



Summer 2010 URCPP Project Participants

Berea College Journal of Undergraduate Research Abstracts 2010



Annual Meeting of KAS, November 2010

INTRODUCTION

Editors: Ronald B. Rosen {Professor of Biology} & Abigail L. Wier {Senior Biology Major}

During the Fall 2006 Science Retreat, the science faculty at Berea College approved a student initiative proposed by Emilie Throop (B.A. Biology: Berea College; M.S. Ecology: Kansas State University) to publish abstracts of undergraduate research on an annual basis. The inaugural edition of the, “Berea College Journal of Undergraduate Research Abstracts Science Division 2006”, was published with Emilie’s assistance. In this fifth issue an effort has been made once again to include undergraduate research completed by students in disciplines outside the sciences. The common theme to the research represented by these abstracts is that the: (1) original proposal was peer-reviewed and/or (2) work was subsequently presented by undergraduates at an off-campus meeting. Though certainly not inclusive of all the undergraduate research conducted last year by Berea College students, this year’s journal contains 39 abstracts representing majors from ten different academic departments. These abstracts represent research completed on-campus with funds provided by Berea College’s Undergraduate Research and Creative Projects Program (URCPP 19 projects reporting), three externally funded (Research Corporation) on-campus projects, and senior research projects. Off-campus projects were funded by the Kentucky Biomedical Research Infrastructure Network (KBRIN) at the Universities of Kentucky and Louisville, and by various universities and research organizations around the country. The abstracts are published as submitted; editorial changes have only been made: (1) to the titles of each abstract by the editor to ensure consistency of style and (2) by department chairs. Much of this collaborative work was presented at off-campus meetings including the Annual Meeting of the Kentucky Academy of Science (29 presentations and 7 awards received). Off-campus presentations and awards are listed below each abstract where appropriate. It should be noted that a number of these projects were also presented on campus at the 11th Annual Undergraduate Research & Internship Symposium, October, 2010 (also indicated). Hopefully this publication will continue in the future and serve as a resource for: (1) Berea College’s efforts in admissions, development, and departmental self-studies and (2) students to locate interesting programs for future research and acknowledge their accomplishments.

ACKNOWLEDGEMENTS

This fifth edition of the, “Berea College Journal of Undergraduate Research Abstracts”, would not have been possible without the support of many people. I acknowledge Stephanie Browner, Academic Vice President and Dean of the Faculty, for providing funds to print hard copies of these abstracts. Also, many thanks to Berea College faculty for their contributions, and of course to their students for whose hard work this journal is a reflection. This year Abigail Wier, a senior biology major from Wilmore, Kentucky, took on the primary responsibility for putting

this publication together; she has done an outstanding job and we want to thank her for completing this task. Finally, we would like to thank all the off-campus mentors at the following research centers and universities for supporting Berea students during the summer of 2009 (number of Berea students in brackets): Cincinnati Children's Hospital Medical Center {1}, Fermi National Accelerator Laboratory and Illinois Accelerator Institute {1}, Iowa State University {2}, Mayo Clinic {2}, University of Kentucky {3}, University of Louisville {2}, Vanderbilt University {5}, and Virginia Polytechnic Institute {2}. A special acknowledgement is once again extended to former Berea College students and current trustees, Dr. Harold Moses (Vanderbilt University) and Dr. Chella David (Mayo Clinic), for continuing to coordinate and support research experiences at their respective institutions for Berea College undergraduates. It should be noted that a majority of the students who completed Mayo and Vanderbilt internships have continued their education at various graduate and professional schools around the country.

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DEPARTMENT OF BIOLOGY

Hormone Replacement Therapy in Turner Syndrome. CECILIA ALBERS¹, BARYNIA BACKELJAUW², IRIS LITTLE M.D.², PHILIPPE BACKELJAUW, M.D.², LESLIE AYENSU-COKER M.D.³, ¹Department of Biology, Berea College, Berea, Kentucky 40404; ²Division of Endocrinology, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio 45229-3039 ³Division of Adolescent Medicine, Pediatric and Adolescent Gynecology, Cincinnati Children's Hospital Medical Center, Ohio 45229-3039.

Turner Syndrome is the most common X chromosome mutation affecting 1 in every 2500 live born females. One of the symptoms of Turner Syndrome is lack of development of the secondary sexual characteristics due to insufficient production of estrogen by the ovaries. In order to allow development of these characteristics hormone replacement therapy (HRT) must be given. Currently there is no definite guideline for HRT use, and most treatment is based on expert opinion. The study looked at 22 patients who were treated at the Cincinnati Children's Hospital Turner Syndrome clinic to determine what kinds of treatments were being used and how the effectiveness of the treatment was being measured. It was determined that patients were being treated with HRT later than normal girls receive hormones through natural puberty and that their treatment was actually quite varied. No outcome measures were being used to assess treatment effectiveness. This study is the preliminary for a larger study whose ultimate goal is to create guidelines and outcome measures for use with HRT in Turner Syndrome patients.

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation - Health Sciences Section)

Cincinnati Children's Hospital Medical Center Internship

DEPARTMENT OF BIOLOGY

Nitric Oxide Synthase Isoform Expression in Regenerating *Axolotl* Salamander Retina CHARLI R. BOBBITT¹, JALICIA A. STURDIVANT¹, ELIZABETH A. DEBSKI², ¹Department of Biology, Berea College, Berea, Kentucky 40404, ²Department of Biology, University of Kentucky, Lexington, Kentucky 40506.

Axolotls, *Ambystoma mexicanum*, have the ability to regenerate central nervous tissue. For this reason they are used as models for retina regeneration. Nitric Oxide Synthase (NOS) expression was observed in the regenerated retina as a possible component of regeneration in axolotls. Since it has been proven that NOS is down regulated in axolotls during regeneration the question for this experiment was to find if all three isoforms of NOS (neuronal NOS (nNOS), endothelial NOS (eNOS), and inducible NOS (iNOS)) were also down regulated. For tissue samples, optic nerve, together with the ophthalmic artery was unilaterally transected. The axolotls were recovered and allowed to survive for varying time periods (particularly 6 weeks and 8 weeks post surgery). Control and experimental retinas were then harvested, mounted, and cryostat sectioned to view both control and experimental retinal tissues on a slide. Immunocytochemistry was used to view the Nitric Oxide Synthase (NOS) fluorescence. It was found that after injury and during repair eNOS was down regulated in Muller cells, inner plexiform layer (IPL), and outer plexiform layer (OPL) and nNOS is down regulated within the IPL, OPL, Muller cells, amacrine cells and the inner segments of the photoreceptors. Large unknown cells (possibly astrocytes, macrophages, or retinal pigment epithelium) were present in eNOS after damage and different types of nNOS positive Amacrine cells were also found. There is a continuous down regulation of nNOS and eNOS after repair is complete, but it is still unknown if these isoforms play a role in regeneration.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation - Cellular and Molecular Biology Section; 2nd place in undergraduate research competition)

University of Kentucky (KBRIN Funded Research)

DEPARTMENT OF BIOLOGY

Effect of Ouabain on Intracellular pH in Olfactory Neuroepithelial Progenitor (ONP) Cells Derived from Bipolar Subjects and Psychiatrically Healthy Controls. ADAM CHAMBERS¹, YONGLIN GAO², ZHENMIN LEI², CHENGLIANG LU², FRED J. ROISEN², RIF S. ELMALLAKH², ¹Department of Biology, Berea College, Berea, Kentucky 40404; ²Department of Psychiatry, University of Louisville School of Medicine, Louisville, Kentucky 40292.

Bipolar disorder is a psychiatric condition that manifests itself with extreme shifts in mood, activity, and energy. It is characterized by episodes of mania, when activity and energy increase to the point of causing sleep deprivation and mood becomes more irritable, and depression, when activity and energy decrease greatly and mood becomes despondent, separated by periods of relative normalcy. The pathophysiology is believed to involve abnormalities in the regulation of the transmembrane distribution of biologically active cations. Ouabain (OB) is a Na⁺-K⁺ATPase (sodium pump) inhibitor. The objective of this investigation was to determine if increasing the concentration of intracellular Na⁺ affects pH_i and, therefore, non-Na⁺-related cell functions and factors. No significant difference was found between bipolar ONP cells and healthy ONP cells at any concentration of ouabain (control, p= 0.541; 1μM OB, p=0.141; 10μM OB, p=0.229; 100μM OB, p= 0.220; 1000μM OB, p= 0.625). Also, no significant difference was found between the control and each concentration of ouabain in either bipolar ONP cells (1μM OB, p=0.632; 10μM OB, p=0.903; 100μM OB, p= 0.143; 1000μM OB, p=0.124) or healthy ONP cells (1μM OB, p=0.233; 10μM OB, p=0.737; 100μM OB, p= 0.316; 1000μM OB, p=0.077). It is possible that with a larger sample size that a difference may be significant between the bipolar ONP cells and healthy ONP cells at the ouabain concentrations of 1μM, 10μM, and 100μM. With more power behind each cell line, it is likely that the small differences present will become significant.

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation - Cellular and Molecular Biology Section; 3rd place in undergraduate research competition)

University of Louisville (KBRIN Funded Research)

DEPARTMENT OF BIOLOGY

The E3 Ubiquitin Ligase NEDD4L Interacts With and Polyubiquitinates Δ Np63 α Following Genotoxic Stress. ALISHA M. HOLMBERG¹, CHRISTOPHER E. BARTON², DEBORAH J. MAYS² and JENNIFER A. PIETENPOL², ¹Department of Biology, Berea College, Berea, Kentucky 40404; ²Department of Biochemistry, Vanderbilt-Ingram Cancer Center, Vanderbilt University, Nashville, Tennessee 37240.

The p63 protein, a homolog of the p53 tumor suppressor, is essential for epithelial differentiation and development. The *p63* gene has two promoters that drive transcription of proteins either containing (TA) or lacking (Δ N) an N-terminal transactivation domain. In addition, alternative splicing at the 3'-end can generate proteins with different C-termini (α , β and γ). Although numerous proteins can be expressed from the *p63* gene, Δ Np63 α is the predominant isoform observed at the protein level in human epithelia. In rapidly growing cells, Δ Np63 α abrogates the ability of *p53* to transcriptionally activate target genes that regulate cell cycle progression and apoptosis. In response to genotoxic stress, p63 is polyubiquitinated and degraded by the proteasome. Specific proteins responsible for the post-translational modifications of p63 that lead to its degradation following genotoxic stresses are largely unknown. Here we show that NEDD4L, an E3 ubiquitin ligase, plays a critical role in the polyubiquitination of p63. Utilizing a mass spec-based protocol, we identified NEDD4L as a novel p63 interacting protein in BPH cells. In vitro, we found that NEDD4L expression is sufficient to reduce p63 expression. Further, NEDD4L rapidly increases the amount of ubiquitinated p63 when DNA damage is induced by treatment with cisplatin, a chemotherapeutic agent. These findings serve as the preliminary groundwork for future studies aiming to determine the relative contribution of NEDD4L and other p63-interacting proteins, to the regulation of p63 protein levels in human epithelia.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation - Cellular and Molecular Biology Section)

Vanderbilt University Internship

DEPARTMENT OF BIOLOGY

Immune Response to Vimentin Peptides and the Role of Smoking in an HLA Transgenic Mouse Model of Rheumatoid Arthritis. KAYLA KINKER¹, VEENA TANEJA,² and CHELLA DAVID²,
¹Department of Biology, Berea College, Berea, Kentucky 40404; ²Department of Immunology, Mayo Clinic, Rochester, Minnesota 55905.

Rheumatoid arthritis (RA) is a systemic autoimmune inflammatory disorder that often leads to joint deformities. Although the etiology is unknown, both environmental and genetic factors are associated with development of arthritis. Antibodies to citrullinated peptides (ACPAs) are used as a diagnostic marker for RA. Smoking has been shown to enhance ACPA levels resulting in severe arthritis. Studies have suggested antibodies to citrullinated Vimentin peptides as the most accurate indicator of RA. Genetic predispositions to development of arthritis are suggested by associations with HLA alleles DR4 and DQ8. Mice lacking endogenous class II molecules but expressing the susceptible genotype develop collagen-induced arthritis (CIA) similar to humans. This model was used with HLA transgenic mice to determine the impact of cigarette smoke on immune response to recombinant Vimentin and its derived peptides. Mice immunized with type II collagen generate response to rVimentin and some of its peptides suggesting cross reactivity or spreading of response to other autoantigens. Mice immunized with CII generated a similar immune response. The mice exposed to cigarette smoke showed high T cell proliferation in presence or absence of antigens in vitro suggesting smoking leads to heightened immune response which could be due to an increase in the antigen presenting cells. Cytokine analysis showed female DR4 mice produced higher levels of IL-17 compared to males. This study will contribute to understanding the role of smoking in arthritis pathogenesis. CIA in humanized mice provides a good model to study interaction between environmental and genetic factors in development of RA.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation, Cellular and Molecular Biology Section - 2nd place in undergraduate research competition)

Mayo Clinic Internship

DEPARTMENT OF BIOLOGY

Localization and Characterization of Photoreceptors in the Cercariae of the Trematode, *Proterometra macrostoma*. KATHRYN MASSANA, ABIGAIL WIER, and MARC ROWLEY, Department of Biology, Berea College, Berea, Kentucky 40404.

The swimming behavior of the cercariae of the digenetic trematode, *Proterometra macrostoma*, changes in response to light. However these cercariae do not contain obvious eyes or eye spots. With the combination of swimming behavior assays and electrophysiology we were able to demonstrate the presence of photoreceptors in the transverse band of the cercarial tail that are sufficient for mediating this light dependent behavior.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation – Zoology Section; 1st place in undergraduate research competition)

Berea College URCP Funded Research

DEPARTMENT OF BIOLOGY

Effect of Reproductive Effort on CORT Response in House Sparrows and Tree Swallows. MARY BENSON¹, WHITNEY RÉMY², DAVID F. WESTNEAT³, ¹Department of Biology, Center College, Danville, Kentucky 40422; ²Department of Biology, Berea College, Berea Kentucky 40404; ³Department of Biological Sciences, University of Kentucky, Lexington, Kentucky 40506-0225.

Corticosterone (CORT) is a glucocorticoid found in many animals, including birds. It regulates a variety of activities, including breeding and parental care. We assessed the impact of brood size and parental workload on circulating CORT in two species; Tree Swallows (TRSW) and House Sparrows (HOSP). We predicted that TRSW would have higher baseline CORT levels than HOSP and females would have higher baseline CORT levels than males. After observing parental care three times throughout the nestling period, we captured the parents and drew their blood. We performed a 30-minute stress test to obtain a measure of peak CORT level. We found that peak levels were substantially higher than baseline in both species. HOSP had higher baseline CORT levels than TRSW; males and females had similar baseline and peak CORT levels in both species. Peak CORT increased with brood size and number of trips made per hour across both species. However, we had insufficient data to assess differences between the species or which of brood size or parental workload was more important in explaining CORT. Our results nevertheless confirm that CORT may interactively regulate elements of reproductive behavior.

11th Annual Berea College Undergraduate Research Symposium, October 28, 2010, Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation –Zoology Section)

University of Kentucky (KBRIN Funded Research)

DEPARTMENT OF BIOLOGY

Glucose Clamping in the Conscious Mouse. Jane Tonello¹, Dr. David Wasserman² and Dr. Owen McGuinness², ¹Department of Biology, Berea College, Berea, Kentucky 40404, ²Department of Biological Sciences, Vanderbilt, Nashville, Tennessee 37240.

Glucose clamping in mice is a procedure in which the arterial glucose in a conscious mouse is maintained or is altered to meet a pre-defined point by infusion of either glucose, insulin, or both. Various levels of glucose, insulin, or tracers can be clamped in the mouse to see any homeostatic responses to hypoglycemia or hyperglycemia. Glucose clamping involves three major steps in order for a successful procedure: insertion of catheters via MASAs, postoperative care of the mouse, and the actual clamping experiment.

11th Annual Berea College Undergraduate Research Symposium, October 28, 2010, Berea College, Berea, Kentucky (Poster Presentation)

Vanderbilt Mouse Metabolic Phenotyping Center Internship

DEPARTMENT OF BIOLOGY

The Role of T-cells and Cytokine Release in SEB, Staphylococcus Enterotoxin B Superantigen, injected HLA MHC Class II Transgenic Mice. MARAH HOLZ¹, DR GOVINDARAJAN RAJAGOPALAN PhD,² and CHELLA DAVID², ¹Department of Biology, Berea College, Berea, Kentucky 40404; ²Department of Immunology, Mayo Clinic, Rochester, Minnesota 55905.

Superantigens (SAGs), such as toxins produced by *Staphylococcus aureus* and *Streptococcus pyrogenes*, are potent antigens that cause overstimulation of the immune system and a cytokine storm by binding to the MHC class II molecule of an antigen presenting cell and the V β chain of a T-cell receptor, causing serious diseases such as Toxic Shock Syndrome (TSS). Three experiments were conducted by injecting HLA transgenic mice with Staphylococcus Enterotoxin B (SEB) to study the effects of cytokine release and the role of T-cells. Aim 1: Neutralize cytokines TNF- α and IL-17 by binding antibodies to their receptors and compare with AE^oDR3 $\alpha\beta$ transgenic control mice. Aim 2: Measure damage of the intestine of SEB injected IFN γ knock out mice compared to AE^oDR3 $\alpha\beta$ transgenic control mice by gavaging with Fitc conjugated Dextran and measuring presence of Fitc in the sera. Aim 3: Knock out CD4 and CD8 cells and observe their importance in SAg activation. It was found that mice with neutralized TNF- α cytokines lived longer and in some cases did not die, as compared with the IL-17 or control mice. SEB injected AE^oDR3 $\alpha\beta$ mice had a greater amount of Fitc present, signifying that the intestine of the AE^oDR3 $\alpha\beta$ mice was more damaged than the IFN γ knock out mice. Findings from these experiments show that TNF- α and IFN γ are damaging to hosts. Lastly, it was found that SAg activation still occurs even when CD4 and CD8 cells are knocked out, showing that CD4- and CD8- T-cells must be involved in SAg activation.

Mayo Clinic Internship

DEPARTMENT OF BIOLOGY

TGF- β Modulates Ras Pathway Alteration of Murine Neural Stem Cell Differentiation. S. LEE WARE¹, MICHELLE STARK², PING LI², AND TY W. ABEL², ¹Berea College, Department of Biology, Berea, Kentucky 40404; ²Vanderbilt-Ingram Cancer Center, Vanderbilt University, Nashville, Tennessee 37232.

Both rat sarcoma (Ras) and transforming growth factor beta (TGF- β) signaling pathways are essential to gliomagenesis. Complex genetic, physiological and environmental factors collectively shape their effects, as does the differentiation status of affected cells. To characterize their potential interactions, we developed a novel murine model of gliomagenesis using GFAP-directed Cre-Lox technology to activate oncogenic K-Ras (KrasG12D) and delete the TGF- β type II receptor gene (Tgfbr2) in neural stem cells (NSC) of the subventricular zone (SVZ). Cells were harvested from the SVZ of adolescent mice and grown as neurospheres (NS) *in vitro*. In NS multipotency assays, differentiated cell populations of a control genotype were strongly positive for glial fibrillary acidic protein (GFAP, an astrocyte marker) and weakly so for myelin basic protein (MBP, an oligodendrocyte marker) and neuron-specific class III beta-tubulin (Tuj1); differentiated NS-derived cells of an experimental GFAP-Cre/KrasG12D genotype were weakly positive for GFAP and Tuj1 with an inverse increase in MBP expression. When contrasted, these differing tri-lineage patterns suggest that expression of oncogenic K-Ras alters the differentiation capacity of NSC, restraining cell fate from neural and astrocytic lineages while promoting oligodendrocyte development relative to controls. However, this effect was abrogated by homozygous-Tgfbr2 deletion, exposing previously undescribed mechanistic interactions between TGF- β and Ras signaling pathways in NSC fate decisions.

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation – Cellular and Molecular Biology)

Vanderbilt University Internship

DEPARTMENT OF ECONOMICS AND BUSINESS

Financial Literacy Essentials. WINNIFRED ARTHUR, DANIEL BARASA, TRUNG A. HUYNH, CHRISTELLE LOUIS, and TRISH ISAACS, Department of Economics and Business, Berea College, Berea, Kentucky 40404.

The goal of the project was to address a campus need for financial literacy training materials by developing teaching materials tailored to Berea College students in order to help them make informed judgments and good decisions about the management and use of their money. The project consisted of research into (1) current programs and course offerings of other colleges relative to financial literacy courses/training for students, and (2) available information and teaching resources related to financial literacy, followed by development of financial literacy teaching modules for Berea College students. Four modules were developed: Cash Management/Budgeting, Paying for a College Education, Savings, and Debt. The modules include learning objectives, presentations, video clips, quizzes, and other learning materials. The materials these students developed were originally scheduled to be presented to first-year students in Fall 2010. Due to scheduling conflicts, the workshops are now scheduled for January 2011. The four students, along with the faculty mentor, presented this work during the 2010 ACA Summit.

ACA Summit XIII, October 22-23, 2010, Southwest Virginia Higher Education Center, Abingdon, Virginia (Presentation –Developing Financial Literacy Workshops for First-Year Students: Deploying Current Students to Meet Campus Needs)

Berea College URCP Funded Research

DEPARTMENT OF CHILD AND FAMILY STUDIES

Berea College Student Community Garden Project. SARAH MARTIN, KATHERINE SIMONSON and NEIL MECHAM, Department of Child and Family Studies, Berea College, Berea, Kentucky 40404.

Research looking at college students' dietary habits reveals that students do not include adequate amounts of fruits and vegetables in their diets. The Berea College Student Community Garden Project investigated how gardening might affect the eating habits of students over the course of the summer. Forty-one students participated in the project. Twenty-four students worked in either a community garden, or tended to their own garden plot while seventeen non-gardening students agreed to participate by providing information about their eating behaviors. Everyone was asked to report their eating behaviors 3 times throughout the summer (one survey each month for three months) using a Food Frequency Questionnaire (FFQ). These questionnaires covered 9 food categories plus 9 additional food preparation questions. Changes in eating behaviors of gardeners and non-gardeners were examined using independent T tests. Mean comparisons of the three rounds revealed that eating behaviors did not change significantly for either the gardeners or non-gardener indicating that spending time in a garden setting had no effect on the eating behaviors of Berea students during the summer.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

Berea College URCP Funded Research

DEPARTMENT OF CHILD AND FAMILY STUDIES

African American families and their heritage in Garrard County Kentucky. ALLYSE TAYLOR, STACEY ROBERTS, and JANICE BURDETTE BLYTHE, Department of Child and Family Studies, Berea College, Berea, Kentucky 40404.

Diverse parameters and methodologies foster the documentation of a community's heritage. Public records, historical documents, oral histories, physical structures, artifacts, and other evidence enable the reconstruction of this historical landscape. The purpose of this eight-week project was to enhance knowledge about African American families in Lancaster proper and rural Garrard County (GC) communities of Bryantsville, White Oak/Herrington Lake, Davistown, Boones Creek, Flatwoods, Paint Lick, and Scotts Fork/Buckeye. Primary and secondary documents were examined at Berea College, Eastern Kentucky University, the Kentucky History Center, and the GC Public Library, Board of Education and County Clerk's Office. Records place African slaves in GC in the 1790s and 1800s. A photographic portfolio documents extant cemeteries (Flatwoods, Buckeye, and Lancaster), church structures (Paint Lick, Flatwoods, Buckeye, Boones Creek, Davistown, and Lancaster proper), and the former home of an African American physician (Lancaster). Three different denominational groups were identified. Other documentation includes former non-extant sites of Rosenwald Schools (White Oak and Scotts Fork), and other one or two-room rural schools (Davistown, Boones Creek, and Flatwoods), along with two schools in Lancaster. Public records authenticate ownership of farms and other properties by blacks. Evidence reveals former teachers and principals in the segregated school system, former venues of businesses, and social organizations, e.g. lodges and service groups, established in the 1930s. Ten audio-recorded interviews, five male and female African Americans (birthdates between 1924 and 1980), offer insights about genealogy, family dynamics, work, play, education, military service, church, and other community traditions during the depression, segregation, and integration.

2010 Kentucky State Historic Preservation Conference in conjunction with the 14th Annual International Preservation Trades Workshop, October 21-23, 2010, Frankfort, Kentucky (Kentucky Places Session Three: Notes from the Field, Old Capitol Senate Chamber).

Berea College URCP Funded Research

DEPARTMENT OF CHEMISTRY

Nutrient and Waste Management at Berea College Farm: Analysis of Soil Samples for the Availability of Phosphorus. CASEY T. GRAY, VIOLET R. KATIYO, ALEXCIA MOORE, GRACE PAR, and PAUL C. SMITHSON, Department of Chemistry, Berea College, Berea, Kentucky 40404.

Berea College in south-central Kentucky operated from 1972 to mid-2010 a small industrial style swine production facility on the College Farm, which used anaerobic treatment lagoons to manage waste. The partially treated, nutrient-rich water has overflowed accidentally in the past, delivering excess phosphorus (P) and other nutrients to a downstream stock watering pond, leading to eutrophication. Our objective was to measure available P in the soil downslope from the waste lagoons using Kentucky Extension Service analytical methods. We collected 100 georeferenced topsoil (0 to 5 cm) samples from two small watersheds downslope from the swine house, one watershed receiving lagoon overflow and the other not. Soils were extracted with Mehlich III solution (0.2 M acetic acid, 0.25 M ammonium nitrate, 0.015 M ammonium fluoride, 0.013 M nitric acid, 0.001 M EDTA), filtered and analyzed for orthophosphate P by the molybdate blue method. Spatial analysis using ArcGIS software showed a “plume” of elevated soil P in the overflow drainage path, significantly higher ($P = 0.03$) than in the surrounding upland, and higher ($P = 0.02$) than in the drainage path of the unaffected watershed. Compared to earlier work at the site, our results showed a decrease in overall P concentration in the soil, perhaps due to improved waste management procedures adopted by farm management several years ago.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12–13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation –Chemistry Section)

Berea College URCP Funded Research

DEPARTMENT OF CHEMISTRY

Chemical and Phosphorus-31 NMR Characterization of Phosphorus in a Swine Facility Waste Stream. JAMES HAMBLIN, REBECCA LINVILLE, ZELALEM MEKONNEN, and PAUL C. SMITHSON, Department of Chemistry, Berea College, Berea, Kentucky 40404.

Runoff from fertilized crop fields or livestock facilities can cause surface water eutrophication via excessive phosphorus (P) input. The Berea College Farm swine production facility has historically impacted downstream water quality due to accidental overflows of the waste treatment lagoons. The fraction of residual P in the watershed that is in organic forms is of interest due to the higher mobility of organic P in runoff and percolating soil water. We sampled topsoil (0 to 5 cm) at 61 georeferenced locations in the small (0.7 ha) watershed receiving lagoon overflow, and analyzed for P in 0.25 M NaOH + 0.05 M EDTA extracts of the soils. NaOH-extractable P ranged from 30 to 3100 mg P/kg soil. Extractable P in soils within 2 m of the overflow drain path was not significantly different ($P > 0.05$) from P in upland areas of the watershed. Selected soil sample extracts were freeze-dried, dissolved in H₂O and D₂O and analyzed by P-31 NMR. Samples of swine manure, waste lagoon bottom sediment and downstream lake sediment were also extracted with NaOH-EDTA, freeze-dried and analyzed by P-31 NMR. For all samples, inorganic orthophosphate was the major form of P, with organic forms comprising a relatively small percentage of the total. Phytic acid (inositol hexaphosphate) was the most common organic P compound identified. Organic P compounds appear to be fairly rapidly mineralized to inorganic orthophosphate in this agricultural operation.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12–13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation –Chemistry Section)

Berea College URCP Funded Research

DEPARTMENT OF CHEMISTRY

Development of an HPLC Assay for the Analysis of Adducted DNA-protein Cross-links. CHIDO HAMBIRA¹, SARAH SHUCK², PHIL. KINGSLEY², LAWRENCE J. MARNETT², ¹Department of Chemistry, Berea College, Berea, Kentucky 40404. ²Vanderbilt Ingram Cancer Center, Vanderbilt University, Nashville, Tennessee 37232-0301.

The production of reactive oxygen species (ROS) is a normal cellular process, yet, accumulation of these ROS causes a variety of deleterious effects in the body. These oxyradicals react with cellular lipids and DNA to form a variety of products which include the mutagenic species malondialdehyde (MDA), and base propenal. MDA and base propenal react with DNA bases to form adducts 3-(2-Deoxy- β -D-erythro-pentofuranosyl)pyrimidol[1,2- β -purin-10(3H)-one (M₁dG), Oxopropenyldeoxyadenosine (OPdA), and Oxopropenyldeoxycytidine (OPdC). Previous studies have shown the *N*²-oxopropenyl derivative of deoxyadenosine, (OPdA), to be capable of covalently bonding with *N*-acetyl lysine. This suggests possible cross-linking of protein with modified DNA. These cross-links may obstruct DNA replication or increase mutation frequency, and may be relevant to the biochemistry of cancer. The major purpose of this project was to develop a High Performance Liquid Chromatographic (HPLC) method to characterize oligonucleotides and to employ this method to monitor the reaction of oligonucleotides that include an OPdA lesion with *N*-acetyl lysine at neutral pH. We developed a reverse phase HPLC method to separate oligonucleotides by the differences in their base chemistry using triethylammonium acetate buffer on a heated C8 column. The cross-link reaction was carried out and monitored using the established method Structural analysis of products was performed using mass spectrometry.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

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Berea College URCP Funded Research

DEPARTMENT OF CHEMISTRY

Histidine-Functionalized Water Soluble Nanoparticle as Mimics of Hydrolytic Enzymes. IMELDA HOT¹, HONGKWAN CHO² and YAN ZHAO², ¹Department of Chemistry Berea College, Berea, Kentucky 40404; ²Chemistry Department, Iowa State University, Ames, Iowa 50011.

Water-soluble nanoparticles were synthesized by covalent capture of surfactant micelles and were functionalized with Histidine ligands by the click chemistry. The UV-Vis spectroscopy was used to monitor the kinetics of the hydrolysis of a hydrophobic substrate (para -nitrophenyl acetate). The micelle showed ability to catalyze the para-nitrophenyl acetate when the concentration is below CMC. The UV results showed that it is possible to treat micellar catalysis by assuming that the substrate molecule is incorporated into the micelle independent of zinc.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

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Iowa State University Internship

DEPARTMENT OF CHEMISTRY

Struvite Precipitation in Anaerobic Swine Lagoon Liquid at Berea College Farm: Effect of pH and Mg:P Ratio. HAOTIAN Li, JAMES MCCARTY, IVAN TITALEY and PAUL C. SMITHSON, Department of Chemistry, Berea College, Berea, Kentucky 40404.

Berea College manages swine waste from the College Farm in open treatment lagoons, and occasional overflows have degraded downstream water quality, due in part to excess phosphorus (P) in the runoff. Lagoon liquid is also high in Mg^{2+} and NH_4^+ , and at elevated pH the insoluble mineral struvite ($MgNH_4PO_4 \cdot 6H_2O$) may precipitate. We investigated altering the lagoon liquid chemistry to enhance struvite precipitation and reduce runoff P concentration. We collected liquid samples from the swine waste lagoons on the College Farm, and stored them at 4 °C until analysis. We adjusted the pH of subsamples from 7.5 (initial pH) to 9.5 in 0.5 pH increments, and for each pH level we varied the Mg:P molar ratio from 1.6 (initial Mg:P) to 2.7 by steps of 0.3, for a total of 30 treatment combinations. Samples were allowed to stand overnight, were centrifuged for 15 min at 3000 RPM, and the supernatant analyzed for pH, Mg by atomic absorption spectroscopy, NH_4^+ by indophenol blue method, and orthophosphate P by molybdate blue method. There was little change in pH upon standing, but the measured Mg:P ratio increased substantially from the initial treatment ratios, suggesting that enhanced precipitation of struvite was occurring. The Mg:P ratio increased as both pH and nominal Mg:P increased. Increases were minimal at both lower pH and lower nominal Mg:P ratios, but increased noticeably as both pH and nominal Mg:P increased. We conclude that both addition of Mg^{2+} and increased pH will be required to increase struvite precipitation considerably.

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Berea College Chemistry Department Research Funds

DEPARTMENT OF CHEMISTRY

CD151 Clustering by the Monoclonal Antibody 1A5 Abrogates TGF- β 1 Induced Tumor Cell Migration. KELLY MOUAPI¹, WILL ASHBY², SHANNA ARNOLD³, and ANDRIES ZIJLSTRA^{2,3}, ¹Department of Biology, Berea College, Berea, Kentucky 40404; ²Department of Chemical and Physical Biology, Vanderbilt-Ingram Cancer Center, Vanderbilt University, Nashville, Tennessee 37232; ³Department of Cancer Biology and Pathology, Vanderbilt- Ingram Cancer Center, Vanderbilt University, Nashville, Tennessee 37232.

The leading cause of death in cancer patients is metastasis, the ability of tumor cells to disseminate from the primary tumor to a secondary site. Tumor cell migration is necessary for metastasis. The anti-CD151 monoclonal antibody (1A5) inhibits metastasis by immobilizing tumor cells *in vitro* and *in vivo*. Tumor cell immobilization is due to the clustering of the tetraspanin CD151 and its partner ALCAM (Activated Leukocyte Cell Adhesion Molecule) which prevents detachment from the extracellular matrix by inducing focal adhesions. The 1A5 immobilizes tumor cells because it mimics the natural macro-molecular clustering of the CD151/ALCAM complex at cell-cell junctions and promotes cell adhesion to the matrix. TGF- β 1 (Transforming Growth Factor beta 1) induces cell migration and has been shown to enhance metastasis. Thus, cell migration and metastasis stimulated by TGF- β 1, are inhibited by the clustering of CD151 and its binding partner, ALCAM.

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Berea College URCP Funded Research

DEPARTMENT OF CHEMISTRY

Constructing an Inducible System for the Study of Rod Cell Degeneration and Regeneration. PREMILA SAMUEL¹, MARIE A. FORBES², ANN C. MORRIS², ¹Department of Biology, Berea College, Berea, Kentucky 40404, ²Department of Biology, University of Kentucky, Lexington, Kentucky 40506.

Mutation in the rhodopsin gene is responsible for 25% of the autosomal-dominant inheritance of Retinitis Pigmentosa (RP), a group of retinal degenerative disorders. The primary goal of this project was to construct a spatiotemporally controllable system for the intent of manipulating the expression of specific mutant rhodopsin (Rho) genes within the retina. Zebrafish (neural retina is remarkably regenerative) will be the animal model for the system. The system was built based on the LexPR system. Constructs for the system were built to induce 5 specific rhodopsin gene mutations: P23H, T58R, R135L, K296Q, and P347S. A vector construct expressing a transactivating factor and the fluorescent marker protein, mCherry (mCh), was built in order to make a Driver transgenic line. 5 different types of Effector vectors, each carrying one of the transcriptionally silent mutant Rho genes were built as part of the system. The addition of mifipristone to the system will cause the LexPR sequence on the Driver vector to express the transactivating factor that can switch on the expression of gene sequences (Rho and mCherry genes) that had been placed under the LexOP promoters. LexPr sequence was placed under ZOPS (zebrafish opsin rod promoter) in the system to limit mCh and Rho expression within rod cells. The Driver and Effector lines will be crossed to make the various zebrafish transgenics that will be used to study rod cell degeneration and regeneration.

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Berea College URCP Funded Research

DEPARTMENT OF CHEMISTRY

Synthesis of Enantioenriched β -Ketoesters via a Ketene-Claisen Condensation. DOMINIC SUMA, PARKER SHULER and MARY ROBERT GARRETT, Department of Chemistry, Berea College, Berea, Kentucky 40404.

Many reaction pathways for drugs result in racemic mixtures of enantiomers. While one of these enantiomers is desired, the opposite is often functionless or even detrimental for the purpose of the compound. To obtain a product in high selectivity of one enantiomer over the other is desirable. Such selectivity has been proposed using the catalyst benzoyl quinine (BQ) via a ketene-Claisen condensation. The goal of this research is to synthesize the BQ catalyst (and derivatives thereof) and use them to optimize the reaction conditions for the synthesis of the enantioenriched β -ketoesters. When a nucleophilic catalyst (such as BQ) is added to a ketene, a zwitterionic enolate can be formed. Previous literature has documented trapping this enolate with a proton, or an electrophilic chlorine species. This research investigates trapping the enolate with an aromatic ester to arrive at the β -ketoester. Product isolation has been elusive, thus, this research focuses on the reactivity of a different acyl donor, anhydrides. After analyzing different catalyst loadings, a variety of ketene precursors, and electrophiles, it appears that the desired reactivity in the chosen solvent was minimal. More solvents and catalysts will be examined in the future.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

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Research Corporation (Cottrell College Science Award)

DEPARTMENT OF CHEMISTRY

Simulation of ^2H Static Solid- State NMR Spectra for the Determination of Influenza A M2 Transmembrane Peptide Side Chain Conformation and Dynamic. THEINT THEINT¹ and MEI HONG², ¹Department of Chemistry, Berea College, Berea, Kentucky 40404.; ²Department of Chemistry, Iowa State University, Ames, Iowa 50011.

The M2 protein channel of influenza A plays important role for viral infection and replication. The M2 channel is pH sensitive and opens at acidic pH. Amantadine drugs were widely used to treat influenza A virus. However drug resistance rate in human, birds and pigs has reached more than 90%. Elucidating the mechanism of the protein channel upon drug binding can aid in the understanding of channel mutations and the mechanism of drug resistance. As side chains of the channel backbone are important for enzyme active site chemistry and interaction with small molecules, we study methyl side chain conformation and dynamic by using ^2H solid-state NMR and matlab based spectra simulation program. The shape of the spectra depend on the motional state of the deuterons, therefore the parameter of the quadrupolar interactions are extracted by line-shape analysis.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation –Chemistry Section)

Iowa State University Internship

DEPARTMENT OF CHEMISTRY

New Synthetic Pathway to Imidazolium and Triazolium Carbene Complexes. JOSE VICTORIA, DHADON DHADON and ANES KOVACEVIC, Department of Chemistry, Berea College, Berea, Kentucky 40404.

N-heterocyclic carbenes have become increasingly popular ligands in recent years. They are found to be a good alternative for more traditional phosphine based ligands. They are fully tunable sterically and to some extent electronically. This research shows a new synthetic pathway to both imidazolium and triazolium carbene complexes. It involves room temperature C-H bond activation and $[\text{Ir}(\text{H})_2(\text{PPh}_3)_2(\text{Acetone})_2] \text{X}$ as a precursor. In addition, solvent choice determines binding position of the metal, giving a new synthetic pathway to both normal and abnormal carbenes.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation –Chemistry Section)

Berea College URCP Funded Research

DEPARTMENT OF ENGLISH, THEATRE, AND COMMUNICATION

Apollon – a Peer-reviewed Undergraduate eJournal in the Humanities. BISHEN SEN, MOLLIE HARRIS, ANDREW SMITH, AND JASON COHEN, Department of English, Theatre, and Communication, Berea College, Berea, Kentucky 40404.

Apollon, online at www.apollonejournal.org, supports undergraduate research in the humanities first by supplying a unique response to important intellectual challenges facing students in liberal arts institutions, and second, by answering the challenge of making the humanities more relevant, timely, and meaningful to students, institutions, and prospective employers. *Apollon* works because it provides a digital humanities model for disseminating and emphasizing undergraduate research in liberal arts and humanistic educations; further, it invites undergraduates from collaborating institutions to participate in their own professional and intellectual development by reviewing their peers, and directing every phase of the processes of academic publication from submission through production and distribution. In sum, as an eJournal project, *Apollon* elevates the visibility of undergraduate research in the humanities in smaller schools by providing an excellent outlet for emerging research as well as promoting the critical skills associated with producing a journal.

Public presentation: online at www.apollonejournal.org

Berea College URCP Funded Research

DEPARTMENT OF ENGLISH, THEATRE, AND COMMUNICATION

Designing an Appalachian Literature Anthology. SAMANTHA COLE, KATHERINE EGERTON, and MORGAN SMITH, Department of English, Theatre, and Speech Communication, Berea College, Berea, Kentucky 40404.

Lookout: An Anthology of Contemporary Appalachian Literature is designed to introduce the reader to the work of approximately twenty-five contemporary Southern Appalachian fiction writers and poets. For each author, in addition to a short story or a selection of poems, we will present a biographical sketch and a brief annotated bibliography of relevant primary and secondary sources for further reading and research. For faculty designing courses, *Lookout: An Anthology of Contemporary Appalachian Literature* will provide a range of excellent contemporary selections as well as biographical information, suggestions for further reading, and guidance for student research. This anthology can be useful for both courses in contemporary regional literature and for overall overviews of the field. It may be used as the only required text, in conjunction with other assigned books for class assignments, and as a quick guide for students to use to decide upon authors to select for individual class presentations or papers. Regardless, this anthology will give students and teachers an excellent overview of this dynamic and diverse field. We also hope that high school teachers throughout the region will use this anthology to find works and writers to teach in their classrooms, creating more readers who will seek out Appalachian literature on college campuses, through the regional journals, and beyond.

Now under contract with the University of Tennessee Press for publication in 2012

Berea College URCP Funded Research

DEPARTMENT OF HISTORY

Preserving the History of Lincoln Institute. TRISTON JONES, SHERRI JENKINS, and ANDREW BASKIN, Department of African and African American Studies, Berea College, Berea, Kentucky 40404.

Lincoln Institute, created by Berea College, located near Simpsonville, Kentucky, became a legal entity on January 17, 1910. Until 1966, it was more than the only option for many African Americans who desired a high school education in Kentucky; it was their home. Unfortunately, one day all Lincolnites (former students and employees) will be dead. When this eventually occurs, there will be no one to tell their stories about life at Lincoln Institute; their voices will be silent. Two students (Sherri Jenkins and Triston Jones) and I used an Undergraduate Research and Creative Projects Program (URCPP) grant to spend eight weeks in the summer of 2010 collecting and preserving the memories of the African Americans who either attended or worked at Lincoln Institute before their voices go silent.

Triston, Sherri and I traveled to locations in Kentucky and Indiana and interviewed more than thirty Lincolnites in either group or individuals sessions. The interviewees spoke about why they attended Lincoln Institute; memories of specific teachers and classmates; what they felt about Lincoln's closing; and what the school means to them in 2010. Usually, the interviews ended with the singing of the school song. In addition, at the bi-annual Lincoln Institute Reunion held on July 9-11, 2010 in Simpsonville and Shelbyville, we videotaped the major activities (memorial service, banquet and worship service) and interviewed more Lincolnites.

Because of our efforts, future researchers of Lincoln Institute will have more than written sources to examine its importance to African Americans. They can go to Berea College's Special Collections and listen to and look at the facial expressions of African Americans most directly affected by the school explain why Lincoln Institute was still "first place in their heart" many years later.

Berea College URCPP Funded Research

DEPARTMENT OF MUSIC

Modern Performance Editions of the Chamber Music Compositions and Pedagogical Music Instrument Method Texts of Jean Baptiste Schiltz (n.d.) (2010). CHARLES TURNER, NEIL MECHAM, AMBER PEARCE, and ERIK KING, Department of Music, Berea College, Berea, Kentucky 40404.

The purpose of this research is to present surviving chamber music compositions and pedagogical method texts of mid-nineteenth century Parisian musician, composer, and pedagogue Jean Baptiste Schiltz (n.d.) Written for early orchestral woodwind and brasswind instruments during the mid-Nineteenth Century, Schiltz's compositions and texts provide rare examples of orchestrational and pedagogical practices of French Grand Opera composers who were the most aggressive and innovative in the acceptance and orchestration of the new instruments. Throughout Schiltz's texts and chamber music, his orchestrations of early instruments are unerringly idiomatic with regard to use of key, register, articulation, and style; displaying a mastery of the characteristic strengths, weaknesses, versatility, and possibilities of pre-modern wind and brass instruments of the early modern orchestra. The edited musical examples of the texts are presented in modern pedagogical method text format with English translations of the original French instructions. The edited chamber brass instrument compositions are presented in a modern music full score format, with accompanying individual parts for performers of each of the instruments. A brief biography of Schiltz is included in each modern edition.

Berea College URCP Funded Research

DEPARTMENT OF PHYSICS

Copper-Based Superconductors. TOMMY BOYKIN, ROHAN ISAAC, TYLER VANOVER, and AMER S. LAHAMER, Department of Physics, Berea College, Berea, Kentucky 40404.

The $Y_3Ba_5Cu_8O_7$ (Y358), $Y_1Ba_2Cu_3O_7$ (Y123), and $La_1Ba_2Cu_3O_7$ (La123) superconductors have been synthesized using the solid state method. X-ray diffraction was used in the crystal structure identification of these compounds. Meissner effect was also used as a preliminary test of superconductivity. Interestingly, the X-ray diffraction patterns for the Y123 and Y358 were identical as was reported. Heating of the Y123 superconductor under the flow of oxygen increased the amount of oxygen. Other results will be presented.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation –Physics and Astronomy Section)

Berea College URCP Funded Research

DEPARTMENT OF PHYSICS

Synthesis of Iron-Germanium. ROHAN ISAAC, TYLER VANOVER, TOMMY BOYKIN, and AMER S. LAHAMER, Department of Physics, Berea College, Berea, Kentucky 40404.

The many phases of the half-metallic compound Iron-Germanium (FeGe) are studied when they are synthesized under both argon and vacuum. It is noted that heat treatment plays an important role in determining what phases of the compound are found. We note the difficulty of obtaining a single phase sample of FeGe that is relatively stable. We observed the phases FeGe, Fe_{1.4}Ge, Fe_{1.67}Ge and FeGe₂.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation –Physics and Astronomy Section)

Berea College URCP Funded Research

DEPARTMENT OF PHYSICS

The Importance of Glia in Chemosensory Modulation of Respiration. HODARI-SADIKI JAMES¹ and NICHOLAS M. MELLEN², ¹Department of Physics, Berea College, Berea, Kentucky 40404; ²Department of Paediatrics, University of Louisville, Louisville, Kentucky 40202.

Respiration is modulated by pH detection in specific sections of the brain stem. The parafacial respiratory group (pFRG) which lies ventral and lateral to the facial nucleus (FN) contains neurons whose firing patterns are associated with increases in inspiratory amplitude and respiratory frequency in vivo. We sought to answer two questions: Can in vitro respiratory rhythm be modulated by focal acidosis puff to the pFRG? And if glial cells mediate this process of chemosensory transduction? Our calcium imaging data taken of the pFRG, shows a transient increase in the activity of cells in this region when acidosis puff is applied.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation –3rd Place in Undergraduate Research Competition in the Physiology and Biochemistry Section)

University of Louisville (KBRIN Funded Research)

DEPARTMENT OF PHYSICS

Infrared Reduction Analysis and Photometry. DAMIKA JONES, RITA YALDA, and TRACY HODGE, Department of Physics, Berea College, Berea, Kentucky 40404.

We present the results of a near-infrared imaging study of the HII region, specifically the part IC133, located in the galaxy M33. J, H & K images were obtained at the Apache Point 3.5 m telescope using the NIC-FPS camera. The image spans approximately 4' x 5'. We have performed photometry on the region centered on IC133 as well as an HII region to its southwest. We present color-color diagrams of each region and discuss the implications for the age of the star-forming regions. We have also uncovered previously, through using point Spread Function (PSF), unknown optical double star. The star is identified as J01331599+3055128 by the 2MASS survey and has been resolved as two separate stars in our image. Acknowledgment: We would like to thank Bill Ketzbeck of the Apache Point Observatory for obtaining these images.

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Berea College URCP Funded Research

DEPARTMENT OF PHYSICS

Establishing Density Profile for Ultra-Cooled Gas in Harmonic Potential. JUSTIN MCGLOTHLIN and MARTIN VEILLETTE, Department of Physics, Berea College, Berea, Kentucky 40404.

We have successfully managed to establish density profiles for Bose-Einstein condensate (BEC) in a harmonic potential in both one and three dimensions. This further supports the analytical evaluations and conclusions which were presented by Albert Einstein in the 1920's and the current experiments where BECs are produced today. We have determined the critical temperature of a BEC gas in one dimension and three dimensions through an analysis of the density profile.

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Research Corporation (Cottrell College Science Award)

DEPARTMENT OF PHYSICS

BEC to BCS Crossover in a Rotating Fermionic Gas. WILLIAM NORRIS and MARTIN VEILLETTE, Department of Physics, Berea College, Berea, Kentucky 40404.

We report on the BEC to BCS crossover in a rotating trap. We consider the problem of a rotating atomic fermionic gas near a Feshbach resonance in a harmonic trap. We establish the critical temperature of the BEC to BCS crossover in a rotating trap. The effect of rotation on the superfluid condensate is shown to reduce the critical temperature of the superfluid phase. Unlike a Bose gas, an additional mechanism for the destruction of the superfluid phase is present.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

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Research Corporation (Cottrell College Science Award)

DEPARTMENT OF PHYSICS

Quench Localization in Superconducting Radio-frequency Cavities. RAMESH ADHIKARI¹ and ELVIN HARMS², ¹Department of Physics, Berea College, Berea, Kentucky 40404; ²Fermi National Accelerator Laboratory, Batavia, Illinois 60510.

Superconducting Radio-frequency (SRF) cavities are the accelerating components for the next generation of particle accelerators. Unlike the normal-conducting cavities, the SRF cavities can stand a high electric field gradient (up to 60 MV/m for niobium) with very low dissipation of the rf power. Cavities that perform at the accelerating gradient of 30-35 MV/m are the current state-of-the-art. Since, the cavities installed in an accelerator must demonstrate no quenches during routine high gradient operation, limitations to such performance must be identified and removed entirely during their manufacturing and testing. Such a test can be performed with a cavity in a helium bath. The second sound generated from the quench on cavity can be used as a signal to identify the quench location. We discuss on a method based on trilateration to predict the location of the quench on a single cell cavity which was verified by the complementary experimental observations from Resistance Thermal Detectors (RTDs).

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Oral Presentation- Physics and Astronomy, 1st place in undergraduate research competition)

Fermi National Accelerator Laboratory and Illinois Accelerator Institute (Lee Teng Internship)

DEPARTMENT OF PHYSICS

Pulsed Laser Ablation of Solids in Liquid Environment. TYLER VANOVER, ROHAN ISAACS, TOMMY BOYKIN, and AMER S. LAHAMER, Department of Physics, Berea College, Berea, Kentucky 40404

Pulsed Laser Ablation of solid targets in a liquid environment has proved to be a viable method in creating novel nano-material. Ablation of graphite in an assortment of organic solutions has produced fullerenes both above and below the well known C₆₀ fullerene, including for the first time C₃₆. Ablation of graphite submersed in cyclohexane solution along with a small amount of dissolved dihydroanthracene produced the C₃₆ fullerene. This, along with the results from the other liquids will be presented.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

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Berea College URCPD Funded Research

DEPARTMENT OF PHYSICS

The Identification of Graphene Layers through Optical Reflectivity. CHRISTOPHER YALUMA¹ and DOUGLAS STRACHAN², ¹Department of Physics, Berea College, Berea, Kentucky 40404; ²Department of Physics and Astronomy, University of Kentucky, Lexington, Kentucky 40506-0027.

The goal is to construct few-layer graphene Field Effect Transistors or FETs on transparent membranes. These can be created by having a bi-layer graphene (BLG) put on a silicon wafer containing a transparent membrane i.e. silicon nitride (SiNx) or silicon dioxide (SiO₂). The wafer is then appropriately cut out and removed, leaving the BLG suspended on top of the membrane. When you have the BLG suspended, it is now possible to use a gate electrode that creates the electric field and connects the source with the drain. However, this cannot be achieved without having a quick and efficient method to identify single layer and bi-layer graphene. Single layer graphene (SLG) is found to absorb a significant (2.3%) of incident white light. This is a phenomenon that we can apply and use to identify few-layer graphene (FLG) samples. FLG samples were prepared using a process known as mechanical exfoliation. Poly (methylmethacrylate) or (PMMA) was applied on a few samples so we can compare them with samples without PMMA. The Optical Microscope was used to observe the samples and we took the optical images using the Q Color 3 Camera. We then analyzed the images and determined the reflectance ratios. The Atomic Force Microscopy (AFM) was then used to find the thickness of the graphene samples and we found that there was a linear relationship between the reflectance ratios and the thickness. FLGs have the potential to transform our nano-scale technology and change the way we live our lives forever. But first, there are challenges that are yet to be solved such as the absence of a naturally occurring bandgap in a BLG.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Oral Presentation)

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University of Kentucky (NSF EPSCoR Research Scholars Program)

DEPARTMENT OF PSYCHOLOGY

The Effects of Presented Scenes on Cognitive Tasks. JENIPHER DENNIS, RACHEL KREBS, JESSICA BARNES, and WAYNE S. MESSER, Department of Psychology, Berea College, Berea, Kentucky 40404.

We examined whether gender, personality (NEO-FFI), exposure to nature (previous and current), and scenes (Nature vs. Urban) effected performance on six cognitive and three physiological measures. Cognitive tasks included Embedded Figures, Crossing out E's, Necker Cube Reversal, ISPY scenes, and thinking about a current life problem. Our previous research indicated that Openness scores on the NEO-FFI correlated with childhood exposure to nature as well as scores on the New Ecological Paradigm (NEP) Scale. Sixty-two people completed the cognitive tasks in both the Nature and Urban conditions in a within-subjects, counterbalanced design. Nature scenes ($M = 57.27$, $SD = 8.87$) were rated higher than Urban scenes ($M = 27.23$, $SD = 11.01$), $t(61) = 16.51$, $p < .001$. Subjects' diastolic and systolic blood pressures were not affected by scene type; neither was heart rate, although larger heart rate declines in the Nature condition approached significance ($p = .07$) compared to the Urban condition. Of the six cognitive tasks, only the ISPY task yielded a significant difference, with more items found under the Nature condition ($M = 12.50$, $SD = 2.33$), than the Urban condition ($M = 11.32$, $SD = 2.67$), $t(61) = 3.09$, $p = .003$. Subjects' ratings of the Urban scenes correlated negatively with their NEP scores, $r(61) = -.29$, $p = .026$. No other correlations or differences were found.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation –Psychology Section)

Berea College URCP Funded Research

DEPARTMENT OF PSYCHOLOGY

Neurophysiological and Cognitive Indices of Creativity. VICTORIA FULTON, JORDAN HARRISON, ALI HASSAN, YUTA KATSUMI, and ROB SMITH, Department of Psychology, Berea College, Berea, Kentucky 40404.

An emerging trend in cognitive neuroscience and the study of creativity has been a shift toward the use of electrophysiological techniques as a way to investigate the underlying primary and secondary cognitive processes believed at least partially responsible for our creative thinking and behavior. For our study, we asked a small sample of adolescents and college students to complete a series of questionnaires on various dimensions of creativity (intrinsic motivation, creative self-efficacy, and creative personality type) and preferred thinking styles. We then had each participant complete a remote associations task while his/her electroencephalograph (EEG) data was recorded. Correlational analyses of our data revealed numerous interrelationships between each of the three dimensions of creativity and thinking styles, as well as numerous interrelationships between creative self-efficacy and the mean spectral power in both the alpha and beta frequency bands. Participants who reported greater creative self-efficacy tended to also demonstrate greater alpha and beta suppression in the prefrontal, frontal, and right parietal and temporal lobes. Significant group differences (high vs. low creative self-efficacy) in mean spectral power were found within the beta frequency band but not in the alpha frequency band. Specifically, those highest in creative self-efficacy showed greater suppression of their β_2 activity during task performance than did those who rated themselves low on creative self-efficacy.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

23rd Annual Convention of the Association for Psychological Science, May 25-29, 2011, Washington, DC.

Berea College URCP Funded Research

SUSTAINABILITY AND ENVIRONMENTAL STUDIES DEPARTMENT

Pedagogy of Place: Development of an Invisible Curriculum. ZACHARY E. DANNEMAN, TARA L. SHUMATE, and WILLIAM J. COOMES, Sustainability and Environmental Studies Department, Berea College, Berea, Kentucky 40404.

There was a time when people knew the plants, animals, systems, and cycles of the land which they depended upon. This indigenous wisdom was not taught inside the walls of a classroom using a textbook. Instead, it was a part of everyday life. In this modern age of agendas, convenience, materials, and technology, most people have lost that basic understanding of the natural world. As we face the reality of upcoming global environmental threats, it is increasingly important that we regain a sense of place and an understanding of basic ecological literacy.

The goal of this research project was to explore an alternative approach to environmental education. We sought out to design lesson plans that encouraged critical thinking and active engagement. By assessing our personal interests, doing background readings, and researching existing models, we were able to create lesson plans which focused on several environmental concepts. Two lessons put students role-playing as characters on either side of a given debate. One focuses on the controversy over pesticide use in the 1960s, while another focuses on mountaintop removal coal mining. Other lessons bring students outdoors to learn about birds, water, fire, edible/medicinal plants, and more through hands-on activities that help to expand sensory awareness. By engaging the body and mind, this educational approach ensures that students can build a meaningful and lasting relationship with the material learned.

11th Annual Berea College Undergraduate Research Symposium, October 22, 2010 Berea College, Berea, Kentucky (Poster Presentation)

96th Annual Meeting of the Kentucky Academy of Science, November 12—13, 2010, Western Kentucky University, Bowling Green, Kentucky (Poster Presentation –Science Education; 1st place in undergraduate research competition)

Berea College URCP Funded Research

SIFE (Students In Free Enterprise)

Mark Roselli, Department of Economics & Business, Team Sponsor

SIFE stands for “Students In Free Enterprise.” It is an international organization dedicated to improving the lives of others through the positive power of business. For more information you can visit the SIFE website at www.sife.org. Colleges and universities form SIFE teams and complete community service projects, mainly teaching others skills in understanding market economics, financial literacy, success skills, ethics and sustainability. There are over 600 teams in the USA and over 1500 teams world-wide in over 40 countries. Once each year, the teams present the results of their projects to a panel of judges (mainly executives from the corporate world) at a dozen or so regional locations in the U.S. The winners from these regional competitions go on to compete at the USA national competition.

We competed in the Cleveland Regionals on March 24, 2010. The team won 1st place in their league in Cleveland, and advanced to the national competition in Minneapolis (May 11—13, 2010). Our Cleveland presentation team included **Charles Badger, Sasha Solomatova, Ahmad Shuja, and Lorena Luna**, and our tech team, **Tengis Bat-Erdene and Stephen Dweh Chenneh**.

At the national competition, the team won 2nd runner up in their league, placing them in the top 60 teams in the nation (top 10%). At Minneapolis our presentation team was **Christian Gonzales, Jessica Crawford, and Hong Zhang Durandal**, and our tech team, **Haotian Li, Zewdu Muleta, and Sourabh Garg** (photographer).

42nd Annual Festival of Region IV of the Kennedy Center American College Theatre Festival (KCACTF), 2010, Middle Tennessee State University, Murfreesboro, TN.

Accompanying Professors: Shan R. Ayers, MFA, Professor of Theatre, and Velicia Daniels, Ph.D., Visiting Assistant Professor of Theatre.

Students participated in a variety of workshops, auditions and competitions and were able to watch performances of 4 invited and fully staged productions and several short play readings while at the conference. KCACTF Region IV is made up of the following states; Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Southern Virginia.

Ashley French, Edwin Schiff, Anthony Nathan and Jonathan Johnson were invited to participate in the Irene Ryan Acting Scholarship auditions as a result of receiving a nomination from respondents to Berea College productions. Each of these students selected a partner to accompany them to the audition. Student partners were **Christian Honce, Stephanie Radford, Traci Sisson and David Bellnier**. Ashley French and Christian Honce advanced to the Regional Final Auditions, competing for a chance to audition at the KCACTF National Conference held in Washington, DC, at the Kennedy Center for the Arts. Ashley was awarded the Region IV certificate, Best Performance of Classical Literature, for her scene from *Medea*.

French, Nathan, Johnson and Sisson were also cast in parts for the National Playwriting Program (NPP) Short Play and Ten Minute Play concert reading performances at the festival. **Adina Ramsey and Kathryn Newquist** participated in the Stage Management Fellowship program and served as stage managers for NPP plays.

KCACTF Region IV also presented certificates for Excellence in Directing to **Dr. Deborah Martin** for *The Rocky Horror Show*. Certificates for Excellence in Design were also presented to **Mary Ann Shupe** for her costume designs for August Wilson's play, *Seven Guitars* and to Shan Ayers for his scenic design for *The Rocky Horror Show*.

Postscript: At this year's KC/ACTF Regional Conference, Dr. Velicia Daniels received a certificate for excellence in directing, Ms. Mary Ann Shupe received a certificate for excellence in design for her costumes, and Shan Ayers received a certificate for excellence in design for his scenic design for Moliere's, *The Imaginary Invalid*.

Kentucky Forensic Association State Championship

Dr. Billy Wooten, Department of English, Theatre & Communication, Coach

Berea College's speech and debate team won **1st place** in both the overall parliamentary debate and individual events divisions and **2nd place** in the Grand Champion division among all colleges and universities during the Kentucky Forensic Association State Championship, February 18-19, 2011, Gateway Community and Technical College, Covington, Kentucky.

Chris Moore and **Eric Moore** also won the prestigious Harlan Hamm Award for Forensics Excellence in the state of Kentucky. **Dr. Billy Wooten** was named 2010-2011 Kentucky Forensic Association's Coach of the Year. The following Berea College students participated in the speech and debate team:

Maryam Ahmed -	Top Novice in Extemporaneous Speaking, 7 th Place Novice Debate, undefeated at the Butler tournament and quarterfinalists at the Indianapolis tournament, and 6 th Place Novice Speaker
Charles Badger -	6 th Place Varsity Debate, undefeated at the Butler tournament and quarterfinalists at the Indianapolis tournament, and 1 st Place Open Speaker
Vandet Chambers -	Finalist in Programmed Oral Interpretation, and Finalist in Duo Interpretation
Jessica Crawford -	3rd Place Novice Speaker
Mira Denton -	6 th Place Novice Debate and 1st Place Novice Debate Team
Jacob Hart -	3 rd Place Novice Debate, Finalist in Impromptu Speaking, 1 st Place Novice Debate Team, and 1 st Place Novice Speaker
Felicia Helvey -	Finalist in Prose, and Finalist (twice) in Duo Interpretation
Josh Hughes -	Quarterfinalist Debate
Sean Litteral -	Quarterfinalist Debate, and Finalist in Impromptu Speaking
Rachelle Mathurin -	Top Novice in Programmed Oral Interpretation, Finalist in Programmed Oral Interpretation, and Finalist in Persuasion (and her speech will be published in the KFA Student Journal)
Beth Nelson -	Finalist in Duo Interpretation

Brianna Perry - Top Novice in Prose Interpretation, Finalist in Radio Broadcasting, and Finalist in Dramatic Interpretation

Josh Rhoden - 10th Place Novice Debate

Emmanuel Zipson - Top Novice in Dramatic Interpretation, Top Novice in Poetry, and Finalist in Poetry

Project Pericles Debating for Democracy (D4D) Competition

Dr. Billy Wooten, Department of English, Theatre & Communication, Coach

For the second year in a row, Berea College students have won the national Project Pericles Debating for Democracy (D4D) competition. The 2010 legislative tournament was held in New York City, New York. The 2010 Berea College team members were **Charles Badger, Amber Stanton, and Matthew Callo**. The competition included teams representing Carleton College, Chatham University, Earlham College, Elon University, and Swarthmore College. The judges for this event included former U.S. Senators Nancy Kassebaum Baker (R – Kansas), Bob Kerrey (D – Nebraska), and Harris Wofford (D – Pennsylvania).

The Berea team's proposal entitled "The Neighborhood Stabilization Program: Establishing Community Development Organizations in Economically Disadvantaged Urban Areas" earned the national title and the \$3,000 championship award. With the award, the team intends to implement their proposal by working to revitalize at-risk urban neighborhoods in Birmingham, Nashville, and Knoxville.

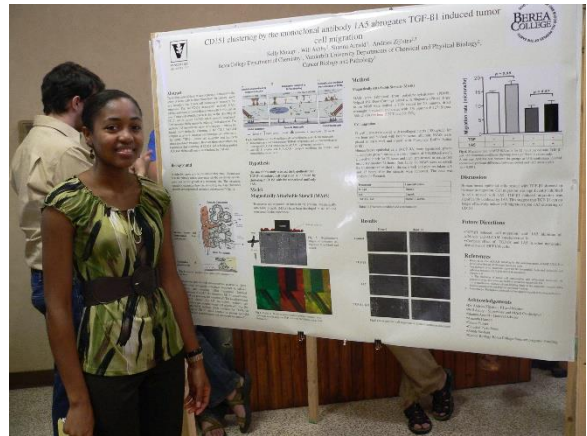
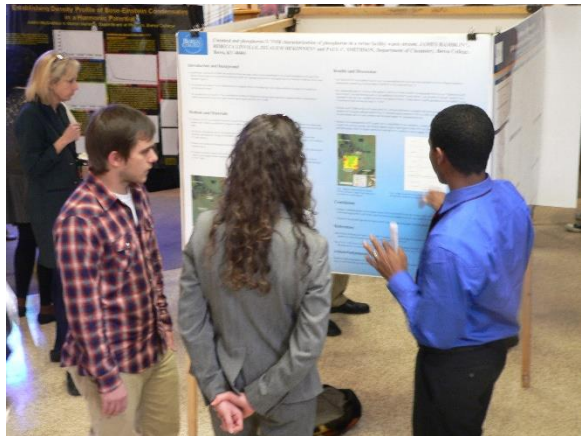
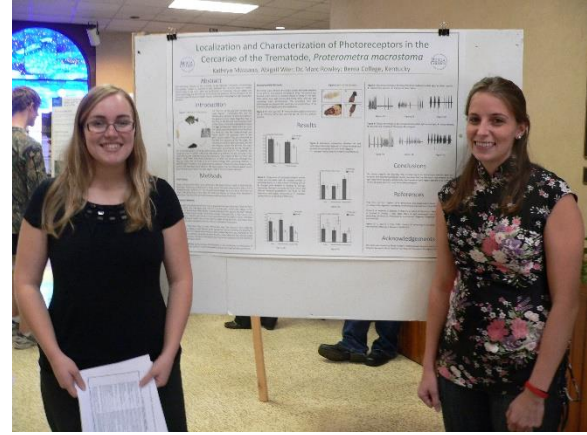
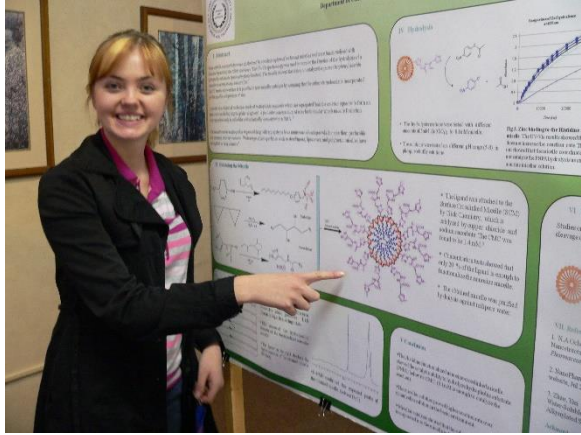


Figure 1. Berea College student presentations at the 11th Annual Berea College Research Presentations, October 2010

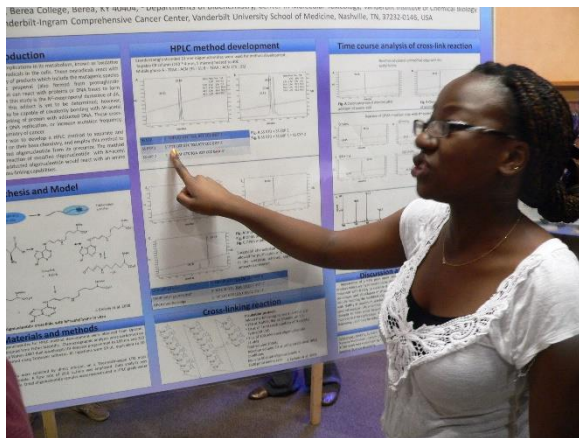
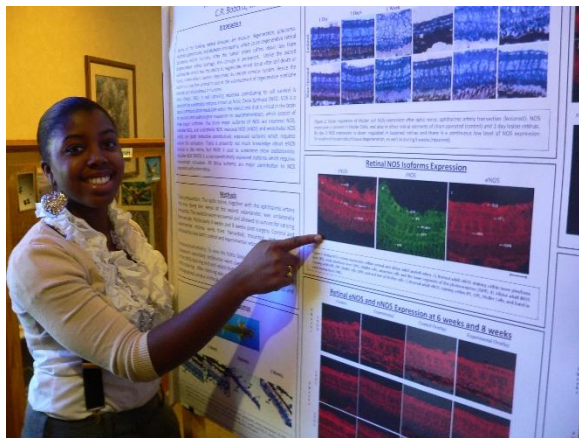
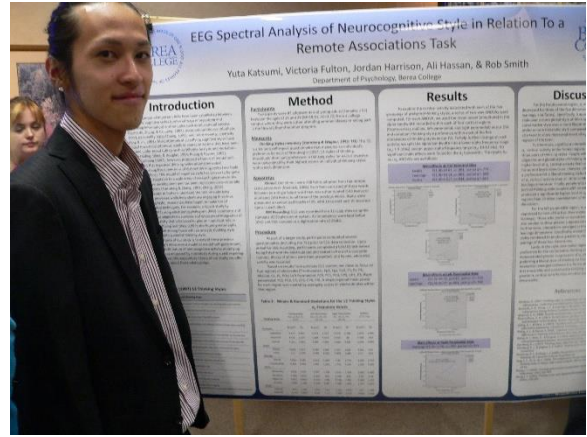
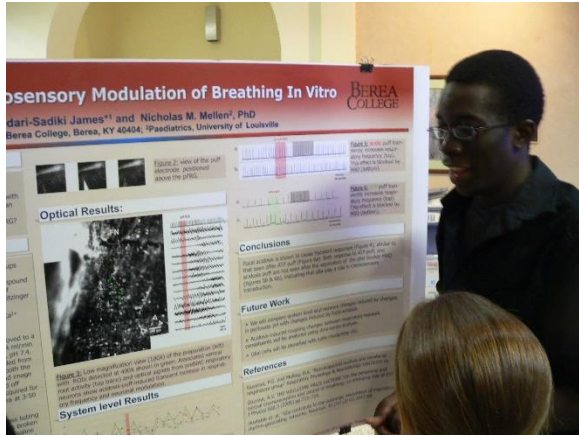


Figure 2. Berea College student presentations at the 11th Annual Berea College Research Presentations, October 2010

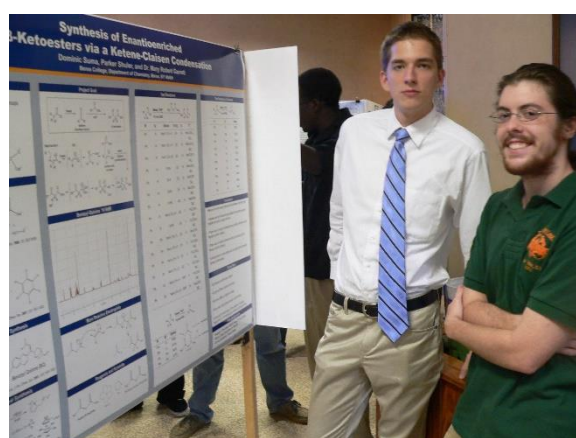
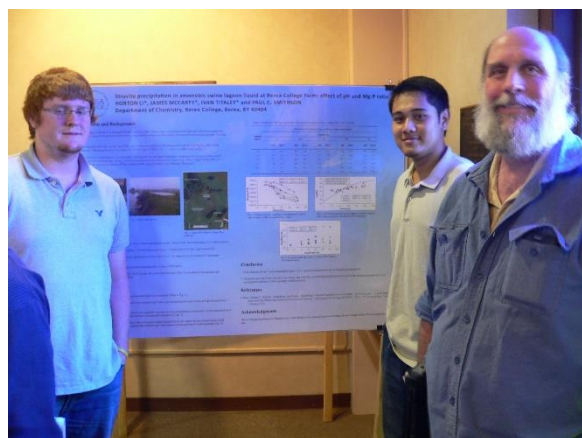
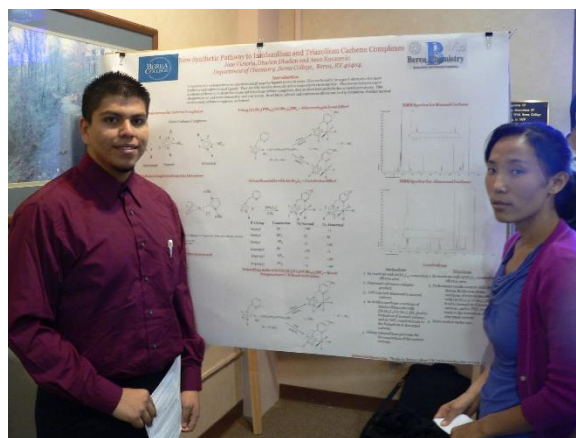
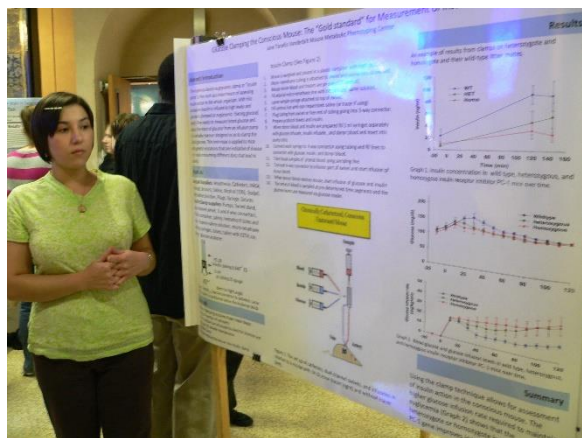


Figure 3. Berea College student presentations at the 11th Annual Berea College Research Presentations, October 2010

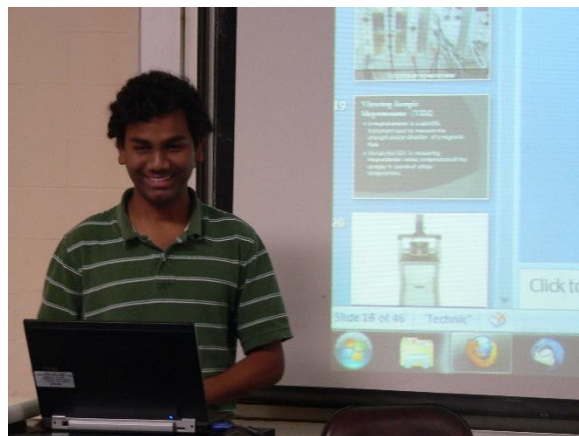


Figure 4. Berea College student presentations at the Berea College Wednesday Student Research Discussions, summer 2010

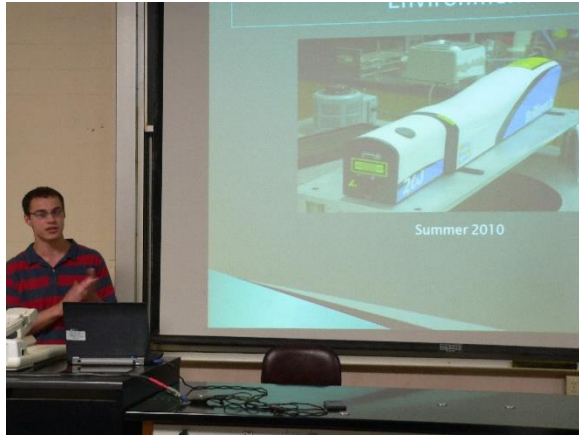


Figure 5. Berea College student presentations at the Berea College Wednesday Student Research Discussions, summer 2010



Figure 6. Berea College student presenting at the 96th Annual Kentucky Academy of Science, November 12-13, 2010

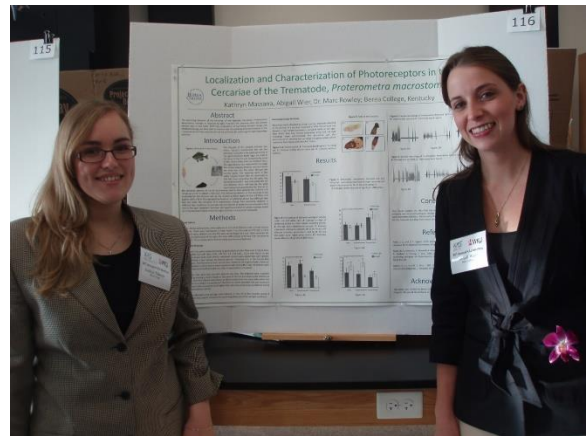
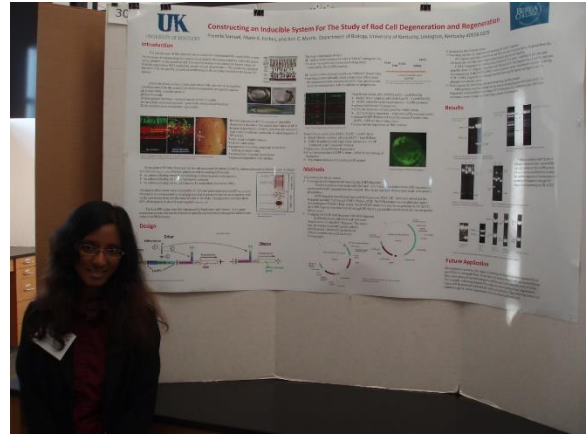
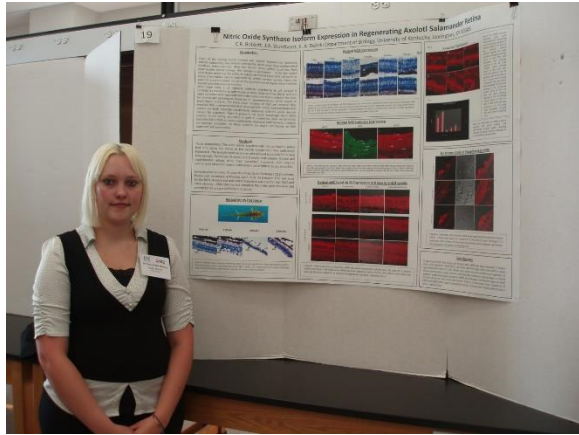
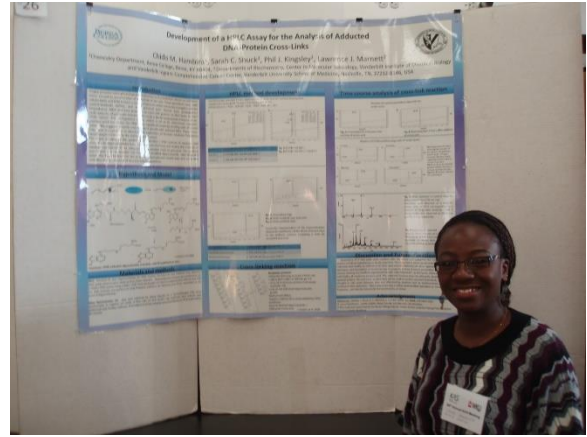
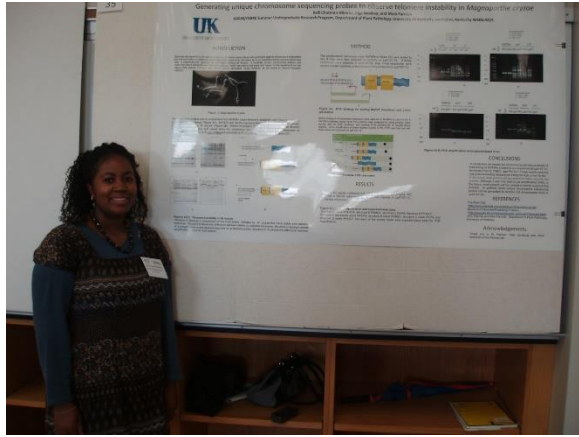


Figure 7. Berea College student presenting at the 96th Annual Kentucky Academy of Science, November 12-13, 2010



Figure 8. Berea College student presenting at the 96th Annual Kentucky Academy of Science, November 12-13, 2010