAMIN-2 IN ZEBRAFISH USING WHOLE MOUNT IMMUNOHISTOCHEMISTRY.

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Background: Von Willebrand's Syndrome is a clotting factor disease that is associated with an inactivating mutation in Anoctamin-2 (ANO2) in humans. Zebrafish express Ano2 at the mRNA level but protein expression has not been determined. Ano2 codes for calcium activated chloride channel, and is hypothesized to be expressed in

the GI tract, epithelial cells, habinula, and the olfactory system. The physiological connection between Ano2 and clotting is unknown. Localization of Ano2 expression will contribute to the basic processes of olfactory and GI physiology, as well as blood clotting.

Aim: Determine spatial expression patterns for Ano2 in zebrafish.

Methods: Zebrafish (2 and 5 days post fertilization (dpf) were fixed using 4% paraformaldehyde, permeabilized, and probed with anti-Ano2 antibody. A fluorescently labeled secondary antibody was used to visualize Ano2 immunoreactivity. Epifluorescence images were captured using Image Pro Plus, a cooled CCD camera mounted on an Olympus BX51 upright microscope with appropriate filters, and also with a Zeiss laser scanning confocal microscope. Two positive controls probed for Ano1 protein expression, and alpha tubulin. Negative controls omitted primary antibody, or both primary and secondary antibodies.

Results: Ano2 reactivity was observed in the olfactory system of 2 and 5 dpf embryos, neuromasts, and in an unidentified region in the central nervous system.

Conclusion: Ano2 appears to be expressed within the olfactory system of the zebrafish. Positive staining was strongest within the olfactory bulbs and hair cells, prompting future research that focuses on the physiological role of Ano2.

THE EFFECTS OF ADIPOCYTE MORPHOLOGY DUE TO MELANIN CONCENTRATING HORMONE AND ITS RECEPTOR CO-LOCALIZATION TO CAVEOLAE.

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Melanin-concentrating hormone (MCH) is integral to the proper regulation of appetite. MCH targets G protein-coupled receptors in the brain and peripheral tissues, including adipose tissue that contains MCH receptor 1. Mouse 3T3-L1 cells are a useful cell model for studying the development of fat because in a pre-adipocyte, fibroblast-like state they can be cultured indefinitely. When induced to differentiate, 3T3-L1 cells develop into rounded adipose cells with large lipid droplets and accumulate cholesterol in the plasma membrane. This cholesterol is important for the formation of lipid rafts, particularly caveolae; a region that we recently reported to be MCH receptor 1 rich. Our lab is interested in understanding how the differentiation of adipose cells influences MCH signaling and how MCH signaling influences the differentiation of adipose cells. Aim 1 of this study was to determine if cholesterol inhibitors could successfully deplete cholesterol from the plasma membrane in order to study MCH signaling in the absence of caveolae. Sucrose gradients were used to isolate caveolae from cells treated with or without methyl-b-cyclodextrin, and Western blots were performed to determine if caveolae were disrupted. Results indicate that pharmacological depletion of cholesterol was insufficient for disruption of caveolae and we recommend using RNAi specific for caveolin-1 for future experiments. Aim 2 of this study was to determine if MCH influenced cell size or the number and size of lipid droplets in differentiated 3T3-L1 cells. Over a period of 10 days in media containing 0-100 nM MCH, confluent 3T3-L1 cells were induced to differentiate using a cocktail of insulin, dexamethasone and IBMX. On Day 10, lipid droplets were stained with oil red. Images were taken on an inverted microscope and accumulated stain was quantitated using spectrophotometery. NIH ImageJ was used to analyze images for size and number of lipid droplets. Preliminary results indicate that MCH treatment decreases the final size of adipocytes, but that there were no detectable differences in overall lipid content.

MIGRATION AND SEGREGATION IN CELLULAR CO-CULTURES: ROLE OF DIFFERENTIAL CELL ADHESION AND ELASTICICTY.

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Binary systems of cell populations are of great interest in the biophysics of embryogenesis and tumor progression. During these processes, different types of cells with different physical properties are mixed with each other, with important consequences for cell-cell interaction, aggregation, and migration. For example, the mechanics and motility of cancer cells in populations of healthy cells has been observed to be dependent on the relative stiffness of the cells. Until recently, experiments and theoretical models of cell co-cultures have focused on two dimensional systems. However, this is not representative of physiological conditions cells where have to navigate 3D micro-environments. Motivated by this, we model cell confined co-culture systems in 3D using an active Brownian Dynamics simulation of a binary system of interacting, active and deformable particles. Our results will provide

insights into the influence of the difference in physical properties of the two types of cells, such as stiffness, adhesion, and self-propulsion on emergent collective properties such as cell aggregation and migration.

MITE REPELLENT FOR THE PROTECTION OF BEES BASED ON DIOXOLANES OF 2-HEPTANONE IN THE PRESENCE OF FORMIC ACID.

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The recent decline of honeybee populations has become a major threat to the diverse crops on which our agricultural systems depend. One prevalent theory as to the cause of this decline is the presence of mites in the hive. 2-Heptanone, is produced naturally by bees and at sufficiently high concentration would normally deter mites. However, it does evaporate within a few days under the conditions in the hive. To allow the repellent to persist for 42 days, equivalent to two honeybee reproductive cycles, we synthesized a solid, polyvinyl alcohol dioxolane and a liquid, glycerol dioxolane. These compounds slowly release the 2-heptanone in the presence of water and formic acid as catalyst. The release of the 2-heptanone from these dioxolanes, which took place in chambers simulating bee hive conditions, was monitored using gas chromatography.

DETENTION PONDS AS ECOSYSTEMS IN DEVELOPED LANDSCAPES: BIODIVERSITY AND THE EFFECT OF BIOTURBATING INVERTEBRATES ON THE BIOGEOCHEMISTRY OF MAN-MADE PONDS.

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Over the past 30 years, development in urban and suburban areas has led to an increased need for stormwater detention ponds. Detention ponds are important features of the urban landscape that provide flood control, reduce erosion and improve downstream water quality. Although they are less often recognized as ecological systems, they may support diverse populations of invertebrates that can alter their environment through feeding, excretion and bioturbation, including sediment reworking and resuspension. Therefore, invertebrates may play an important role in the capacity of detention ponds to remove nutrients and organic matter from stormwater. Surveying benthic invertebrate communities and studying their effect on sediment biogeochemistry may lead to a better understanding of how detention ponds function as ecological systems. Further, relating management practices, biological community structure and sediment biogeochemistry may lead to increased efficiency of detention ponds in nutrient removal from stormwater and the use of detention ponds for provision of multiple ecosystem services.

In a study conducted in Monroe County, NY we surveyed 10 detention ponds to examine physicochemical parameters and benthic invertebrate communities. We also conducted a microcosm experiment to examine the effect of larval *Chironomus dilutes* and *Lumbriculus variegatus* on sediment oxygen consumption as well as ammonium, nitrate and phosphate fluxes between detention pond sediments and the overlying water column. Additional response variables included sediment organic matter, benthic microalgal chlorophyll *a* and porewater nutrient concentrations. We chose two ponds that differ in management strategy and sediment organic content: one pond is highly managed by mowing shoreline vegetation and has low organic matter while the other appears more natural with abundant shoreline vegetation and higher sediment organic matter. Preliminary results suggest that benthic invertebrates have a strong influence on benthic metabolism, particularly soon after colonization of sediments. These results will aid in our understanding of how management practices and invertebrate community structure interact to determine pond biogeochemistry and ecosystem function.

CLIMATOLOGY OF LAKE ONTARIO LAKE-EFFECT SHORELINE BANDS: LAKE-TO-LAKE CONNECTION.

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Visible GOES satellite imagery was used to identify lake-effect events in the Great Lakes region during a 17-winter time period (1997/1998 through 2013/2014). This information provides an unmatched understanding of the frequency and variations of lake-effect events within the Great Lakes region and also provides insight into multi-lake lake-effect events, previously termed lake-to-lake events. The influence that upwind Great Lakes have on the development or intensification of lake-effect events over a downwind Great Lake is not well understood and remains a difficult operational forecasting issue. Using the winters of 2004/2005 through 2013/2014, two groups of events were identified when a lake-effect shoreline band existed over Lake Ontario. The first group included nearly 30 events with lake-to-lake bands extending from Lake Huron to Lake Ontario and a second group contained about 200 events with a shoreline band over Lake Ontario and no visible lake-to-lake band from Lake Huron present.

Northwesterly flow over three distinct areas of Lake Huron was found for the lake-to-lake group using backward air parcel trajectories from the HYSPLIT model and a much larger variation in flow directions, dominated by westerly flow over Lake Erie and south of Lake Huron was found for the non-lake-to-lake group. North American Regional Reanalysis (NARR) composite map analyses showed two distinctive patterns in sea-level pressure, 850mb temperatures and winds, and low-level specific humidity for the lake-to-lake and non-lake-to-lake groups. More comprehensive findings from the Great Lake lake-effect climatology, HYSPLIT trajectory analyses, and NARR analyses will be presented.

POINT CONTACT SPECTROSCOPY ON $FeTe_{0.55}Se0.45$, Pb, AND YFe_2Al_{10}: AN UNDERGRADUATE INVESTIGATION INTO QUANTUM CRITICALITY.

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A quantum theory of point contact spectroscopy (PCS) was recently developed as a potential filter for non-Fermi liquid behavior in correlated materials. Classically, PCS is an experimental technique which has been used for several decades to determine scattering information on normal metals as well as gap information on superconducting materials. The quantum theory of PCS for correlated materials suggests that a zero bias peak in the dI/dV spectrum can be associated with an excess density of states for non-Fermi liquids. The initial experimental approach to using PCS on YFe_2Al_{10} in order to try to detect quantum critical fluctuations in this material is presented.

THE EFFECTS OF OSMOLYTES ON THE STABILITY OF GNRA HAIRPINS.

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Osmolytes, which are small, chemically diverse, organic solutes, are an essential part of the cellular response to environmental stresses such as changes in temperature, pressure, and salinity. Although much is known about the effects of osmolytes on protein structures, the effects of osmolytes on nucleic acid structures, in particular the effects of osmolytes on secondary structure motifs, is generally less-well understood. Secondary structure motifs such as non-Watson Crick base pairs, bulged and mispaired nucleotides, and the loops of nucleic acid hairpins play important functional roles as metal binding sites, protein and drug binding sites, and participants in tertiary structure contacts. To begin quantifying the effects of osmolytes on nucleic acid secondary structure motifs, we are investing the folding thermodynamics of the stable GN(R)A hairpin loops of DNA and RNA in the presence and absence of a neutral cosolute (PEG 200) using UV-Vis and Circular Dichroism spectroscopy. We will present our current findings as well proposed future directions for this work.

CSTAR ANALYSIS AT DELHI UNIVERSITY, INDIA.

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Using the data received from the Chinese Small Telescope ARray (CSTAR), 70 stars from 2008, and 104 stars from 2010 have been analyzed. These stars have been put through a Fourier decomposition algorithm, in which the phased values are put into an average bin to help decrease the scattering of the fitted light curves. Research is still being done to help find the metallicities of multiple variable stars, specifically the RR Lyrae, and Delta (δ) Scuti Stars. There are 7 RR Lyrae variable stars from the CSTAR data, along with 8 δ Scutis. The newly found metallicities will be compared to other recorded RR Lyrae and δ Scuti data, to see how well the CSTAR data actually is. The metallicities will also be used to compare the different data sets from 2008 and 2010.

MODELING THE BLACK HOLE OF THE MILKY-WAY.

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The presence of a supermassive black hole at the Sagittarius A* branch of the Milky Way has been reported.

Its mass was determined to be equivalent to 4.31 million solar masses, from which its radius (event horizon, $R_{e,h}$) was calculated to 1.19E+07 km. These data are providing the basis for modeling the orbital properties below and above the event horizons. Attempts to determine the event horizon (radius) using relativistic Lorentz / Einstein transform and the model of identifying gravity as a bending of space failed in the studied examples. The discovery that gravity is anti-energy made the chosen approach is possible.

Modeling Black Holes has uncertainties since there is no agreement on their physical shape. Black holes may be closed objects, like the Sun, where all mass is confined into a globe surrounded in one plane by planets. Another possibility is in the form of a galaxy where the mass is in one plane around the center. Another possibility is that of a singularity, where the energy-mass is localized in a Bose-Einstein state. For convenience, the planetary model was preferred which was previously applied to the solar and planetary systems in general.

In planetary systems it is taken for granted that objects can be transferred between lower to higher orbits using appropriate launch-velocities. Such launch-velocities were calculated for modeled BH-radii. The calculations reveal that the calculated launch-velocities, VP, range from below to greater than the velocity of light, c, $v_r < c$, and $v_r > c$. Of course, the velocity v_e cannot exceed c. The distance, where reaches $v_e = c$, is referred to as the 'orbital event horizon' $R_{s,\,h.}$

In agreement with standard modeling, the location of the center of the black hole was set equal to zero. The center to event horizon distance was set equal to 1.0. This distance was divided into ten equal distances, and each distance was treated as the radius of an orbit, R_s, with values of 0.1 to 1.0. For calculations the actual mass and radius of the black hole were used. The calculated results were re-normalized to modeling parameters. This allows showing the modeling results in transparent presentations.

For inner orbits ranging from 0.1 to 0.3, the orbital event horizon, $R_{s,h}$ is less than the BH event horizon $R_{e,h}$ (1.0). At about R_s=0.40, the orbital event horizon, $R_{s,h}$, exceeds 1.0. This indicates that the orbit event horizon breaks the hole-event horizon. For R_s=0.95, $R_{s,h}$ is greater than 35 times the $R_{e,h}$ (1.0). Thus, the reach of the black hole exceeds the BV- event horizon $R_{e,h}$.

Orbital Periods were calculated. Within the black hole they increased from 0.23s for R_s at 0.1 to 4.1min at R_s=0.99. For orbital event horizons, $R_{s,h}$, the orbital periods increased from 0.25s at $R_{s,h}$ =0.017 to 190 hrs at $R_{s,h}$ =330. For electrically charged objects, decreases of orbital periods might result in photon emissions, similar to transitions in atoms from higher to lower orbits.

TUNING CHEMOSELECTIVITY TOWARD AN AFFORDABLE SYNTHETIC APPROACH TO AURANTIOCLAVINE.

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Aurantioclavine is a natural product isolated from *Penicillium aurantiovirens* that gained the interest of the synthetic community for its proposed role in the biosynthesis of the complex polycyclic alkaloids of the communesin family. Members of this family display notable bioactivities, including insecticidal properties and cytotoxicity toward leukemia cell lines.

Our interest in this important compound lies in its structural resemblance to tryptamine, a derivative of the amino acid tryptophan. Tryptamine is readily available and more than one hundred times less expensive than the starting materials used in the reported total syntheses of aurantioclavine. Therefore we aim to develop a rational reaction sequence to progressively transform tryptamine and access aurantioclavine synthetically. This approach, nevertheless, is bound to involve an "unfavored" cyclization in order to assemble aurantioclavine's characteristic seven-membered ring. We expect to tune the chemical selectivity of this process via the functionalization of the indole ring and pendant chain of tryptamine—altering the geometry and electronics of the functionalities involved in the cyclization. Our progress in these efforts will be presented.

APOPTOTIC INDUCTION OF HERBAL SUPPLEMENT EXTRACTS IN THE JURKAT CELL LINE.

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The use of herbal supplements has become more common in contemporary medical practice and treatment as a readily available homeopathic alternative to modern medicine. How these supplements function in cell pathways such as apoptosis may provide foundational information for treatments of diseases such as cancer and Alzheimer's disease that exhibit an abundance or lack of programmed cell death respectively. A process of screening commercially available herbal supplements and testing apoptotic activity was done to identify supplements of interest and evaluate their ability to induce programed cell death in the Jurkat human T-lymphocyte cell line. Four herbal supplement phosphate buffered saline (PBS) extracts of Andromax, Bee Vive, Brain Pep, and Blueberry Tea where shown to have marked apoptotic activity on Jurkat cells *in vitro* by trypan blue viable cell count, as well as morphological and Annexin V flow cytometric analysis. These extracts were shown to decrease cell viability when compared to PBS buffer controls as well as a decrease in viability when compared to treatment with St. John's Wort extract, a known herbal inducer of apoptosis. Furthermore, when analyzed by Annexin V binding and flow cytometry, cells treated with these herbal extracts demonstrated a characteristic apoptotic trend, supporting the conclusion that these supplements induce apoptosis. The results presented here suggest that these supplements, while sharing no common ingredients among each other or St. John's Wort, each have a component that stimulates apoptosis in Jurkat cells.

NANOPARTICLE PRODUCTION VIA MICROFLUIDIC DEVICES.

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Advancements in microfluidics (the study of how fluids and gases behave at the micro and nano-scale) have made it possible to produce devices with many biological applications. The production of nanoparticles of 10-100 nm in size using microfluidics is highly reproducible and easily affordable. Essentially, these devices contain channels (approximately 50 micrometers in depth and 60 micrometers wide) in a pattern that promotes the formation of solvent-buffer interfaces resulting in the formation of lipid nanoparticles. Stable lipids such as phosphatidylcholine (PC) dissolved in ethanol and fed through a microfluidic chip, in the presence of a simple buffer solution is just one method to produce lipid based nanoparticles. Pressure and particle physics within the device cause the lipids to self-assemble into a spherical shape. During this process, lipophilic and hydrophilic compounds can be incorporated into the liposome. Here we have used microfluidic technology to make nanoparticles and are now working on incorporating a lipophilic compound. Parthenolide has been shown to act as an anti-inflammatory, but nanoparticles have not been used as a mode of delivery. The next step is to test our nanoparticles *in vitro* as a method of delivery of anti-inflammatory therapies.

SOLUBILITY OF MINERAL SALTS IN BINARY SOLVENT SYSTEMS OF NONIONIC SURFACTANTS AND WATER.

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Polyethylene glycol (PEG) and many nonionic surfactants related to PEG are liquid at room temperature and possess benign properties including low vapor pressure, low toxicity, biodegradability, and high solvation power due to their amphiphilicity. We also observed an appreciable ability to solvate mineral salts in contrast to traditional organic solvents. Very little is known about the solubility of mineral salts in these surfactants. For these reasons we began a systematic solubility study of a variety of mineral salts in solutions of varying ratios of water and surfactant from neat surfactant to water rich compositions. Three different surfactant/water solvent systems were evaluated: PEG200/water, $C_{10}E_6$/water, and $C_{10}E_7P_2$/water. Solubility measurements were taken for NaCl, KCl, KBr, CsCl, K_2HPO_4 and K_2SO_4 using atomic absorption spectroscopy. The solubilities decreased with decreasing water content but remained appreciably high in the neat surfactants, on the order of 10 mmolal for K_2SO_4 to 1 molal for KBr. Some salt solutions underwent phase separation or formed gels at particular water content levels.

RESPONSE OF SONG SPARROWS (*MELOSPIZA MELODIA*) TO VARYING LEVELS OF ANTHROPOGENIC NOISE IN WESTERN NEW YORK STATE.

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Anthropogenic noise disturbance is a form of pollution receiving increased attention. Noise pollution can affect animals' fitness by hindering communication critical to mate attraction, territory defense and danger alerts. By degrading habitat quality, noise pollution can also decrease the amount of available suitable habitat. Anthropogenic noise, often characterized by traffic noise, occurs at high amplitudes and frequencies up to about 5 kHz. Animal vocalizations are adapted to efficiently communicate information in the environments where they are found. Birds are vocalizing animals, with many species having repertories of numerous songs and the ability to change song characteristics. Past studies of songbirds have shown that some common species change song characteristics to minimize the effects of anthropogenic noise. This study served to identify if these changes in song characteristics exist in Song Sparrow (*Melospiza melodia*) populations of New York's Genesee River Valley. From May to August 2014, 70 individuals were recorded at sites of varying background noise levels. Recording locations were chosen based upon habitat and proximity to roads and other human developments. Recordings were digitized and analyzed using Raven Pro to determine song characteristics. Statistical analysis of sound metrics may reveal adaptive responses of bird songs to anthropogenic noise. I hypothesized that birds singing in habitats with higher levels of background noise would change song structure in order to decrease masking by anthropogenic noise.

THE SEDIMENTARY RECORD OF LAKE LEVEL CHANGE: GEOCHEMICAL CLIMATE PROXY DEVELOPMENT IN THE MONO BASIN, CALIFORNIA.

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We are interested in how Mono Lake has changed over time, for instance lake level, and pH. We have very few tools to interpret these changes, in particular in the ancient lake (> 10 ka). This research is part of ongoing studies aimed at evaluating the viability of new geochemical proxies of Mono Lake level variability. The study had two primary goals: to evaluate geochemical retentivity of different textural varieties of carbonate precipitates (tufa) through analysis of modern samples; and to use previous findings to evaluate lake level change in chronologically-constrained tufas.

To be assured that measurements of ancient tufa preserve original concentrations, it is critical to verify that texturally well characterized samples routinely record primary elemental signatures. We received a collection of tufa samples that were collected for their textural attributes by Dr. Scott Stine of Cal. State East Bay. These samples had been analyzed previously for C and N isotopic compositions. The trace element concentrations we measured in the samples show a distinction between densely laminated forms of tufa and those with more friable, spongy textures. The data from the former textural variety are consistent with retention of original depositional elemental characteristics.

Previous work from our group established a link between lake level and lanthanoid element concentration. We used this relationship to investigate lake level change in a dated sequence of densely-laminated tufa samples from a single large mound. The elemental data are consistent with major fluctuations in lake level between ~40 ka and ~30 ka, and again after ~30 ka. Although the Ba concentration data are consistent with the same pattern, B appears to reflect more complex behavior.

ELECTRO- AND SPECTROELECTROCHEMICAL CHARACTERIZATION OF REDOX ACTIVE N-HETEROCYCLIC CARBENES.

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N-heterocyclic carbenes (NHCs) are widely used as organocatalysts for a variety of organic transformations. We investigate the influence of appended redox active groups on the catalytic activity of NHCs. Two different N-heterocyclic carbene containing *N*-ferrocenyl and *N*-mesityl substituents were synthesized. These complexes were characterized using ultraviolet-visible spectroscopy, electrochemistry, and spectroelectrochemistry. Currently, such NHCs are tested towards organocatalysis.

SEASONAL VARIATION IN PLASMA TRIGLYCERIDE LEVELS IN THREE SPECIES OF MIGRATORY SONGBIRDS.

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Neotropical migrants make the flight twice a year between the breeding grounds (North America) and wintering grounds (Central or South America). Birds require large amounts of stored fat is required to successfully complete migration. During migration, birds must avoid predation, face adverse weather, and find stopover sites with food adequate to support their needs. The breeding season also represents a large energetic cost for birds. Upon return to the breeding grounds following migration, males must find and defend territory from other males. Females incubate eggs and both males and females may participate in feeding young leaving less time to feed themselves.

Body condition and fuel deposition rates can be used to determine a bird's health and ability to complete migration, and also their energetic status during breeding. Migrants need high quality stopover sites in order to refuel after a strenuous flight and continue migration. Fuel deposition rate can indicate site quality because birds at a high quality site will generally have a higher rate of fat deposition than those at a poor site. One way to assess body condition and refueling rate is to measure the levels of certain plasma metabolites. Plasma triglycerides indicate fat deposition in birds and have been used to assess fuel deposition rates and habitat quality of stopover sites. Using plasma metabolites, fuel deposition rate can be determined in birds that have been caught only once.

The Braddock Bay Observatory is an important stopover site for birds along the south shore of Lake Ontario. Gray Catbirds, Song Sparrows, and Yellow Warblers were captured and banded at the Braddock Bay Bird Observatory in spring, summer, and fall of 2014. Blood samples were collected from the birds and the plasma was analyzed for triglyceride concentrations using colorimetric endpoint microplate assays. Plasma triglyceride levels and body condition will be compared among the three seasons for which plasma was collected. By comparing seasons we hope to identify times of the year where fuel deposition is low making access to food sources vitally important. Plasma triglyceride levels are expected to be lowest in the summer, when birds are feeding young or incubating eggs, and soon after birds complete a long migration flight. Levels will likely be highest in the period right before migration starts and during the recovery period after a migration flight.

Comparisons in plasma triglyceride levels will also be made between species. Song Sparrows and Gray Catbirds will likely stay low longer in the summer than Yellow Warblers, as the first two species will raise more broods and begin migration later than Yellow Warblers. During migration, Song Sparrows and Gray Catbirds will probably have lower triglyceride levels due to a shorter flight to their wintering grounds than Yellow Warblers. In the future, B-hydroxybutyrate and chronic stress measurements of these same birds will also be compared with triglycerides and across seasons and species to inform us about overall differences in fat utilization and health/stress levels of these birds across seasons. Ultimately we hope to gain a better understanding of seasonal changes in migratory birds and how different seasonal stressors may affect body condition.

BIOCOMPATIBLE BONE CEMENTS AS AN ALTERNATIVE TO MODERN METHODS OF BONE FRACTURE REPAIR.

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In the realm of bone fracture treatment, the use of Calcium Phosphate Cements (CPCs) to aid in bone augmentation and reconstruction has captivated many as the promising characteristics of CPCs can play a significant role in minimizing multiple invasive surgeries. Due to their biocompatibility and bioactive properties, CPCs are an excellent alternative to commonly used bio ceramics. CPCs are essentially a mixture of calcium orthophosphates that react in an aqueous/physiological medium at room/body temperature to form (precipitate) dicalcium phosphate dihydrate or Hydroxyapatite. The first objective of this research project is to analyze the characteristics of Hydroxyapatite Cement (HA) as a drug carrier and to synthesize a biocompatible wound dressing. Once combined, this may effectively accelerate the healing process. The second objective is to combine HA with chitin, a natural polysaccharide containing nitrogen, that induces human cells to promote the restoration of wounds, and enhances the healing process of wounds. The third objective is the synthesis a bioactive and biodegradable chitin derivative as a wound dressing, Dibutyryl Chitin (DBC), that can potentially be valuable when applied with the CPCs at the site of injury. By optimizing the properties such as setting time and the release rate will help attain a better understanding of the correct use of CPCs. The following are the results and discussion of this investigation and future perspectives.

USING TARGETED MOLECULAR IMAGING AGENTS (TMIAS) TO EVALUATE DIFFERENCES BETWEEN TWO- AND THREE-DIMENSIONAL CELL CULTURE CANCER MODELS.

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The goal of this research is to recreate and understand the three dimensional (3D) organoid which constitutes cancer, the King of the Maladies. Cancer cells are embedded in a matrix whose signaling may contribute to malignant progression of the cancer cells. To further understanding of cancer primary cells and metastases, the human lung adenocarcinoma cell line A549 and the murine brain endothelial cell line bEnd3 were cultured using traditional two-dimensional methods as well as several three-dimensional matrices including collagen type I, Matrigel, and Geltrex. An ever increasing body of literature indicates significant differences in cell morphology, gene expression, proliferation, migration and many other cellular properties between 2D and 3D cultured cells, with 3D culture more accurately representing that which is observed within live animal models *in vivo*. Fluorescent microscopy on a Leica TCS SP5 confocal microscope was used in conjunction with multiple fluorescent dyes including NucBlue, Tubulin Tracker Oregon Green, and Mitotracker Red, targeting the nucleus, microtubules, and mitochondria respectively. In addition, the targeted molecular imaging agent (TMIA) Cy5.5-RGDyK conjugate, synthesized at RIT, which specifically targets αvβ3 integrins, shown to be overexpressed on the surface of some cancer cell strains, was also employed. Our results show differences between the properties of 2D and 3D cell culture systems which may be important in the way cancer cells metastasize and spread throughout the body of a cancer patient. We also observed that the TMIA agents utilized penetrated 3D cancer models and stained cells buried inside the spheroid tumor model. We conclude that the use of 3D cellular models which mimic more closely in vivo tumors should facilitate development of TMIA's and result in molecules which target to metastatic tumors illuminating their presence, size, and structure thus allowing better treatment and enhanced cancer survival.

TRENDS OF INVASIVE *TYPHA* (CATTAIL) COLONIZATION FOUND IN SILVER LAKE FEN (OSWEGO COUNTY, NY).

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Invasive *Typha* (cattail) species have negative impacts for biodiversity of Great Lakes shoreline marshes. Unlike many wetlands that are invaded, Silver Lake is a peatland (intermediate fen). This site is notable for harboring one of the few populations of the New York State endangered bog buckmoth (*Hemileuca* sp1). The bog buckmoth relies almost entirely on the bog buckbean as its larval food source. The increased abundance of *Typha* in the Silver Lake peatland mat has the potential to eliminate bog buckbean and therefore jeopardizes the long term viability of bog buckmoth populations. Our objective was to quantify the early stages of *Typha* encroachment on the peatland mat in order to determine if detrimental consequence of *Typha* colonization were now apparent. We predicted that increases in live *Typha* will lead to an increase in dead standing *Typha* biomass. We then hypothesized that species richness will decline as *Typha* stems and biomass increase. We also hypothesized that as water depth increases species richness will decrease. Our data show that *Typha angustifolia* is the dominant invasive *Typha* at Silver Lake fen as indicated by stem counts and biomass measurements ($p < 0.0001$). Neither *Typha* dry biomass nor water depth had a significant effect on native plant species richness ($p > 0.05$). We also found that standing water depth was not related to *Typha* stem counts ($p > 0.05$). The lack of significance in our data was not surprising based on the early stages of the *Typha* colonization at Silver Lake. In the absence of adequate control, we expect *Typha* to continue to increase, depositing a mulch of *Typha* leaf litter that will inhibit native plant growth.

DEVELOPING A SYNTHETIC ROUTE TO CARAMBOXIN, A BIOACTIVE NON-PEPTIDIC AMINO ACID.

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Ingestion of *Averrhoa carambola*, more commonly known as star fruit, can be fatal to chronic kidney disease patients or results in symptoms such as vomiting, mental confusion, and seizures. Caramboxin has been recently identified as the neurotoxin that causes these adverse effects and its molecular structure has been determined to be an amino acid-like moiety resembling phenylalanine. Our interest in caramboxin lies on its orsellinic acid-like aromatic ring, a feature present in various medically relevant compounds. Given that the chirality of caramboxin has not been determined, the present project aims at its synthesis for structural confirmation and to access to large

quantities of this bioactive non-peptidic amino acid for biological studies. Furthermore, our synthetic route, which begins with aspartic acid, may provide a glimpse at how this molecule is produced in nature by *Averrhoa carambola*.

SPATIOTEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE ONTARIO PREY FISH.

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Fatty acid signatures (FAS) are currently used in food web studies to provide insights into long term feeding habits of predators based on the degree of similarity between their FAS and that of their prey. To date, FAS data of fish from Lake Ontario are limited and are required to better understand how FAS variation in prey fish affects top predators. In this study, three major prey fish (alewife - *Alosa pseudoharengus*, rainbow smelt - *Osmerus mordax*, and round goby - *Neogobius melanostomus*) were collected at three sites along the south shore of Lake Ontario (Olcott, Rochester, and Oswego) during the spring and fall of 2013. Using multivariate statistics, we will compare FAS among species as well as their spatiotemporal variation. These data will further our understanding of predator-prey interactions in Lake Ontario's food web.

PROBING THE MOLECULAR INTERACTIONS OF BOVINE GAMMA B CRYSTALLINS THROUGH NMR SPECTROSCOPY.

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Human eyes contain abundant amounts of crystallin proteins. Crystallins, when mutated, can aggregate, thus altering the transparency of the lens. Permanent crystallin aggregation can cause cataracts, underlining the biological relevance and importance of understanding the interactions between crystallins. Our research focuses on the Bovine Gamma B Crystallins (CRYGB) whose functions are dependent on their ability to efficiently scatter light. We have genetically engineered two versions of recombinant CRYGB proteins--one with a histidine tag and one without--and have successfully expressed them in *Escherichia coli*. Purification of CRYGB has been challenging and not without its caveats, but we have recently developed a working protocol for CRYGB purification using column chromatography. We have also obtained a 2D HSQC nuclear magnetic resonance (NMR) spectrum of His-tagged CRYGB; we propose that the His-tag may affect global folding and/or stability of the protein.

INVESTIGATING THE ROLE OF HIF-1□ IN THE UV-INDUCED KERATINOCYTE STRESS RESPONSE AND CARCINOGENIC TRANSFORMATION.

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The outermost part of the skin, the epidermis, provides an essential barrier to environmental agents, such as bacteria and yeast, and to the loss of water and solutes from the body. However, it is subject to injury from solar UV light. Exposure of epidermal cells, called keratinocytes, to high levels of UV light results in activation of programmed cell death, or apoptosis. Lower doses of UV irradiation induce cell quiescence, an anti-apoptotic state, and DNA repair. UV is also the carcinogen causing skin cancer.

Hypoxia-inducible factor-1alpha (HIF-1□) is a transcription factor capable of activating expression of genes promoting survival during hypoxia, and resistance to apoptosis. HIF-1□ expression has also been observed in many types of cancer cells. We previously observed the activation of HIF-1□ in UV-irradiated keratinocytes in culture, as well as in whole human skin. Further, we documented elevated HIF-1□ expression in non-melanoma skin cancers. These results suggest a role for HIF-1□ in the UV stress response, and in keratinocyte tumorigenic transformation.

In order to address these possibilities, we sought to reduce HIF-1□ expression in cultured keratinocytes following UV-irradiation, and in squamous cell carcinoma cells. To that end, we have transduced immortalized HaCaT keratinocytes, as well as squamous cell carcinoma cells (SCC-25) with human immunodeficiency virus-based vectors siRNA designed to target HIF-1□ mRNA, allowing for the examination of phenotypic changes associated with HIF-1 inhibition. We have also treated UVA-irradiated HaCaT keratinocytes with the HIF-1□ chemical

inhibitor YC-1, revealing an decrease in cell viability post-UV. These results support the hypothesis that HIF-1 upregulation after UV exposure inhibits apoptosis, promoting survival.

TERRITORIAL AND DEFENSIVE BEHAVIOR IN THE LARVAL STAGES OF THE EUROPEAN GRAPEVINE MOTH (TORTRICIDAE: *LOBESIA BOTRANA*).

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The European grapevine moth (EGVM) is a major pest of grapes in many regions of the world. It can be very destructive as the larvae feed on the buds and fruit. The EGVM larvae create small silken hammocks in order to designate an area to feed. Previous studies determined that high larval density resulted in high larval mortality, but did not determine the mechanism. This project focused on intraspecific competition between various combinations of larval instars. Results indicated that older residents were observed to have more complex and aggressive behaviors towards intruders, than younger residents. These behaviors increased the mortality rate in older instars. Results also indicated that territory had significant value, and older residents were more successful in defending their silken hammocks against invaders. Furthermore, if territory was not established, fifth instars were highly aggressive to each other as both were trying to designate their own territory and defend their food resource.

ANOCTAMIN 2 EXPRESSION IN ZEBRAFISH.

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Anoctamin 2 (Ano2) codes for a calcium activated chloride channel that plays a physiological role in olfactory signal transduction and blood clotting. Homologs of the anoctamin 2 gene and the anoctamin 2-like gene have been identified from sequence databases. Expression of Ano2 in the olfactory apparatus, habenula, and in photoreceptors has been reported but temporal expression and expression in other organs has not been reported.

Confirm Ano2 expression in zebrafish, and to determine spatial and temporal expression patterns.

Anoctamin 2 expression was assessed using reverse transcriptase PCR using RNA isolated from larva 4 and 18 days post fertilization (dpf) zebrafish. Amplicons from the RT-PCR were observed using gel electrophoresis.

Anoctamin 2 and anoctamin 2-like expression was observed in 4 and 18 dpf zebrafish.

These data are consistent with Ano2 expression in whole zebrafish larva at 4 and 18 dpf. Expression of Ano2 will be probed in adult brain, heart, GI tract, swim bladder, eyes, and skin.

THE ROLE OF *DNM1* IN MITOCHONDRIAL GENOME STABILITY.

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Mitochondria are essential organelles in eukaryotes. Known as the "power house" of the cell, mitochondria manufacture ATP which is required for the successful completion of many cellular processes. Mitochondria have individual genomes, separate from the nuclear DNA, which encode for proteins required for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) results in the loss of mitochondrial function which leads to neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene *DNM1* in maintaining mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. Dnm1p is a dynamin-related GTPase protein localized to the outer membrane of mitochondria. Mitochondria undergo a constant state of fusion and fission within the cell which allows for mitochondrial segregation during cellular division. Dnm1p is a key regulator of mitochondrial fission. Loss of Dnm1p leads to aberrant mitochondrial structures. The lab is interested in determining whether loss of the *DNM1* gene plays a role in mitochondrial genome stability. We observed in *dnm1*Δ mutants a 3-fold increase in spontaneous respiration loss which may be a result of altered mtDNA stability. Mitochondrial genome instability can arise via spontaneous point mutations or deletion events. Assays were done to measure the spontaneous point mutation rate between wild type and *dnm1*Δ mutant strains. Spontaneous point mutation rates were shown to increase in *dnm1*Δ mutants. The lab is currently constructing strains to determine the role of Dnm1p in direct repeat-mediated deletion events.

CONDITIONAL ENTROPY METHOD TO DETECT PERIODS ON VARIABLE STAR.

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We present a validation for a new period finding method based on conditional entropy to detect period of variable stars. We calculated the periods for fundamental mode and first overtone Cepheid on the OGLE-III catalog using the conditional entropy method and compared with the results published in the catalog.

The Conditional Entropy method (CE) is based on conditional Shannon entropy from information theory. The Shannon entropy measures the lack of information about a system. The correct period should minimize the entropy function. This method is an alternative to least squares and Fourier based methods

We present a comparison of the results from CE and OGLE. The CE method present some interesting result. On the major cases, it return the same period as OGLE while in another cases it returns one harmonic or a different period. To improve the reliability of results, a filter and a method to measure the significance of peaks in the periodogram is necessary.

The following steps for the project is develop a significance peak criterion based on analysis of variance to reduce the aliasing due to period harmonics and implement this method for multi-mode Cepheid.

ELECTROCHEMICAL CHARACTERIZATION OF TRIHEXYLTETRADECYLPHOSPHONIUM CHLORIDE AND DECYLMETHYLIMIDAZOLIUM CHLORIDE MEASUREMENTS IN MEOH.

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Ionic liquids are an exciting area of research since they encompass many of the ideals of the green chemistry initiative. They can be tailor-made through ion exchange to create a wide range of cation-anion ion pairs. Imidazolium (Im) ILs have been very widely studied using a host of experimental and theoretical techniques, particularly focusing on the C_2, C_4, and C_6 chain lengths. Less well studied are longer chain ($> C_8$) Im analogs. Comparatively, phosphonium ionic liquids (PILs) have received far less attention. One universal feature of ILs is their propensity to form extensively aggregated solvent structures. The purpose of our work is to determine the association constants of $P_{(14,6,6,6)}^{+}$ Cl^- and $C_{10}Im^+$ Cl^- in MeOH. We have used two approaches to measure association: Cl^- ion-selective electrochemistry and electrical conductivity. Solution concentration was measured from ~1 – 13 mmolal over a temperature range of 20.0 – 40.0^{o}C in 5.0^{o}C increments. We observe a systematic increase in conductivity as both temperature and solution concentration is increased. The Cl^- ion-selective electrode data was analyzed directly to estimate the equilibrium association constant whereas the conductivity data was analyzed in the framework of the "low concentration chemical model" (LcCM).

THE ROLE OF THE *VAN GOGH* GENE IN OLFACTORY CIRCUIT CONSTRUCTION IN *DROSOPHILA MELANOGASTER.*

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Diseases like malaria cause tremendous human suffering, and olfaction plays a key role in their spread by insects. Our goal is to elucidate the mechanisms of insect olfactory circuit development using the *Drosophila* antennal lobe (AL) as a model. In *Drosophila*, targeting of the dendrites of Projection Neurons (PNs) pioneer the olfactory circuit. We recently showed that Wnt5 acts as a repulsive cue to guide the dramatic rotational movement of the PN dendrites. Wnt5 is a member of the non-canonical Wnts, which play important roles in development and cancer. Despite their importance, the mechanisms by which they direct cell movements are unclear. To isolate molecules functioning downstream of Wnt5, I conducted a genetic screen. I found that the *Van Gogh (Vang)* mutant shows AL defects that strongly resemble those of the *wnt5* mutant. Vang, a tetraspanin, is a component of the planar cell polarity (PCP) pathway, which plays essential roles in cell movements. We hypothesized that *Vang* acts downstream of *wnt5* in PN dendritic targeting. We now show that the PN dendrites were displaced dorsally in the *Vang* mutant ($61.4^\circ \pm 2.6^\circ$, n=22, versus $30.1^\circ \pm 1.0^\circ$, n=22, in wild type, $p<0.0001$). We also show that the *wnt5; vang* double-homozygotes exhibited a *wnt5*-like phenotype. Collectively, our preliminary data support our model that *Vang* acts downstream of *wnt5* to guide the novel rotation of the PN dendrites during the development of the fly olfactory circuit. Ongoing experiments will further characterize the roles of *Vang* in *wnt5* signaling and PN dendritic guidance.

BIOLOGIC SIGNIFICANCE OF DUAL ORIENTED NTHI VACCINE CANDIDATE P6.

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Nontypeable *Haemophilus influenzae* (NTHi) or nonencapsulated Hi causes diseases such as pneumonia, bacteremia, meningitis and sepsis in adults. NTHi is also linked to 25-35% of the roughly 25 million annual cases (within The United States) of acute otitis media (ear infections) in children. Vaccines against encapsulated strains of *Haemophilus influenzae* have been proven effective; yet, no vaccines have been produced to protect against NTHi infection. The 16-kDa outer membrane lipoprotein P6 has been shown to be nearly homologous between NTHi strains, making it one of the leading vaccine candidates for NTHi. However, it was recently demonstrated, using flow cytometry, confocal microscopy, and other biochemical methods, that P6 exhibits dual orientation in the outer membrane of NTHi. Specifically, a small percentage of the P6 population faces out of the cell while a much larger percentage faces in toward the periplasm. These studies, however, were only performed on a single strain of NTHi, which was cultured in a laboratory under aerobic conditions. In order to gain insight into P6's *in vivo* orientation(s), similar studies were performed on multiple clinically-relevant strains of NTHi, as well as studies on P6 expression under different physiological pH conditions (which more closely resemble the environment of the ear).

SOLVATION DYNAMICS OF COUMARIN 153 IN BINARY SOLVENTS.

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Coumarin 153 (C153) is a prototypical molecular probe used in the determination of solvation dynamics because of its notable sensitivity to solvent environment. The luminescence properties and excited-state lifetime of this hydrophobic optical dye make it amenable to photon counting measurements. Moreover, C153 has been used extensively in the characterization of solvation and rotation dynamics of room-temperature ionic liquids (ILs). However, one of the problems with many ILs is that they readily absorb water and this exacerbates solution preparation due to air exposure. Additionally, ILs are often combined with an organic cosolvent to tailor the IL solution properties. Often, these organic solvents can contain significant amounts of water or are notoriously hygroscopic. The goal of this work is to characterize the impact of water on the solvation dynamics in using organic solvents that are commonly paired with ILs. C153 solvation in acetonitrile (ACN)/water and dimethylsulfoxide (DMSO)/water mixtures was determined by calculating the time dependent Stokes shift as a function of water mole fraction. The composition dependent solvation times typically follow solution viscosity. The magnitude of the dynamic Stokes shift is similar in both ACN/water and DMSO/water varies from ~ 50 – 400 cm^{-1} as water mole fraction varies from 0 – 1. Solvation times are less than 500 ps in both systems.

PREDECESSOR SNOW EVENTS ASSOCIATED WITH EXTRATROPICAL CYCLONES.

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During the winter months, the Great Lakes region is repeatedly affected by lake-effect snow events. These events often occur following the passage of a cold front, as a prevailing westerly or northwesterly wind sets up resulting in heavy accumulations to the east and southeast of the lakes. However, under certain environmental conditions, this paradigm can be reversed and cause lake-effect snow on the western sides of the lakes. One way in which this reversal is realized is when air ahead of a warm front of an approaching extratropical cyclone is cold enough as to allow the lake-effect snow to form under easterly flow. This predecessor snow event (PSE) is subsequently exacerbated by synoptic-scale precipitation associated with the approaching extratropical cyclone. The purpose of this presentation is to examine a PSE climatology and case study during the winter of 2013-2014 off Lake Ontario.

Five PSEs formed during the winter of 2013-2014 off of Lake Ontario. The characteristics associated with these PSEs such as distance from the extratropical cyclone, low-level environmental lapse rate, and snowfall totals varied widely. The 14 December 2013 PSE is highlighted in this presentation because it featured the most structured band of the five events. This PSE formed under easterly flow between the approaching extratropical cyclone to the

southwest and an Arctic anticyclone to the north and lasted for twelve hours. As this cyclone approached Lake Ontario, the inversion height over the lake decreased, weakening the PSE before being absorbed by the snowfall associated with the extratropical cyclone.

COMPARISON OF MOLECULAR AND MORPHOLOGICAL ANALYSES OF IGUANID EVOLUTION.

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Throughout the history of studying iguanid evolution, two competing theories have been in effect until recent advancements. To determine iguanid evolution, a phylogenetic tree constructed from morphological characteristics and a tree from molecular comparisons have proposed possible answers. Since early work in iguanid evolution, characteristics such as skeletal morphology, behavior, digestive tract, and mitochondrial DNA sequences have been used to determine evolutionary relationships of this diverse, monophyletic group. With the recent sequencing of mitochondrial and nuclear DNA from all iguanid species, evolutionary biologists can more accurately determine both gene and species trees and a consensus of relationships among iguanas. The morphological tree has proposed that the genus *Iguana* is a sister group to the genus *Cyclura* (rock iguana), when in fact *Iguana* (common iguana) and *Sauromalus* (chuckwallas) are sister groups instead. The sister group of *Ctenosaura* (spiny-tailed iguanas) has not yet been fully resolved, but it appears most closely related to the Galapagos genera *Amblyrynchus* (marine iguana) and *Conolophus* (land iguana). These differences seen in the molecular and morphologic trees are caused by homologous and analogous structures that have evolved in iguanas. The morphological similarities seen in *Cyclura* and *Iguana* arise from similar environmental conditions that select for the same anatomical feature.

THE ROLE OF THE NUCLEAR GENES *RAD1* AND *RAD10* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE.*

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Mitochondria are essential organelles in the cell. It is often referred to as the powerhouse of the cell because it produces much of the cells energy in the form of ATP. This energy is used to successfully complete many different cellular processes. Mitochondria have their own genome, separate from the nuclear genome, which encodes for proteins specifically for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) results in the loss of mitochondrial function which leads to neuromuscular and neurodegenerative disorders. To help prevent mutations in the nuclear genome, there are genes that express proteins involved in DNA repair mechanisms. For example, both the *RAD1* and *RAD10* genes are involved in the nucleotide excision repair (NER) pathway. NER is a repair mechanism that utilizes double-strand breaks and cuts out damaged portions of DNA and replaces it by copying the template strand. Specifically, Rad1p and Rad10p form a complex that shows endonuclease activity that promotes the 5' incision event in NER. Research so far has found that the Rad1p and Rad10p protein complex target lesion sites on nuclear DNA. Recognition of the damaged sites is very important in order for NER to be effective in DNA repair. This research focuses on determining the role of the nuclear genes *RAD1* and *RAD10* in maintaining the stability of the mitochondrial genome in *Saccharomyces cerevisiae*. To do this, the lab observes how the loss of the *RAD1* and *RAD10* genes plays a role in the stability of the mtDNA. An assay was done to measure the percent of spontaneous respiration loss in *rad1*Δ and *rad10*Δ mutants. We observed that neither *rad1*Δ and *rad10*Δ mutants showed a significant increase in spontaneous respiration loss compared to that of wild type. In addition to respiration loss assays, a direct repeat-mediated deletion (DRMD) assay was also used to determine if there was a change in the stability of the mtDNA. We found that neither *rad1*Δ and *rad10*Δ mutants showed a significant increase in mtDNA mutations. In the future, we are planning to do a third assay that monitors mtDNA stability in the presence of induced double-strand breaks called the induced direct repeat-mediated deletion (Induced DRMD) assay.

U.S.A. AND BRAZIL: HOW TO INCREASE THE VITALITY IN STEM FIELDS.

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Through the history of the United States we find many examples of scientists who changed the course of modern society. Scientists like Thomas Edison, Albert Einstein, Nikola Tesla, Maria Goeppert-Mayer, Richard Feynman, and many other geniuses. However, nowadays the number of students interested in the fields of science, technology,

engineering and mathematics (STEM) has decreased, as well as the number of teachers skilled in those subjects. To solve this problem President Obama has set a priority of increasing the number of students and teachers who are proficient in these vital fields.

The Brazilian government, also worried about the lack of professionals in these areas, has been strongly encouraging Brazilian students to start a career in the fields of STEM. There are several examples of new projects that the Brazilian Ministry of Education has approved. One of these projects, called "I want to be a teacher, I want to be a scientist", encourage high school students from public schools to start a career in teaching in areas with lack of professionals and scientific research.

This project aims to explore the methods that the United States and Brazil are using to increase the interest of students on STEM areas, based on the results reported by the Brazilian Ministry of education and by the American Department of Education.

EASURING MORPHOLINO OLIGONUCLEOTIDE EFFICACY WITH POLYMERASE CHAIN REACTION.

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Morpholino oligonucelotides (MO) are designed to anneal to pre-mRNA and disrupt RNA processing, ultimately eliminating protein expression. Splice altering MO induce excision of target exons and give rise to non-functioning protein. Morpholinos are easy to use, stable, and relatively inexpensive.

To study the role of the anoctamin 1 in the zebrafish gastrointestinal tract we used a splice altering morpholino to knockdown *ano1* mRNA expression. The primary objective for this work is to verify MO efficacy at the mRNA level. A Splice-altering MO was designed to excise exon 4. Therefore, the MO injected animals are predicted to express Ano1 lacking exon 4 that is 52 nucleotides in length. To measure MO efficacy mRNA samples were harvested from MO injected animals, cDNA templates were synthesized, and polymerase chain reaction was performed using primers that flank exon 4. PCR products were visualized on an agarose gel. Two PCR products, approximately 510 and 560 bp were observed when using mRNA isolated from 4 day post fertilization larva. Wild type controls showed only a single band at 560 bp. We repeated this experiment with animals of different ages to determine morpholino efficacy at each developmental time point.

Future studies will focus on using quantitative PCR to quantify the amount of wild type versus alternative spliced mRNA at each time point. We also plan to repeat similar experiments with a photo-activated morpholino to more selectively examine Ano1 function in the GI tract.

SYNTHESIS AND CYTOTOXICITY OF VARIOUS FERROCENYLATED GOLD(I) N-HETEROCYCLIC CARBENE COMPLEXES.

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Ferrocene-containing molecules have been shown to reduce a cell's ability to proliferate by catalyzing the formation of radical hydroxyls and reactive oxygen species, which can break down DNA. Au-containing *N*-Heterocyclic carbenes have been shown to have high specificity in combating cancer cell lines by working through a mitochondrial apoptotic pathway and inhibiting the activity of the selenoenzyme Thioredoxin Reductase (TrxR). These two anti-proliferative molecules were combined to evaluate the anticancer properties. Three ferrocene containing NHC-annulated metal complexes have been synthesized, and preliminary cytotoxicity studies were performed. In the future, the same pathway will be explored using slightly altered ferrocene groups containing 1,2,3, or 5 methyl substituents.

STUDIES TOWARDS THE TOTAL SYNTHESIS OF TROCHELIOPHOROLIDE A.

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Trocheliophorolide A is a natural product isolated from soft coral. It is an interesting synthetic target because it has biological activity against *Staphylococcus aureus* and *Baciliius subtillis*. We envision the synthesis of trocheliophorolide A as a convergent synthesis. A novel one-pot hydroboration-cyclization step is currently being

investigated as a means for the final coupling step in the synthesis. Progress toward the completion of each coupling unit will also be discussed.

ISOLATION OF A *slk19* ^{ts} STRAIN OF THE BUDDING YEAST S. *CEREVISIAE*.

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Slk19 was identified in a screen for genes necessary for growth in *S. cerevisiae* strains lacking *KAR3*. In strains of yeast in which both *SLK19* and *KAR 3* are deleted the cells are not viable (Zeng et.al.,1999). Cells deleted for *SLK19* only, remain viable when grown vegetatively but produce diploid spores when undergoing meiosis. Slk19p, along with the proteins separase (*Esp1*), polo-kinase (*Cdc5*) and Spo12, is a component of the FEAR pathway (Stegmeier et.al., 2002). This pathway helps to coordinate the timing of cell cycle events from anaphase to cytokinesis.

Havens et.al. (2010) demonstrated that Slk19p has functions during anaphase beyond its role in the FEAR pathway and also has a functional role with interpolar microtubules of the anaphase spindle. Richmond et. al (2013) have shown that Slk19p forms dimers that function as a "kinetochore glue" causing kinetochores to cluster together allowing faithful chromosome segregation during mitosis.

We used random PCR mutagenesis on the plasmid pCD1 which contains the *SLK19* gene in its entirety. Following mutagenesis, the PCR product was co-transformed along with linearized pCD1 into yeast cells deleted for both *KAR3* and *SLK19*. These cells are still viable because they contain a plasmid with the wild type *KAR3*. The resulting yeast transformants now contain the mutated *slk19* on a HIS+ based plasmid

Yeast transformants were screened for their ability to grow at 23°C, 30°C, and 35°C and for the ability to lose the *KAR3* plasmid. Out of about 2000 colonies, 1 is strongly temperature sensitive, at least while the mutant allele of *SLK19* is localized to the plasmid. We are in the process of integrating the mutant allele into the yeast chromosome by homologous recombination. Development of this strain will allow us to do a variety of experiments leading to elucidation of other pathways in which *SLK19* is involved.

DEVELOPMENT OF A RAPID SOIL PHOSPHORUS FIELD ANALYSIS METHOD AND APPLICATION TO ARCHAEOLOGICAL SITES.

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Phosphorus is often used as an archaeological indicator of human activity. Many elements areadded to the soil by pre-agricultural humans, but P is persistent and a sensitive indicator. In this study, we looked to develop a rapid extraction and testing method for P analysis that could be easily carried out in field with simple equipment and minimally hazardous reagents. Initial test development was completed with a well characterized soil. Replicate samples were extracted at room temperature with a 1 M sulfuric acid solution for 15 min. After dilution to bring solution concentrations into range, solutions were analyzed using the ascorbic acid method with a Vernier colorimeter. For this sample, precision was found to be 8% and accuracy against a boiling sulfuric acid digestion was found to be 80%. The method was applied to samples from the Sinking Pond and McKendry archaeological sites. Results found soil P to range from 113 mg kg^{-1} to 1010 mg kg^{-1}. Recovery accuracy was similar to the well characterized soil, but not as precise. This is likely due to the use of a measuring spoon, as opposed to an electronic balance, to measure an aliquot of soil for extraction, and variations in soil moisture of field soils. Despite the decreased precision in the field samples, the method represents an improvement of field analytical methods and may be a valuable real-time field mapping tool.

WHAT BIRDS SHOULD EAT AND WHY: NUTRITIONAL DIFFERENCES IN FRUITS AMONG SITES AND GROWING SEASONS.

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Migration is a physiologically challenging activity, and birds require large amounts of energy to successfully complete annual migration. The main source of energy for these birds in autumn is wild berries that are consumed

during short stopovers, during which the birds rest and replenish their energy stores before they continue on. In order to obtain enough energy to continue their flight, the berries ingested by birds must be high in energy, fat, sugar content, phenols and antioxidants, and low in fiber and water. The level of each nutrient may be affected by factors like growing conditions for any particular year, and could significantly impact the timing of the birds' migration. For instance, a drop in the energy content of fruits may require birds extend their stopover time in order to adequately refuel for the remainder of their journey. The goal of our study was to investigate nutritional differences between fruits collected during different growing seasons and from two different sites in the area. Our study focuses on wild fruits collected at the Braddock Bay Observatory, an important stopover site located on the south shore of Lake Ontario. We also collected fruits at Rochester Institute of Technology (RIT), approximately 15 miles south of Braddock Bay along the Genesee River corridor. Native and invasive fruits were collected in autumn of 2011, 2012 and 2013 and analyzed for energy, fat, fiber, phenolic content, anthocyanin content, antioxidant content and sugar content. Fruits from Braddock Bay were also compared with those found on the RIT campus, focusing on their energy, sugar, and fat levels. We predict that differences in temperature and rainfall during growing seasons will affect the nutritional quality of fruits. In addition, different sites may vary in terms of their nutrient availability due to different habitat types and soils, which could also impact the nutritional quality of fruits. Results from this study could be used to predict the impact of climate change and habitat alteration on the quality of stopover sites that are crucial for migratory birds.

PHOTOBIOSTIMULATION IN *C. ELEGANS* AS A MODEL FOR LIGHT THERAPY.

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Low-Level Laser Therapy (LLLT) is a developing therapeutic technique that has been gaining recognition in the scientific community in recent years. Previous experiments performed in LLLT research projects have been primarily mammalian and cell culture based. These experiments have produced results showing accelerated tissue repair. In this experiment, we introduce a new model, *Caenorhabitidis elegans,* a free-living soil nematode, to be used in LLLT research by testing the effects of exposure of the organism to various wavelengths and intensities of light commonly used in LLLT. *C. elegans* was shown to respond to photobiostimulation when exposed to specific wavelengths of Infrared light, 920nm-980nm, at an intensity of $5J/cm^2$. These responses include an 18-20% increase in growth rate and overall length and width of each organism. The cellular mechanism behind this acceleration of growth is unclear and as an excellent model for examining the interactions of cells and tissues on a molecular level; the introduction of *C. elegans* into the field of LLLT research will provide valuable insight into the cellular processes that produce this significant change in biochemistry resulting in accelerated tissue repair and growth induced by LLLT.

STUDIES TOWARD THE TOTAL SYNTHESIS OF APLYDACTONE: A MODEL STUDY.

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Aplydactone is a sesquiterpene natural product isolated from the sea hare *Aplysia dactylomela* that is found on the northern coast of Madagascar. Interest in synthesizing aplydactone is driven by its extremely novel and conformationally strained tetracyclic framework. Aplydactone's ring system has bond angles more acute than ever before seen for cyclobutane. Additionally, the carbon-carbon bonds in aplydactone's cyclobutane rings are reported to be longer than average carbon-carbon bonds. As such, the development and execution of a model study leading to the synthesis of this natural product will provide great insight into the compound's biomimetic pathway as well as strategies for the synthesis of similar structures.

DOMINANT BENTHIC COMMUNITIES FOUND IN 42 LAKES.

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The bottom sediments of most monomictic and dimictic lakes often have an amazing amount of"rarely seen" animal life. I used Ekman and Ponar dredges to collect bottom mud samples, from the deeper areas, of several widely distributed lakes. The mud samples were then sieved to separate the benthos (bottom organisms) from the muddy sediments. During the extensive lab and counting work I noted that, although each lake usually had a mix of different benthic organisms, one main group was usually dominate (numerically) over the other groups. This

work will show how that dominance may change in a variety of lakes sampled over a broad region.

My study involved 42 lakes (41 of which were in the USA), i.e., 29 lakes from New York State, 11 from the State of Wisconsin, 1 lake from the State of Michigan, and 1 lake (the most northerly) from the country of Iceland. The dominant four groupings found were from two types of fly larvae (chironomids and chaoborids), small oligochaetes, and tiny nematodes.

BIOASSESSMENT OF THE WATER QUALITY OF THE TIOUGHNIOGA RIVER IN RELATION TO SURROUNDING LAND USE, CORTLAND COUNTY, NY.

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The Tioughnioga River, a first order river of the Susquehanna River Watershed, flows through Cortland County, NY. The Tioughnioga has important local ecological, economic, and aesthetic use values, and flows to the ecologically impaired Chesapeake Bay Watershed. However, long-term studies of the Tioughnioga's water quality are lacking. Major water quality concerns of potential importance include nonpoint agricultural sources and inadequate rural septic systems. This study was undertaken to determine the current water quality of the East Branch of the Tioughnioga River and its tributaries in Cortland County, NY. Benthic macroinvertebrate (BMI) sampling was used to assess stream health. Techniques were derived from those used by the New York State Department of Environmental Conservation's Stream Biomonitoring Unit. Six sampling locations along the river were chosen using information from a limited number of past studies and by examining the surrounding land use. BMI samples were taken at the end of June, 2014, at each of the six sites along the river. Water quality, derived from the BMI samples, was assessed for each location. Three indices were used to analyze water quality based on the BMI samples: species richness, EPT (*Ephemeroptera sp.*, *Plecoptera sp.*, and *Trichoptera sp.*) richness, and percent model affinity. Species richness at the six sites ranged from 13 to 18, EPT richness ranged from 5 to 8, and percent model affinity ranged from 64 to 72. All index values were converted to a common water quality scale that ranges from 0 (meaning water quality is severely impacted by pollution) to 10 (meaning water quality shows no impact of pollution). Each of the six samples' indices indicated that the Tioughnioga is slightly impacted by pollution, with a mean water quality scale value of about 6. This study found that the waterways of the East Branch Tioughnioga River support ecological health and anthropogenic uses, but feature a slight negative impact of pollution. Varying land uses surrounding each sample site did not lead to differences in water quality, which varied very little among sites; in fact, the forested tributary of Maxon Creek featured the same average water quality value as downstream sites which border residential and commercial property within the City of Cortland. Continued attention to water sampling and pollution control will be needed to maintain the high water quality of the Tioughnioga.

ABUNDANCE AND DISTRIBUTION OF BLACK-LEGGED TICKS (*IXODES SCAPULARIS*) RELATIVE TO DEER EXCLOSURES AT RICE CREEK FIELD STATION, OSWEGO NY.

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Forests of Rice Creek Field Station (Oswego NY) contain populations of the black-legged tick (*Ixodes scapularis*). This tick is known to carry the spirochete *Borrelia burgdorferi*, the causative agent of of Lyme disease. Vertebrate hosts contract Lyme via a tick vector that introduces *Borrelia* during feeding. Previous work at RCFS during 2012 estimated a density of 500 adult, 51,000 larval, and 1250 nymphal black-legged ticks per hectare. Our objective was to continue surveying tick populations in an area of forest known to have high tick densities at Rice Creek. We also sampled inside and outside deer exclosures located in this forest. During September and October of 2014, we used two sampling methods to locate ticks, traditional drag sampling and small mammal trapping. Three 40 meter transects were arranged both inside and outside of a deer exclosure (n=6 transects total). In addition, 100 Sherman live traps were used to trap small mammals and examine them for ticks (n=50 inside and n=50 outside the deer exclosure). Body mass, number of ticks, and location of ticks were recorded for all trapped mammals. To date, a total of 6 ticks (1 nymph and 5 larvae) have been found using drag sampling. A total of 21 small mammals have been trapped (12 outside, 9 inside) including one flying squirrel (*Glaucomys volans)*, seven Northern short-tailed shrews (*Blarina brevicauda),* and 13 white-footed mice (*Peromyscus leucopus)*. Following examination of these animals, no ticks were located. Drag sampling of ticks over the summer indicates that tick populations were low at Rice Creek this year. However, this fall oak masting was evident and we expect both tick and mice populations to increase in the next few years.

A LOW FREQUENCY ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY STUDY OF THE FIRING TEMPERATURE OF REDART CLAY.

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Electron Paramagnetic resonance (EPR) spectroscopy is technique used to study materials with unpaired electrons such as paramagnetic transition metal ions. Low frequency EPR (LFEPR) is a form of EPR spectroscopy which operates at a frequency of 250 to 300 MHz instead of 9 GHz. LFEPR can accommodate samples several liters in volume, while EPR can accommodate samples of one ml at best. We are developing LFEPR to study the authenticity of large, intact ceramic samples with cultural heritage significance.

Redart clay is a plastic pottery clay commonly used for terracotta earthenware. It's deep red color is attributed to a 7% iron oxide (Fe_2O_3) content which causes it to possess an LFEPR signal. The LFEPR spectra of Redart clay samples fired at temperatures between 100 and 1200 ºC were studied at 250 and 300 MHz. Spectral peaks were characterized by their Landé g-factor (g).

We have discovered that the LFEPR signal of Redart clay changes with firing temperature. Between 100 and 400 ºC there is a narrow $g \approx 2$ peak which is attributed to either carbon centered free radicals which burn off as the temperature increases or radiation damaged f-centered crystallographic defects in the aluminosilicate lattice which are lost upon heating. A broad $g \approx 4$ signal from Fe(III) is present at all temperatures between 100 and 1200 ºC. This $g \approx 4$ signal is overwhelmed by a very large, broad $g \approx 2$ peak which appears between 900 and 1100 ºC. The 300 MHz LFEPR spectra allowed us to see the complete $g \approx 2$ broad peak. This component possessed some ferromagnetic properties which need further investigation. Based on this investigation, LFEPR can be used to characterize the firing temperature of Redart clay.

CLONING OF TRYPANOSOME LIPIN HOMOLOGUE FOR PROTEIN-PROTEIN INTERACTION STUDY.

Jennifer J. Taylor, and Michel Pelletier. Department of Biology, The College at Brockport, Brockport NY

African sleeping sickness is an insect-borne devastating disease caused by the parasitic protozoan, *Trypanosoma brucei*. It threatens over 60 million people and 70 million livestock in 36 countries of sub-Saharan Africa. The current treatment is very toxic and can be fatal to the host. Trypanosomes have a protein coat armor consisting of variant surface glycoproteins (VSG). Although there are over 1,500 genes encoding VSG proteins, only one is expressed at a time, allowing *Trypanosoma* to keep hiding in the body and build tolerance to current drugs. In trypanosomes, a large number of surface proteins with critical role in virulence such as VSGs are anchored to the plasma membrane via a molecule known as glycosylphosphatidylinositol (GPI), which is composed, in part, of phospholipids. Of great importance is the fact that, as opposed to other parasitic organisms, trypanosomes synthesize phospholipids *de novo*. This makes the trypanosome phospholipids biosynthesis machinery a very attractive target for new drug design. Our lab has identified and is investigating a lipin homologue (TbLpn). In trypanosome lipin catalyzes the dephosphorylation of phosphatidic acid (PA) to diacylglycerol (DAG), with a potential role in phospholipid biosynthesis. In order to gain insight into TbLpn functions, interacting proteins will be identified by tandem affinity chromatography. This poster describes the successful creation of a plasmid vector containing the TbLpn gene that will allow the identification of TbLpn binding partners *in vivo*.

ANALYSIS OF MOTILITY DEFECTS IN *CLAMYDOMONAS REINHARDTII*.

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Eukaryotic flagella and cilia are highly conserved organelles needed for cellular motility, fluid movement, sensory reception, and many other functions. Flagella are membrane-bound structures composed of a microtubule core arranged in a 9+2 ring on which are attached regulatory and motor components. Motility defects caused by a loss of regulatory or motor protein components have been shown to cause ciliopathies in humans. To identify novel regulatory and motor components needed to make a motile eukaryotic flagella, insertional mutagenesis will be performed on the model organism Chlamydomonas reinhardtii, a biflagellate protist. Motility mutants will be characterized for phenotype and the insertional locus will be identified. Better understanding of motility defects in C. reinhardtii will potentially lead to better understanding of human ciliopathies and the causes behind them.

PALLADIUM CATALYZED REACTIONS: A SEARCH FOR A GREENER OXIDATION PATHWAY.

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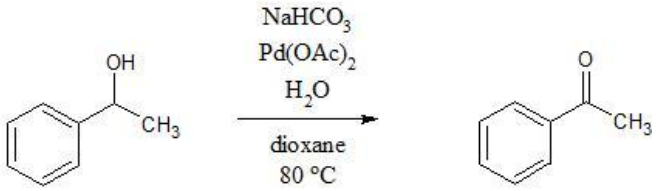
Oxidation of alcohols to aldehydes and ketones is one chemical reaction in particular that is used frequently in organic chemistry where green chemistry practices could be more readily implemented. Some widely used current methods for alcohol oxidation require chromate reagents or halogenated solvents and reactants which are particularly detrimental to both the environment and dangerous to the individuals who work with them in large scale reactions. Other reactions that avoid the use of these reagents, however, require carrying out reactions under oxygen rich conditions which are potentially explosive.

The proposed method investigated in this research took advantage of a transition metal catalyst, palladium acetate that, under mild reaction conditions, was able to carry out the oxidation of 1-phenylethanol. The chemical equation for which is shown below:



The goals at the beginning of the time of research were to carry out reactions using this method with high, reproducible reaction yields (above 95%) that followed green chemistry principles, and that were able to be implemented on an industrial scale. The realization of these goals were achieved through the optimization of reactant amounts, better understanding of the proposed catalytic cycle of this reaction, the ability to reuse the palladium catalyst, and the ability to potentially oxidize various alcohols using this method.

QUANTITATIVE PCR AND *IN-SITU* HYBRIDIZATION TO ASSESS THE IMPACT OF ENDOCRINE DISRUPTING CHEMICALS ON GERM CELL MIGRATION IN THE ZEBRAFISH.

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Animal development is a complex process that generates and shapes the varied tissues and organs present in the adult animal. This process is driven by countless proteins, cellular interactions and migratory events. As might be expected, if developmental processes are perturbed the impact on the developing and adult forms can be dramatic.

Chemicals found in the environment that can disrupt the normal functioning of the endocrine system, referred to as Endocrine Disrupting Chemicals (EDCs), have also been shown to disrupt normal developmental process. Specifically, the migration of Primordial Germ Cells (PGCs) to the genital ridge is required for normal gonadal development and requires that PGCs follow chemical cues given off by somatic cells of the genital ridge. This has been studied extensively in various animal models, including the zebrafish (*Danio rerio*), where proper formation of the gonad requires the presence of a specific number of PGCs (Siefgried et al., 2008). Failure of proper PGC migration in the zebrafish has been shown when EDC exposures occurred in the first 24 hours post fertilization (Wiley and Krone, 2002; Akbulut et. al., 2013). It is currently unclear how EDCs disrupt PGC migration.

Our studies are designed to investigate the expression of PGC migration specific genes following EDC exposure during the 24 hours post fertilization. Using quantitative PCR, embryos that were exposed to the endocrine disruptor Bisphenol A, are currently being analyzed to determine the expression profiles for two specific genes. These studies are ongoing and our data will provide information concerning which EDCs, and doses, likely cause problems with PGC migration. Altered PGC migration will be confirmed with *In-Situ* Hybridization (ISH) wherein we can visualize PGC migration after 24 hours of EDC exposure. ISH for PGCs is accomplished through the generation of riboprobes complementary to the *vasa* gene, which has been shown to be specifically expressed in germ cells (Braat et al., 1999). This two pronged approach should allow us to predict EDC impacts on PGC migration in the zebrafish. Follow up ISH experiments will confirm and provide a visual record of the impact of EDCs on PGC migration specific genes.

METALLOPHTHALOCYANINE-CATALYZED WITTIG OLEFINATION OF ALDEHYDES AND KETONES

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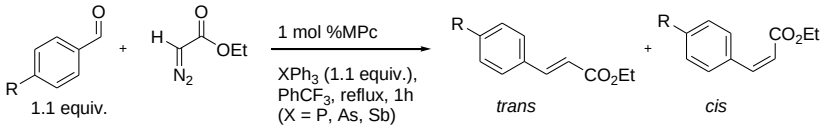
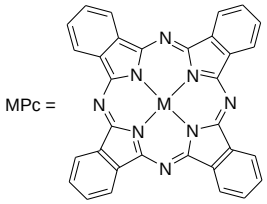
The Wittig reaction to synthesize olefins is a very attractive method in organic synthesis. Recently, this methodology has been achieved utilizing simple metal catalysts and diazo compounds in addition to a phosphine and an aldehyde. We report, for the first time, this chemistry being catalyzed by metallophthalocyanines. The following work investigates the use of a variety of these organometallic complexes to catalyze Wittig-like reactions from various diazoacetates. We also examine the influence of substitution on the aromatic ring of the aldehyde as well as various phosphines, arsines and antimony complexes. We have been able to exclusively synthesize the *trans*-olefins in excellent yields in short periods of time (1 hour).



>20:1 ratio *trans*: *cis*

R = H, Me, OMe, Ph, Cl, F, Br, CF_3, NO_2



M = Ag, Co, Cu, Fe, Ni, Zn

DISTRIBUTION AND ABUNDANCE OF RICKETTSIELLA IN TERRESTRIAL ISOPODS IN CENTRAL NEW YORK.

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Bacterial interactions within host organisms are an important and growing focus in biological research. Studying the intimate relationships between multiple bacterial species and their hosts answers many significant questions regarding each bacterium's effect on the other microbes in this shared environment and on the host organism itself. Terrestrial isopods are host to many genera of bacteria, including the genus *Rickettsiella*, a pathogenic bacterium that can be devastating to isopods, and *Wolbachia*, a fascinating bacterium capable of altering host reproduction. In this study, we explore possible interactions between *Wolbachia* and two strains of *Rickettsiella* and their possible effects their host isopods. 92 isopod DNA samples were obtained from local species at the Rice Creek Field Station in Oswego, New York, as well as the surrounding area. After PCR testing, we found that the pathogenic *Rickettsiella* is a relative common bacterium found within isopods in the area, while *Wolbachia* seemed to have a lower infection rate. Due to the low encounter rate of *Wolbachia* during the study period, it is possible that further testing is needed to have a strong confidence in the prevalence rate of *Wolbachia* and the effect of *Wolbachia* and *Rickettisella* with the respect to each other and to their common host. Future work will examine genetic diversity and host specificity of *Rickettsiella* in isopods in central New York.

SWALLOWWORT: ANALYZING THE EFFECTS OF A TWINING INVASIVE FORB IN TWO MONROE COUNTY PARKS.

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Pale swallowwort (*Cynanchum rossicum*) and Black swallowwort (*Cynanchum lousieae*) are now considered invasive within various plant communities throughout New York State. Both species have the ability to form dense, twining monocultures and may have varying effects on the success of other native and non-native species. In this study, we examined Pale swallowwort's effect on herbaceous richness and woody plant regeneration. In two regenerating forests, we observed the percent cover of pale swallowwort and other species in 1m² quadrats placed at 5m increments along 50m transects which we ran perpendicular from park trails. We found that swallowwort's

abundance and possible reproductive success seemed to result from distance from trail and light availability. In addition, only the quadrats with swallowwort abundance below 30 % contained more than 10 other species, whereas many plots within disturbed woodlands showed both low swallowwort abundance and low species richness simultaneously. Although quadrats showed wide variation in overall species richness, swallowwort seems to be a possible cause to poorer growing conditions for other plant species.

CO_2 FLUX FROM A SINGLE MAPPED SOIL UNIT UNDER DIFFERENT MANAGEMENT PRACTICES.

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Soil has been identified as a major source of CO_2 flux to the atmosphere, and has been increased by human activities that increase disturbance of the soil. Previous studies have shown that increases in disturbance from agriculture and related activities including fertilization and manure application are correlated with increased CO_2 flux from the soil surface. In this study, we investigate the rate of CO_2 flux from a single contiguous mapped soil unit. Within the unit, three management practices exist. A portion of the area is a tilled field that has been managed in this way for over a decade. A second area was previously tilled, but has been planted with alfalfa for the past 4 years with no tillage. The third area is wooded with mature maple trees. In each area, 8 sampling sites were established with 10 cm diameter by 10 cm high PVC sampling rings inserted 5 cm into the soil surface. Soil samples were collected adjacent to each of the sampling location for determination of soil organic matter content. A vented 1.5 liter chamber is coupled to the sampling rings and CO_2 concentration is determined every 15 seconds for 2 minutes. Soil temperature, air temperature and soil moisture were determined at each location for all sampling events. Results to date show a wide range of CO_2 flux rates that may be associated with ambient air temperature. Soil temperature does not fluctuate to that same degree as air temperature. Soil moisture varies by management type and by sampling date, but does not appear to be related to flux rates. Flux rates do correlate with management type and organic matter content. Contrary to previous studies, the forested site has the highest flux rate, followed by the alfalfa field with the tilled field having the lowest flux rate. This is the same relative relationship for soil organic matter with the forest having an average of 5.1%, the alfalfa field at 3.8% and the tilled field at 2.8%. These represent three distinct soil organic matter contents which appear to be the strongest influence on CO_2 flux rate.

THE SIGNIFICANCE OF THE NUCLEAR GENE, *SGS1*, IN MITOCHONDRIAL GENOME STABILITY IN *SACCHAROMYCES CEREVISIAE*.

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Mitochondria are essential organelles in eukaryotes. Mitochondria synthesize ATP, supplying the cell with energy necessary for metabolic processes, hence its nickname of the cell's "powerhouse". Mitochondria have individual genomes, separate from the nuclear DNA, that encode proteins vital for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) lead to several neuromuscular and neurodegenerative disorders due to the compromised stability of the mtDNA. This particular study focuses on a nuclear gene, *SGS1*, and its significance in mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. *SGS1* is a member of the recQ family of helicases and therefore aids in the unwinding of chromatin at the duplex as it prepares for replication.[1] Similar mutations in the human homolog of *SGS1* helicase lead to specifically, Bloom Werner and Rothmund-Thomson syndromes in humans.[1] Yeast lacking functional Sgs1p protein display hypersensitivity to DNA-damaging agents and hyper-recombination, as well as, exhibit signs of premature aging.[1] The quantitative impacts of *SGS1* mutations on mtDNA stability in budding yeast was studied via two genetic assays that measured spontaneous respiration loss and direct repeat mediated deletion. Budding yeast *sgs1*Δ display an ~2.2fold *increase* in respiration loss. From two independent isolates, *sgs1*Δ mutants have also shown an ~1.7 and ~1.5 *decrease* in mitochondrial homologous recombination, but ~2.4 and ~2.8 *increase* in nuclear homologous recombination. The nuclear data supports conclusions previously published. Our data shows that the presence of Sgs1p protein plays a role in mitochondrial genome stability.

CAN EASTERN BLUEBIRD NESTLINGS BE AGED ACCURATELY WITH GUIDES OF DIGITAL IMAGES?

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We examined the accuracy of age estimates produced from three different aging guides for Eastern Bluebird (*Sialia sialis*) nestlings. The "complete" guide presented digital images of dorsal and lateral views of the entire nestling from days 1 to 17 after hatching. The "wing" aging guide presented images of lateral views of wings and the "tail" aging guide presented dorsal views of tails for the same span of development. One randomly selected aging guide and one of 16 sets of 50 randomly selected images from a total of 596 images were randomly assigned to each participant (n = 39 participants resulting in 1,950 estimates). Differences in average daily age estimates among the guides were explored with a linear mixed model with each observer specified as a random variable. Differences in overall accuracy (± 1 day of actual nestling age) among the three guides and differences in the proportion of accurate age estimates for each day of development among the guides were evaluated with corrected Chi-square tests. There were no differences in average daily age estimates among the three guides. Overall accuracy differed among the guides ($p < 0.001$). Estimates generated by the complete guide (90.3% accurate) did not differ from those of the wing guide (88.2% accurate). Age estimates from the complete and wing guides differed from those generated with the tail guide (75.1% accurate). Generally, the proportion of correct age estimates decreased for older nestlings.

LOCAL MUSEUM SPECIMEN SCREENING FOR THE ARRIVAL OF *BATRACHOCHYTRIUM DENDROBATIDIS* IN CENTRAL NEW YORK.

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Chytridiomycosis, caused by the fungus *Batrachochytrium dendrobatidis* (Bd), is an emerging cutaneous, infectious disease that is causing die-offs of amphibian populations on a global scale. *Bd* has been found in local amphibian populations but the introduction date is unknown due to testing only recently beginning in 2012. The objective of my research was to examine historical collections of amphibian museum specimens captured in the local area of central NY, in order to identify when chytrid first started to infect the native amphibian populations.

The total number of samples that were taken from amphibian museum specimens collected locally in the last five decades is 109. There are two outliers from 1917, 12 samples are from the 1960s, 91 samples are from the 1970s and three samples from the 1980s. Specimens were obtained from the local museum collection at Rice Creek Field Station (RCFS) at SUNY Oswego. Associated data available for each specimen was recorded, including year of collection, species identification, location of collection, weather conditions, time of day, habitat, and overall health conditions at time of capture.

Epithelial cells were collected by swabbing specimens and the swab was then stored in ethanol. The DNA was extracted, amplified with PCR, and visualized using gel electrophoresis. Thus far, I have fully analyzed 30 samples which have all tested negative for the presence of *Bd*. These samples ranged from a collection date of 1964 to 1988, suggesting that chytrid arrived after the 1990s but more samples are needed to better pinpoint the arrival.

USING QPCR ASSAY TO DETECT THE *BATRACHOCHYTRIUM DENDROBATIDIS* IN THE HELLBENDER.

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Nowadays, hellbenders (*Cryptobranchus alleganiensis*) are facing the problem of wide population decline. One emerging disease, Chytridiomycosis, may be a critical cause for at least some of these population decreases. This study used a rapid assay for detecting the existence of *Batrachochytrium dendrobatidis* (the etiological agent responsible for the chytridiomycosis that infects hellbenders) from hellbender tail clip and swab samples. Real-time PCR has been applied to over hundred samples from New York and Pennsylvania in the northern Allegheny River watershed. Each sample was tested three times independently. For the tail clips, only a few of them turned out to be clearly positive, while most of the swab samples were confidently positive. Furthermore, the tail clips of some hellbenders whose swabs had been detected positive to *Batrachochytrium dendrobatidis* sometimes turned out to be negative, which may suggest the different detection ability of different sampling methods. Understanding the detection ability and distribution of *Batrachochytrium dendrobatidis* may help in planning reintroductions or population supplementation of this rare species.

MORPHOLOGY OF THE LARGE AND SMALL MAGELLANIC CLOUDS USING FUNDAMENTAL MODE CEPHEIDS.

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We study the structure of the Large and Small Magellanic Clouds using publicly available I- and V- band data on fundamental mode cepheids. We use the period-luminosity relationship to find the distances to individual stars, and combine that with RA and Dec to map the stars' locations in a three dimensional cartesian coordinate system. We model the structure of the galaxies by fitting both a plane and a triaxial ellipsoid, and find that the ellipsoid is more robust.

COMPARISON OF INSTRUMENTAL METHODS FOR MEASURING ENZYME ACTIVITY ON WOOD.

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Cellulosic ethanol has several advantages over starch-based ethanol as a biofuel. While it is easier to degrade starch, starch comes from the edible parts of plants, causing competition between food and fuel resources. The non-edible parts of plants (lignocellulose) therefore are a more abundant source of material for use in biofuels. Lignocellulose may also be used for bioproducts including pharmaceuticals and other specialty chemicals. Enzymatic breakdown of lignocellulose plant components comprises the first step in the production of cellulosic ethanol, potentially providing less environmental impact than degradation using mechanical means and/or harsh acids/bases. In order to refine our pool of candidate enzymes, however, we must be able to effectively analyze the effects of enzyme application on plant matter. This poster will describe efforts towards the evaluation of three different solid-sampling analytical methods (Thermogravimetric analysis [TGA], Fourier Transform Infrared Spectroscopy [FTIR], and Time of Flight Secondary Ion Mass Spectrometry [ToF-SIMS]) for the direct detection of small compositional changes in cellulase-treated wood samples. Preliminary results of the amount of cellulose lost after enzyme application will be presented alongside the motivation for the research.

AN Ap_nAase / mRNA DECAPPING NUDIX HYDROLASE FROM *MYCOBACTERIUM LEPRAE*.

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The diadenosine polyphosphatases (Ap_nAases) / mRNA decapping enzymes are a family of enzymes within the Nudix hydrolase superfamily. The diadenosine polyphosphatases from *Legionella pneumophilia* and *Bartonella bacilliformis* have been found to be important in each pathogen's ability to invade its host cells. An Ap_nAases / mRNA decapping enzyme from *Mycobacterium tuberculosis* has been characterized in our laboratory and a homolog to this enzyme has been uncovered in *Mycobacterium leprae*. We have cloned and expressed the *M. leprae* homolog and have determined that it is an Ap_nAase. While the enzyme has good expression, it is rather insoluble. We have lowered the expression temperature, lowered the concentration of IPTG, incorporated GroESL, and used a Rosetta cell line to try to increase solubility, but without much effect. We are still working to increase solubility, before we purify and further characterize the enzyme. If these *Mycobacteria* Ap_nAases / mRNA decapping enzymes are found to be involved in invasiveness and thus in virulence, then these enzymes could be potential novel antibiotic targets in *M. tuberculosis* and *M. leprae*.

ADSORPTION OF WATER ON POLY(METHYL METHACRYLATE).

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The generosity of the NOYCE Research Grant enabled me to focus on the study various polymers. The main goal was to study the molecular orbitals of Poly(methyl methacrylate) (PMMA) and calculate the energy band gap. This research moved forward into potential energy calculations for the polymer chains and water molecules. Calculations were done using HyperChem Professional 8.0, a sophisticated molecular modeling software. It can be observed that water molecules would take favorable positions when near dipole oriented PMMA. This method allows us to visualize how water molecules interact with PMMA polymer chains.

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School of Science and Mathematics, The College at Brockport, SUNY
programs and abstracts booklets

Dr. William Hallahan and the Biology Department, Nazareth College
easels for poster session

Dr. Michael Boller and the Biology Department, St. John Fisher College
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