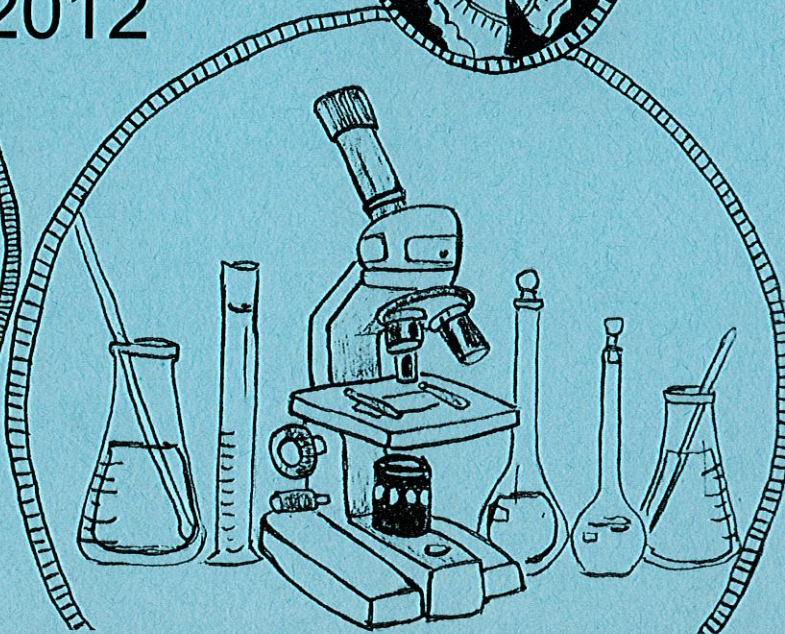
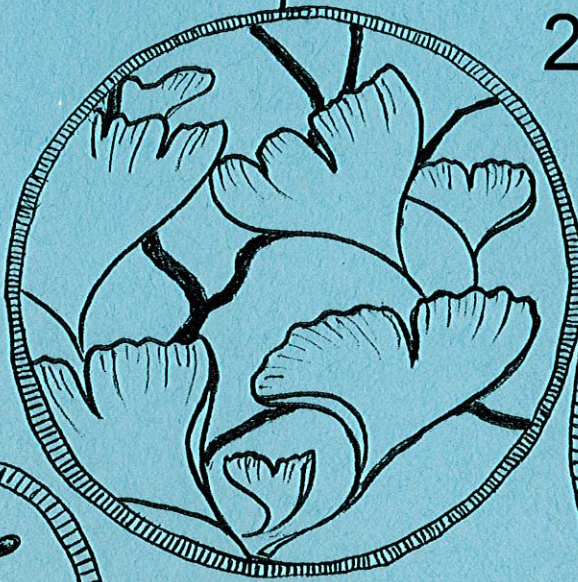
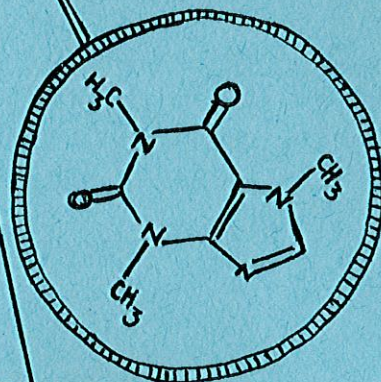
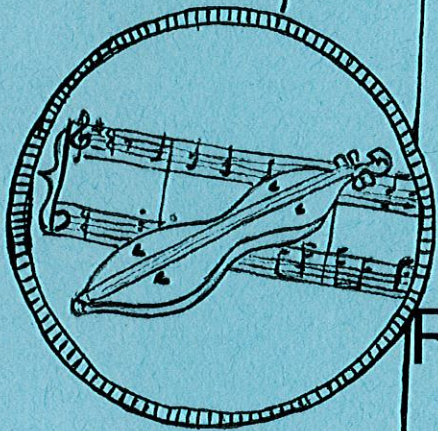




Berea College

Journal of
Undergraduate
Research Abstracts

2012



INTRODUCTION

Editors: Ericka Berg (Junior Biology Major) and Ronald B. Rosen (Professor of Biology)

This seventh issue of the "Berea College Journal of Undergraduate Research Abstracts" contains 55 different abstracts representing majors from 13 different academic programs. The common theme to the research presented in these abstracts is that the: (1) original proposal was peer-reviewed and (2) work was subsequently presented by undergraduates at meetings on- and/or off campus. These abstracts represent research completed on-campus with funds provided by Berea College's Undergraduate Research and Creative Projects Program (URCCP; 15 reporting), the Anne Ray Charitable Trust Internships (ARCT), Center for Transformative Learning and non-funded class or independent projects. Off-campus projects were funded by the Kentucky Biomedical Research Infrastructure Network (KBRIN) at the Universities of Kentucky and Louisville, and by other universities and colleges throughout the country. Much of this collaborative work was presented at off-campus meetings including the 98th Annual Meeting of the Kentucky Academy of Science (43 presentations and 19 rewards received), the Pi Mu Epsilon Conference at the University of Miami, Ohio, the Kentucky Nurses Association Convention, and at undergraduate research symposiums at the sponsoring universities. It should also be noted that many projects were presented on campus during the 13th Berea Undergraduate Research Symposium (BURS) on October 5th, 2012. Presentations and awards received are noted below each abstract where appropriate.

ACKNOWLEDGEMENTS

This publication would not have been possible without the support of many people. We would like to thank Chad Berry, Academic Vice President and Dean of the Faculty, for providing funds to print hard copies of these abstracts and Sarah Broomfield for coordinating the URCCP initiative on campus. We would also like to acknowledge Clara Chapman and Judith Weckman (Institutional Research and Assessment) who assisted us with the Pre- and Post-Survey Assessment found in the Appendix of this publication. Gratitude is extended to Berea College faculty for their mentorship, and of course to students whose hard work is reflected in this journal. This year, Ericka Berg, a junior Biology Major from Mill Spring, North Carolina, took on the primary responsibility for putting this publication together; she has done an exemplary job, and I want to thank her for completing this task. I also want to acknowledge Michon Martin, a senior Biology Major from Berea, Kentucky, for the beautiful cover art gracing this publication. Finally, I would like to thank all the off-campus mentors at the following universities, colleges and non-profit organizations for supporting Berea students during the summer of 2012 (number of Berea students in brackets): Alfred University {1}, Argonne National Laboratory {1}, Barnard College {1}, Clemson University {1}, Clinic for the Rehabilitation of Wildlife, Sanibel Island {1}, Harvard School of Dental Medicine {1}, John Hopkins School of Medicine {1}, Mayo Clinic {2}, Meharry Medical College {1}, Ohio State University {1}, University of Kentucky {3}, University of Louisville {5}, University of Massachusetts Medical School {1}, University of Tennessee {1} and Vanderbilt University {4}.

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AGRICULTURE AND NATURAL RESOURCES PROGRAM

Assessment of black walnut (*Juglans nigra* L.) growth and survival on reclaimed surface-mined land. KALEIGH HIRE, JOSHUA BEST and SARAH L. HALL, Agriculture and Natural Resources Program, Berea College, Berea, Kentucky 40404.

An estimated three-quarter million acres of land in the Eastern United States has been surface-mined for coal and reclaimed to a non-forested state. Efforts to improve these reclaimed minelands include ripping to alleviate soil compaction followed by tree plantings. Students and community members from Berea, Kentucky, planted black walnut seeds and seedlings in Pike County, Kentucky, in the fall of 2011 on a reclaimed mine site. Research was conducted to evaluate the diameter and height of these trees receiving 4 different treatments – planted from seed and from seedling, with and without tree shelters. In May of 2012, data was collected on 600 seedlings (50 in each of three replicate plots per treatment) planted at Fishtrap Lake Wildlife Management Area. Results concluded that one-year nursery stock seedlings had significantly larger diameter and height than trees planted from seed in the first year. There was no significant difference in survival rate of all treatments. The use of shelters significantly benefitted both height and diameter of seedlings but was unclear when used with seed (differences were insignificant but trends were actually for greater height and diameter for those seeds planted without shelters). This project is the first to assess fall planting of black walnut by seed on reclaimed surface-mined lands. Our initial evidence indicates that black walnuts planted from seed have a promising survival rate and should be planted more prolifically during fall and spring planting seasons. Continued research is planned to further assess growth in the coming years.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Ecology and Environmental Science Section)

Funded by Berea College URCPP



AGRICULTURE AND NATURAL RESOURCES PROGRAM

Feasibility of a free-range egg enterprise at Berea College. MAKALA SETTLAGE and AMANDA BENITEZ, Agriculture and Natural Resources Program, Berea College, Berea, Kentucky 40404.

An assessment to determine the profitability of raising Golden Buffs and Plymouth Barred Rock breeds of *Gallus gallus domesticus* (Linnaeus, 1758) for small-scale, free-range egg production was performed on the Berea College Farm during the summer of 2012. The laying hens were free-ranged on pasture with movable arched shelters (8 by 10 ft) in effort to provide access to forage and protection from predators at night. Portable electric netting was used to establish a perimeter fence for predator protection and to prevent the chickens from getting into nearby vegetable-production fields. The chickens were fed food waste from the College's dining hall and a grain-based (soy bean and corn) ration twice daily while forage (plants and insects) and oyster shells were available *ad libitum* throughout the summer. The eggs were routinely harvested every evening in preparation for selling at the local farmers market, through the certified roadside stand in the Berea College Bookstore, and to Berea College Dining Services. A cost-benefit analysis was carried out using input expenses and market value to determine the future profitability. This small pilot enterprise was designed to be scalable to provide opportunities for future expansion. The current cash flow is covering the overhead costs of starting the enterprise and projections indicate profitability in the future. Utilizing re-useable egg cartons, improving the efficiency of food-waste collection, marketing and selling to local businesses, and creating a successful plan for winter housing are all part of a plan to ensure the profitability of the enterprise.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Agricultural Sciences Section; 2nd place in undergraduate research competition)

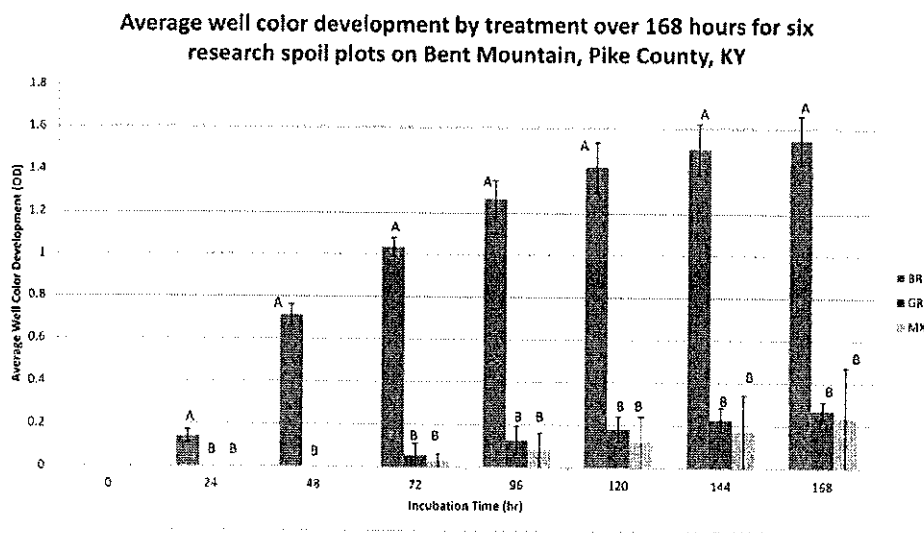
AGRICULTURAL AND NATURAL RESOURCES PROGRAM

Feasibility of pastured broiler production on a student-managed farm. DALLAS COOK and JENNIFER ROMINGER, Agriculture and Natural Resources Program, Berea College, Berea, Kentucky 40404.

The goal of this project was to establish a pasture-based broiler (*Gallus gallus domesticus*) enterprise on the Berea College Farm and evaluate its performance. If feasible, the enterprise would serve the dual purpose of diversifying the Farm's revenue stream and increasing the amount of food from the farm used in the College's dining hall. Since Cornish Cross broilers, the industry standard, are not suitable for pasture-based production, two more suitable breeds were evaluated: Heritage White and Freedom Ranger broilers. Neither of these breeds have growth rates that match the Cornish Cross but they also do not have the health and performance problems typical of the Cornish Cross on pasture. All broilers were produced under free-range conditions with low-cost portable shelters provided and movable electric netting maintained around the perimeter of the foraging area. A complete corn and soy ratio was provided and feed use and growth were monitored. The Heritage White broilers grew at a faster rate, reaching market weight in nine weeks with a mortality rate of 13%, while the Freedom Rangers required 12 weeks to finish and had only a 2% mortality rate. Our financial analysis indicates that a free range, pasture-based broiler production can be profitable. The estimated cost for producing and processing a batch of 400 chickens was \$3780 with gross returns of \$5100 and net returns of \$1320. Since the production methods used were scalable this enterprise could be expanded to produce several thousand broilers per year for the College dining hall and local farmers market.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Agricultural Sciences section; 1st place in undergraduate research competition)

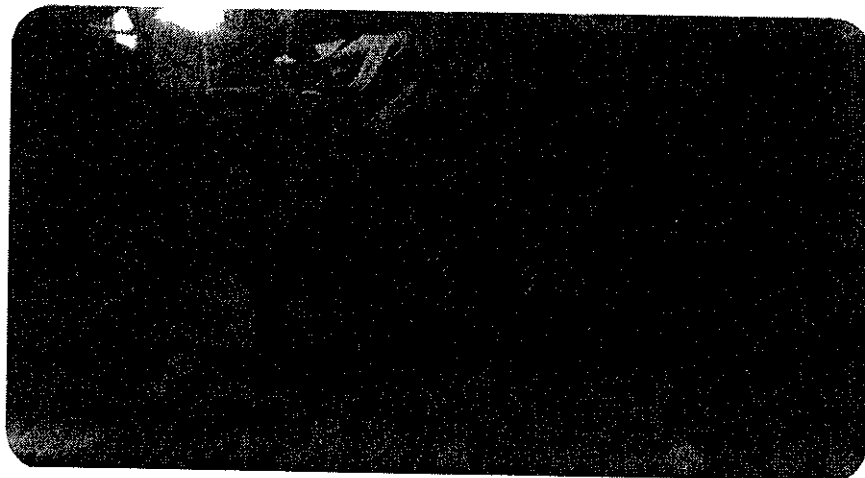


AGRICULTURE AND NATURAL RESOURCES PROGRAM

Improving the sustainability of small-scale, pond aquaculture. SABRINA BARNES, Agriculture and Natural Resources Program, Berea College, Berea, Kentucky 40404.

The goal of this project was to explore options for improving the sustainability of smallscale, pond aquaculture on the Berea College Farm. Three species were produced: prawn (*Macrobrachium rosenbergii*), catfish (*Ictalurus punctatus*), and tilapia (*Oreochromis niloticus*). The study included growth measurements on pond-produced tilapia, water quality measurements throughout the summer, and an aquarium trial to evaluate alternative feeds. Water quality monitoring in the ponds indicated periodic problems with dissolved oxygen and pH. Nevertheless, tilapia growth in suspended cages was steady throughout the summer. The aquarium trial was used to evaluate two alternative feeds to commercial, fishmeal-based feed. These included a new feed product made by Enviroflight, LLC (Yellow Springs, OH), generated by processing spent brewer's grain through black soldier fly larvae (*Hermetia illucens*), and farm-produced hog feed made from corn, soy, and minerals. Water quality in the treatment with hog feed suffered from higher nitrite levels and most of the prawns died. Water quality measurements in the Enviroflight treatment were within the limits considered suitable for aquaculture production. The pond system suffered from periods of high pH and low dissolved oxygen during the hottest periods of the summer. Alum was added to counter the increasing pH levels and additional aerators were added to deal with lower dissolved oxygen. The alum was effective for managing the pH problem. While challenges exist, switching to the Enviroflight feed for tilapia and prawns holds promise for improving the sustainability of the pond aquaculture enterprise. A feed formulation that floats will be needed for the catfish.

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Agricultural Sciences Section; 3rd place in undergraduate research competition)



BIOLOGY PROGRAM

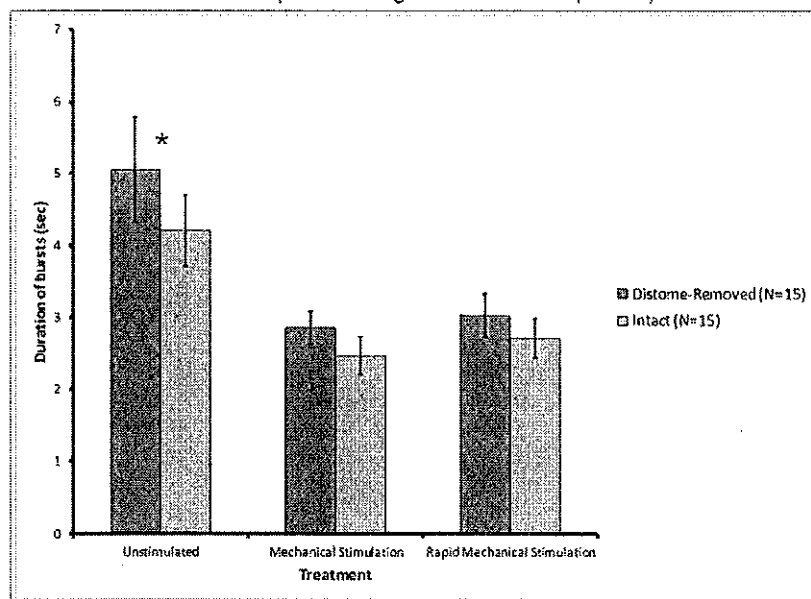
Characterization of the sensory systems in the cercaria of the trematode, *Proterometra macrostoma*. RACHELE JOHNSON, KAILA NOLAND, and MARC ROWLEY, Biology Program, Berea College, Berea, Kentucky 40404.

Cercariae of the digenetic trematode *Proterometra macrostoma* are unusual in that the distome is retracted inside the tail. Prior research shows that the tail acts as an autonomous vehicle and responds to light and mechanical stimuli. Light intensity affects the duration of a swimming burst, while mechanical stimulation has been shown to initiate a burst. In these experiments electrophysiology was utilized in an attempt to further explore the mechanoreceptor response, and characterize the photoreceptors. The mechanoreceptors seem to be diffused throughout the tail of the cercariae, and we have shown that there is a significant difference in the typical bursting behavior versus the mechanically stimulated behavior. Further research is needed to localize the photoreceptors.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Zoology section)

Figure 3. Average (\pm SE) burst duration in three treatments of distome intact and distome-removed cercariae (* denotes significant difference $p < 0.05$)



BIOLOGY PROGRAM

Comparison of Hach® water test kits and standard analytical methods at Berea College's aquaculture and aquaponics facilities. SOPHIA AL-MAAMARY, GEORGIA DAHLQUIST, SARAH ELROD, BRITTANY SCHROEDER and PAUL C. SMITHSON, Chemistry, Biology, and the Sustainability and Environmental Studies Programs, Berea College, Berea, Kentucky 40404.

Berea College raises catfish (*Ictalurus punctatus*) and tilapia (*Oreochromis niloticus*) in two ponds at the College Farm and in a recirculating aquaponics (fish plus hydroponic plants) system at the Berea College Ecovillage. In this study we measured pH, dissolved oxygen, carbon dioxide, alkalinity, hardness, ammonia-N and nitrite-N daily for six days at four pond and aquaponics sampling sites. We analyzed each sample with a Hach® Fish Farmer's Test Kit and with methods detailed in *Standard Methods for Water and Wastewater Analysis*. For most analyses, the chemistry is similar or identical between the kit and standard methods. Paired t-tests (n = 24) comparing methods showed significant differences at 95% confidence level for all parameters. This was due in part to the coarseness of the test kit results, which are based on drop-count titrations and visual color comparisons, and are only semi-quantitative. For the most part, test kit and standard method results showed similar trends, so for a rapid assay the kits seem adequate. However, overall means for the two methods were almost all significantly different at 95% probability (all but alkalinity). Of the significant differences, most would be of little practical significance, but differences in ammonia-N and nitrite-N, two toxic forms of N, could be a cause for concern. Subjectively, analysts found that the test kit's colorimetric analyses (pH, ammonia-N and nitrite-N) were difficult to quantify with the Hach® "color comparator" disks.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Ecology and Environmental Science Section)

Funded by Berea College UCRPP

BIOLOGY PROGRAM

Compositional Changes in Human Tear Lipids with Meibomian Gland Dysfunction. GREGORY W. COX¹ and DOUGLAS BORCHMAN², ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Ophthalmology and Visual Sciences, University of Louisville, Louisville, Kentucky 40202.

Dry eye is a common clinical condition that causes considerable discomfort, interference with visual performance, and impaired quality of life. The most common cause of dry eye is meibomian gland dysfunction (MGD). The meibomian gland is found in the eye lids and secretes the lipid layer of the tear film. The lipid layer helps reduce the evaporation rate of the aqueous layer. When humans are born, the meibum is saturated making the rate of evaporation less. This is why babies only blink one or two times per minute. However, as humans age, their meibum becomes unsaturated causing the rate of evaporation to be increased. Adults blink on average one time every eight seconds. Our group found that with dry eye, cholesterol esters and squalene decreased in meibum. With this information, we were able to run experiments to determine if cholesterol ester and squalene changed the phase transition parameters of wax, the major lipid of human meibum. Cholesterol Ester mixed with wax ester significantly raised the phase transition temperature of wax alone. Loss of cholesterol ester with dry eye may be the cause for the meibum from donors with dry eye to be more fluid than meibum from normal donors. It was also found that meibum lipid composition changes with meibomian gland dysfunction.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Physiology and Biochemistry Section)

University of Louisville Summer Undergraduate Research Summer Symposium, Summer 2012, Louisville, Kentucky (Poster Presentation)

University of Louisville Internship

BIOLOGY PROGRAM

Cross-campus Phenotypic Analysis of SALK T-DNA Mutants of *Arabidopsis thaliana*. HILARY CALLAHAN¹, and HSUAN PENG², ¹Department of Biology, Barnard College, New York, New York 10027; ²Biology Program, Berea College, Berea, Kentucky 40404.

While intensively studying the *Arabidopsis thaliana* genome, the plant biology community has created many knock-out lines, but phenotypic information is limited for the majority of lines in these mutant collections. UnPAK (Undergraduate Phenotyping of Arabidopsis Knockouts) is a project to compile a phenotypic trait database for one mutant Arabidopsis collection, the SALK T-DNA mutant library. At Barnard College, students are scoring growth and fitness-related traits for 3,700+ single T-DNA insertion lines. Ultimately, this database will be useful for addressing the question of why so few mutations affect plant phenotype. The unPAK project replicates its experiments across the campuses of partnered institutions where undergraduate students collaboratively carry out these large experiments. Standardizing environments for experiments is a central concern, and involves using a common set of phytometers (ecotypes found in natural habitat) grown side by side with gene-knockout Arabidopsis plants. In several early experiments, recorded trait values at one site (College of Charleston) were significantly lower than at another (Barnard College). In Spring 2012, to investigate *water quality* as a source of variation in growth conditions between the experimental sites, a small number of lines were grown with either New York City tap or deionized water. (In Charleston, a parallel study compared Charleston tap water and dH₂O.) The study detected no significant difference in plant size or overall fitness (measured by full fruit number and average fruit length). In summer 2012, using a similar protocol, an experiment investigated the *soil mixes* used at the two campuses, and observed a large and very clear difference in overall plant growth and vegetative size. Combined with forthcoming data for reproductive and fitness traits, as well as statistical analysis, this experiment offers a satisfying reminder about the critical role of standardizing soil mixes. In future experiments, attentiveness to and adjustment in this protocol should aid in the continuing UnPAK research effort.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

Sponsored by the Hughes Science Pipeline Project of Barnard College

BIOLOGY PROGRAM

CROW – Clinic for the Rehabilitation of Wildlife. Kevin Joenborg, Biology Program, Berea College, Berea, Kentucky 40404.

Located on Sanibel Island in Florida, the Clinic for Rehabilitation of Wildlife (C.R.O.W.) is a magnificent place with a unique purpose. Each year the clinic receives more than 4000 patients spread out among 200 different species. The goal for all admits is ultimate release. Once an animal has been rescued and admitted to the hospital, a dedicated staff of veterinarians, students, and volunteers work hard to get the wildlife back on its feet. Each case is different and some patients are unable to be safely released back into the wild. Throughout my internship, I mastered several important skill sets. I assisted veterinarians and wildlife rehabbers with large and small animal examinations and treatments. I was responsible for restraining the patients and providing proper feeding and care. I was allowed to draw vaccinations, prepare dosages, and inject medications into the animal. I assisted with surgeries such as hook-removals and amputations. Following the operations, I sterilized the surgical equipment. The internship lasted from May 16th until August 12th 2012.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

Sponsored by Office of Internships at Berea College and CROW (Clinic for the Rehabilitation of Wildlife)

BIOLOGY PROGRAM

Early Diagnosis of Malignant Lung Nodules Using 3D Shape Analysis. KATHERINE WEBB¹ and AYMAN EL-BAZ², ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Bio-Engineering, University of Louisville, Louisville, Kentucky 40292.

We proposed a novel framework for the diagnosis of malignant and benign lung nodules based on analyzing the 3D shape of the detected lung nodules. The proposed steps were the segmentation of lung nodules followed by construction of a 3D mesh model of the segmented lung nodule surface. Then a determination was made of the number of spherical harmonics (SHs) to delineate the lung nodule. We described the nodule shape complexity with a new shape index, the estimated number of the SHs, and used it for the K-nearest classification into the benign and malignant nodule. The preliminary experiments on 327 lung nodules (153 malignant and 174 benign) resulted in the 93.6% correct classification (for the 95% confidence interval), showing that the proposed method is a promising supplement to current technologies for the early diagnosis of lung cancer.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Health Sciences section; 1st place in undergraduate research competition)

University of Louisville Internship

BIOLOGY PROGRAM

HLA Class II Molecules Influence Susceptibility Vs Protection in Rheumatoid Arthritis by Programming the Cytokine Profile. HELENA PETT¹, MARSHALL BEHRENS², CHELLA DAVID², AND VEENA TANEJA^{2,3}. ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Mayo Clinic Department of Immunology, and ³Department of Rheumatology, Rochester, Minnesota 55905.

Rheumatoid Arthritis (RA) is an autoimmune disease characterized by cartilage damage and presence of T-cells reactive to type II collagen (CII), which makes up 90% of the cartilage found in joints. Predisposition to develop RA is associated with the presence of certain HLA class II molecules. Presence of HLA-DRB1*0401 renders susceptibility to RA whereas DRB1*0402 provides resistance. We hypothesized that T-cells selected by HLA class II molecules in the thymus are preprogrammed to develop cytokines which may influence susceptibility/resistance of RA. To prove this hypothesis we used mice expressing *0401 and *0402 genes but lacking endogenous class II molecules. Immunization of *0401 mice with CII leads to development of collagen-induced arthritis, a mouse model of arthritis. Mice were immunized with CII and after 10 days, antigen-specific T cell proliferation and cytokine production was analyzed. Our data showed that DRB1*0401 mice generate a stronger response to CII in vitro and produce much higher levels of pro-inflammatory cytokines (Th1 and Th17) compared to *0402 mice. In another experiment naïve CD4 T-cells were cultured in conditions to differentiate them to produce pro-inflammatory or anti-inflammatory cytokines. CD4 T-cells from *0401 mice produced more Th1 and Th17 cytokines than DRB1*0402 while *0402 mice produced more anti-inflammatory (Th2) cytokines. These observations suggest that CIA-susceptible mice produce more pro-inflammatory cytokines than resistant strains. In conclusion, this data suggest that MHC class II molecules are genetically pre-programmed to produce a specific cytokine profile which can influence susceptibility/protection to autoimmune diseases associated with HLA genes.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Health Sciences Section; 1st place in undergraduate research competition)

Mayo Clinic Internship

BIOLOGY PROGRAM

Integrin subunits $\alpha 3$ and $\alpha 6$ in adhesion, migration and proliferation of inner medullary collecting duct (IMCD) epithelial cells on various matrices. FRANCESKA MEHMETI¹, TIANXIANG TU², EUGENIA YAZLOVITSKAYA², and ROY ZENT², ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Zent Lab, Vanderbilt University, Nashville, Tennessee 37212.

Integrins belong to a diverse family of transmembrane glycoproteins that function as non-covalently associated alpha (α) and beta (β) heterodimers to mediate cell to cell and cell to matrix interactions in multicellular organisms. Based on specificity of ligand binding, integrins can be categorized into leukocyte-specific, RGD, laminin and collagen receptors. Laminin-binding integrins play an important role in the kidney development. Major laminins and integrins expressed in the kidney collecting duct are laminin 10/11 (LM511/521) and laminin 5 (LM332); integrins $\alpha 3\beta 1$, $\alpha 6\beta 1$ and $\alpha 6\beta 4$. Blocking of $\alpha 3$, $\alpha 6$, $\beta 1$ or $\beta 4$ integrin subunits has inhibited branching morphogenesis of the ureteric bud during kidney development. To study the role of laminin-binding integrins in the development of kidney collecting duct, we used cell culture model, inner medullary collecting duct (IMCD) epithelial cells. IMCD cells were isolated from the collecting duct of 3-5 weeks old mice that have double-floxed gene sequence for integrin subunits $\alpha 3$ and $\alpha 6$ (Itg $\alpha 3^{f/f} \alpha 6^{f/f}$) and immortalized with pSV40 plasmid. To knock out integrin subunits $\alpha 3/\alpha 6$, immortalized IMCD cells were infected with adenovirus expressing cre recombinase. Using $\alpha 3/\alpha 6$ -WT (wild type) and $\alpha 3/\alpha 6$ -KO (knock out) IMCD cells, we study the role of $\alpha 3/\alpha 6$ -containing integrins in three major cellular functions: adhesion, migration and proliferation using four different types of matrices: LM332, LM511, collagen I and vitronectin. The adhesion of $\alpha 3/\alpha 6$ -KO IMCD cells to LM511 and LM332 is compromised as compared to the wild type cells. However, adhesion to non-laminin matrices collagen I and vitronectin is similar for both cell types. Cell proliferation showed similar results: no difference between $\alpha 3/\alpha 6$ -WT and KO IMCD cells proliferation on collagen I and vitronectin but decreased proliferation of $\alpha 3/\alpha 6$ -KO IMCD cells on LM332 and LM511 as compared to WT-cells. The migration of $\alpha 3/\alpha 6$ -KO IMCD cells on LM332 is also lower than $\alpha 3/\alpha 6$ -WT IMCD cells. In summary, our results for adhesion, proliferation and migration showed that integrin subunits $\alpha 3$ and $\alpha 6$ are essential for IMCD cells binding to laminins. We conclude that $\alpha 3$ and $\alpha 6$ subunits are principal laminin receptors in the kidney collecting duct epithelial cells.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Cellular and Molecular Biology Section; 2nd place in undergraduate research competition)

Vanderbilt University Internship

BIOLOGY PROGRAM

Investigating the Role of Protocadherin 24 in Bacterial Attachment to Microvilli. AUNG S. LIN¹, DAVID A. SHIFRIN², SCOTT W. CRAWLEY², JESSICA N. MAZERIK², NATHAN GREGA LARSON² and MATTHEW J. TYSKA², ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Cell and Developmental Biology, Vanderbilt University Medical Center, Nashville, Tennessee 37227.

The apical surfaces of intestinal enterocytes possess a densely packed array of actin-based membrane protrusions called microvilli. Collectively, these microvilli, known as the brush border, play a vital role in nutrient absorption and barrier function in the gastrointestinal tract. Previous studies from our laboratory have shown that protocadherin 24 (PCDH24) is enriched at the distal tips of microvilli and plays an important role in brush border assembly. PCDH24, a member of the cadherin superfamily of calcium-dependent adhesion proteins, promotes tight microvillar clustering by physically linking the distal tips of adjacent microvilli together. The final result is the formation of a densely packed brush border which can act as an effective barrier against the luminal microbes. One major human intestinal pathogen is Enteropathogenic *Escherichia coli* (EPEC), which attaches to the apical surface, effaces microvilli, and causes severe diarrhea. Given the significance of brush border barrier function in human health, we are interested in investigating how PCDH24 contributes to the defensive mechanism against EPEC infection. For our investigation, we used Caco-2_{BBE} cells, a colonic adenocarcinoma cell line, which naturally forms a densely packed apical brush border. To understand the dynamics of PCDH24 during EPEC infection, we transfected cells with GFP-tagged PCDH24 and observed the apical surface by live cell deconvolution microscopy during infection. Strikingly, we found that PCDH24-EGFP becomes highly enriched at the sites of EPEC F-actin based pedestals and that microvilli converge together to wrap around attached EPEC. To explore whether endogenous PCDH24 behaves in a similar manner, we stained untransfected cells post EPEC infection with an antibody against PCDH24, with DAPI to identify EPEC and with phalloidin to visualize actin. Similar to our live cell studies, endogenous PCDH24 was found to be markedly enriched at the sites of EPEC attachment. To directly assess the role of PCDH24 in EPEC infection, we performed infection studies using Caco-2_{BBE} cell lines in which PCDH24 had been stably knocked down using lentivirus-transduced shRNA constructs. As a control, a Caco-2_{BBE} cell line transduced with a scramble shRNA, which does not target any protein in particular, was used. Cell lines were infected with EPEC, fixed and stained with anti-PCDH24, DAPI and phalloidin. Wide field microscopy was used to evaluate the quantities of attached EPEC in both cell lines. Interestingly, we found that in PCDH24KD Caco-2_{BBE} monolayers, 30-35% more EPEC were attached on their apical surfaces compared to those of the scramble cell line. Visualization of EPEC attachment sites by scanning electron microscopy demonstrated similar morphology between PCDH24 knockdown and scramble cell lines. Our results show that PCDH24 contributes towards intestinal enterocyte brush border barrier function by promoting microvillar packing.

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98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Cellular and Molecular Biology section; 1st place in undergraduate research competition)

Sponsored by Entrepreneurship for the Public Good (EPG) at Berea College and Vanderbilt University

BIOLOGY PROGRAM

In Vitro assay of the Human Immunodeficiency Virus (HIV) production and infection. MIRLINE DUPHRESNE¹ and CHANDRAVANU DASH². ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Biochemistry and Cancer Biology, Meharry Medical College, Nashville, Tennessee 37208.

HIV is a virus that affects millions of people worldwide. There are various ways in which this virus is transmitted, including sexual intercourse. Though there are no definite cures for the virus, Antiretroviral therapy (ART) is a treatment used to slow its growth. Our project was aimed at analyzing how efficiently the virus replicates in the 293T Human Embryonic Kidney cell lines using the TZM-bl as our control. We used the luciferase method to measure the fold change in virus replications compared to different concentrations of the virus transferred into the cells. This was used as a marker to determine the sufficiency of the cells' ability to act as a host for the virus.

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Meharry Medical College Internship

BIOLOGY PROGRAM

Methyl farnesoate as a regulating hormone in the metamorphosis of *Drosophila melanogaster* Larvae: a general dipteran model. WILLIAM ASSAN¹, HYE-MI LEE², MITCH WATTLES², DR. GRACE JONES², DR. DAVY JONES³; ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Biology, University of Kentucky, Lexington, Kentucky 40506; ³Graduate Center for Toxicology, University of Kentucky, Lexington, Kentucky 40506.

The insect hormone receptor ultraspiracle (USP) exists in a heterodimer with the ecdysone receptor (EcR); the latter has been shown to be essential in regulating insect life processes such as molting and eclosion. EcR needs to dimerize with USP in order to bind to the hormone ecdysone with high affinity. The ligand of USP—an invertebrate ortholog of the vertebrate hormone receptor RXR—is unknown. Our studies investigated a potential role of the insect hormone methyl farnesoate (MF) as a ligand for USP that is important in dipteran larval metamorphosis, with *Drosophila melanogaster* as the model organism. Experiments were conducted to mutate the wild-type ligand-binding pocket of USP while keeping circulating methyl farnesoate levels normal. The resulting data: (1) Suggested that interaction of MF with a wild type USP ligand-binding pocket is necessary for puparium formation in *D. melanogaster*; and (2) identified potential target genes for puparium formation. In a reverse experimental approach, circulating hormone levels were altered through RNAi techniques to confuse the cells making the hormone, but the wild-type USP ligand-binding pocket was kept unmutated. The results of this experiment supported the claim that MF has a role in dipteran larval metamorphosis. The results from both experimental approaches to this question provide insight into the metamorphosis of dipterans and present new possible gene targets for biorational larvicides.

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98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Physiology and Biochemistry Section; 1st place in undergraduate research competition)

Sponsored by Kentucky Biomedical Research Infrastructure Network (KBRIN) and the National Science Foundation (NSF)

Testing the Methyl Farnesoate Hypothesis: Does this MF-USP binding interaction occur *in vivo*?

Method 2: RNAi techniques were used to confuse the corpora allata cells in the ring gland (that secretes methyl farnesoate and related hormones) as to know when to secrete MF.

Results: Larvae exhibited disrupted metamorphosis, including melanization, failure to form pupariums and malformed pupae.



Inference: Methyl farnesoate and/or related hormones from the ring gland are involved in larval to pupal metamorphosis.

BIOLOGY PROGRAM

Ritalin and other dopaminergic drugs affect CNS function and development in *Drosophila* larvae. JENNA M. RUFER¹, KAYLA KING², JOSH TITLOW², and ROBIN L. COOPER².
¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Biology, University of Kentucky, Lexington, Kentucky 40506.

To characterize dopamine (DA) requirements in organismal development and behavior, a laboratory strain of *Drosophila melanogaster* was grown on dopaminergic drugs or standard fly food. Methylphenidate and L-DOPA, which increase synaptic levels of DA through different mechanisms, extended the length of larval development. Alpha-methyl-tyrosine (AMT), which decreases DA levels by inhibiting the rate-limiting synthetic enzyme, caused total lethality at this stage. Combining L-DOPA with AMT treatment enabled survival to the pupation stage but none of the pupae eclosed. To determine the effects of chronic DA manipulation on neural circuit function, we administered these drugs for 30 hours during the larval stage of development and quantified feeding and locomotor behaviors. AMT decreased the number of mouth hook movements and body wall contractions observed during a one minute interval. Combining L-DOPA with AMT improved the feeding behavior but not locomotion. Methylphenidate also only affected the feeding behavior. These results are consistent with a previous study that reported defects in larval feeding behavior when DA synthesis was inhibited in the embryonic stage. Together, these data support the notion that a norm of reaction exists for [DA] and deviation from that range of [DA], above or below, depresses the function of neural circuits driving these behaviors. Those findings are supported by our electrophysiological analysis of sensory to motor transmission in dissected third instar larvae that show remarkable differences in AMT-treated animals.

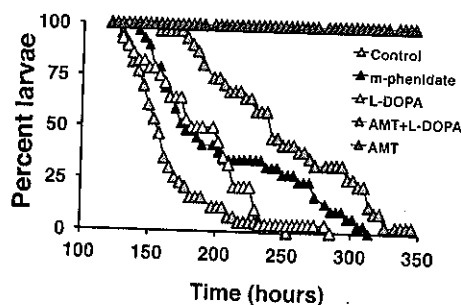
13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Physiology and Biochemistry Section)

University of Kentucky Internship

Sponsored by Kentucky Biomedical Research Infrastructure Network (KBRIN)

Dopaminergic drugs increase the duration of larval development.



BIOLOGY PROGRAM

Role of HLA Class II Polymorphisms on Staphylococcal Superantigen Pathogenicity. ALYSSA N. QUIRAY¹, CHELLA S. DAVID^{2,3}, GOVINDARAJAN RAJAGOPALAN^{2,3}, ASHENAFI TILAHUN². ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Immunology, Mayo Clinic College of Medicine, Rochester, Minnesota 55905; ³Mayo Clinic Undergraduate Research Employment Program.

Superantigens (SAGs) are extremely bioreactive bacterial exotoxins associated with certain human inflammatory immune responses including toxic shock syndrome. The binding mechanisms of SAGs to the major histocompatibility complex (MHC) class II molecules and to T-cells differ from normal antigens and leads to massive polyclonal T-cell proliferation and cytokine storm production. As the immune response is dependent on SAg – MHC class II binding, it was hypothesized that polymorphisms of the MHC class II molecule would result in differing levels of immune response (measured in T-cell proliferation and cytokine production). Mice lacking endogenous MHC class II and transgenic for human leukocyte antigen (HLA) class II molecules were used as a model of SAg pathogenicity. HLA types DR3, DQ8, and double-transgenic DR3.DQ8 were used; both in vitro and in vivo treatments with staphylococcal enterotoxin B (SEB) were performed. Our data showed varying levels of T-cell proliferation and cytokine production amongst the three HLA types, with DR3 exhibiting the strongest immune response. This could indicate a relationship between HLA polymorphs and affinity and response to SAGs.

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Mayo Clinic Internship

BIOLOGY PROGRAM

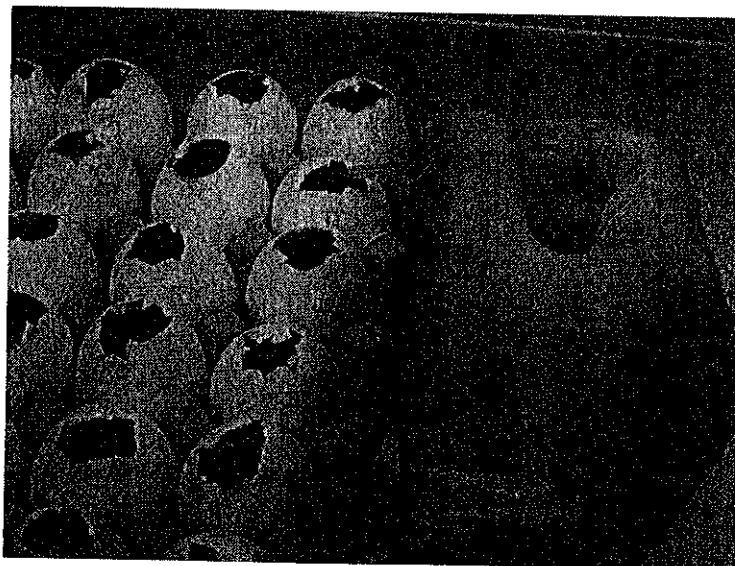
Surveillance of Avian Influenza in Waterfowl. WENDELL BLISS¹, JACQUELINE NOLTING² and RICHARD SLEMONS². ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Veterinarian Preventative Medicine, Sissions Hall, The Ohio State University, Columbus, Ohio 43210.

Wild waterfowl species are primary reservoirs for multiple strains of type A Influenza virus. The various strains of this virus are occasionally transmitted to different species, often swine and poultry and rarely humans. Transmission of the virus can lead to potentially fatal results, which is especially a concern for poultry farmers. The virus can mix in swine along with human Influenza to form other highly pathogenic forms. Migration of waterfowl with avian influenza can represent an easy route for transmission of the virus over large areas. We conducted surveillance of hunter killed and trapped waterfowl along the Mississippi flyway as a research affiliate of MCEIRS (Minnesota Center of Excellence for Influenza Research & Surveillance). Samples were taken in the form of cloacal swabs and were grown through incubation in 10-day-old specific-pathogen free embryonating chicken eggs. Presence of type A Influenza virus was identified using Avian Influenza Virus Type A Antigen Test Kit. Results of surveillance efforts were relayed to NIH (Nation Institute of Health) through MCEIRS. These results are used in an effort to minimize global effects of Influenza A through identification of viruses and gene pools with interspecies and intraspecies transmission potential.

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Sponsored by National Institutes of Health



BIOLOGY PROGRAM

The effect of light on astrocyte morphology in *Gallus gallus domesticus*. TASHA E. PAYNE¹, JIFFIN PAULOSE², GANG WANG², BRANDON SCHELTER², and VINCENT CASSONE².
¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Biological Science, University of Kentucky, Lexington, Kentucky 40546.

Circadian rhythmicity plays a critical role in the behavior and physiology of nearly all organisms. There are 4 well-established characteristics of circadian rhythmicity including a free running period (FRP) of about 24 hours, the ability to entrain to environmental cues, temperature compensation, and endogeny. Although circadian rhythms are coordinated in the brain, almost every cell has been found to contain its own circadian clock, including individual brain cells. Our group wanted to know if circadian clocks could be found in astrocytes. Astrocytes are star-shaped glial cells located in the brain and spinal cord near nutrient-filled vesicles, allowing them to produce ATP and maintain extracellular ion balance. Previous data from our lab suggested that astrocytes contain photoreceptors, so this project aimed to determine if astrocytes located close to light-accessible regions of the brain, are capable of transducing light input directly. To determine this, we collected and cultured astrocytes from 15 day old chick embryos, and placed them in a 12 hour light/12 hour dark cycle for 3 day entrainment. Afterwards, photographs were taken of the astrocytes every 4 hours for 36 hours. The cell's total area and process lengths were measured and recorded. It was found that both measurements increased during photoperiod and troughed during scotoperiod, showing that the astrocytes do contain photoreceptors and possibly express circadian rhythmicity. This conclusion could be reinforced by running the experiment again but with a dark/dark light cycle to determine if the astrocytes expressed circadian or diurnal rhythmicity.

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BIOLOGY PROGRAM

The effect of TGF- β on renal interstitial cells and the progression of tubulointerstitial fibrosis. KAREN REYNOLDS¹, LESLIE GEWIN AND ROY ZENT². ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Department of Nephrology, Vanderbilt University, Nashville, Tennessee 37232.

Tubulointerstitial fibrosis is characterized by the accumulation of extracellular matrix (ECM) components such as collagens I, IV, and fibronectin. Renal fibrosis is the common final pathway to end stage kidney disease, regardless of the original cause of injury. Transforming Growth Factor- β (TGF- β) is a pleiotropic signaling protein that is a strong mediator of renal fibrosis. There are three mammalian isoforms of TGF- β (β_1 , β_2 , and β_3) which all require the TGF- β type II receptor (T β RII), a serine/threonine kinase, for signal transduction. Mice with over-expression of TGF- β displayed increased ECM production. While global inhibition of TGF- β with an antibody ameliorates injury induced by unilateral ureteral obstruction (UUO), the standard model of tubulointerstitial fibrosis, and TGF- β 's pro-fibrotic effect is well established, the specific cell type responsible for TGF- β mediated fibrosis is unclear. TGF- β induces renal fibroblasts to produce ECM components *in vitro*, suggesting that these cells may mediate TGF- β 's pro-fibrotic effects. However, TGF- β signaling in renal fibroblasts has not been investigated *in vivo*. Removing T β RII in ECM producing cells helps assess how this affects fibrosis in response to renal injury. T β RII was removed using the Cre-Lox system. The receptor was removed from a Cre-Collagen 1A2 containing mouse (Tgfr2^{Col1A2}) or a Cre-Tenascin C containing mouse (Tgfr2^{Ten.C}), both of which were tamoxifen inducible. Both transgenic mouse models were on the tomato (mT/mG) reporter mouse which shows Cre activity by green (EGFP) fluorescence. Mice were injured through UUO at 8 weeks, euthanized 7 or 14 days later, and their kidneys were removed. Paraffin embedded kidney sections were used to assess expression of ECM components by immunohistochemistry. Frozen sections were used to detect co-localization between EGFP+ cells and mesenchymal cell markers by immunofluorescence. Little difference was found in collagen I production between the floxed wild type and the Tgfr2^{Col1A2} 7 day UUO kidneys suggesting that the removal of T β RII is not protective against fibrosis as hypothesized. The question remains, what kinds of cells are expressing T β RII in the interstitium and how might these cells be influencing matrix production? We found little overlap between Cre positive cells and α smooth muscle actin, a marker of activated fibroblasts that are common contributors to fibrosis. A similarly small overlap was found between cells missing T β RII and cells stained for fibroblast specific protein (FSP-1), another marker typical of activated fibroblasts. The interstitial Cre positive cells seem to be primarily located in the medulla, the area that is most affected by UUO injury, but so far they do not appear to be typical matrix producing cells.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Cellular and Molecular Biology section)

Vanderbilt University Internship

BIOLOGY PROGRAM

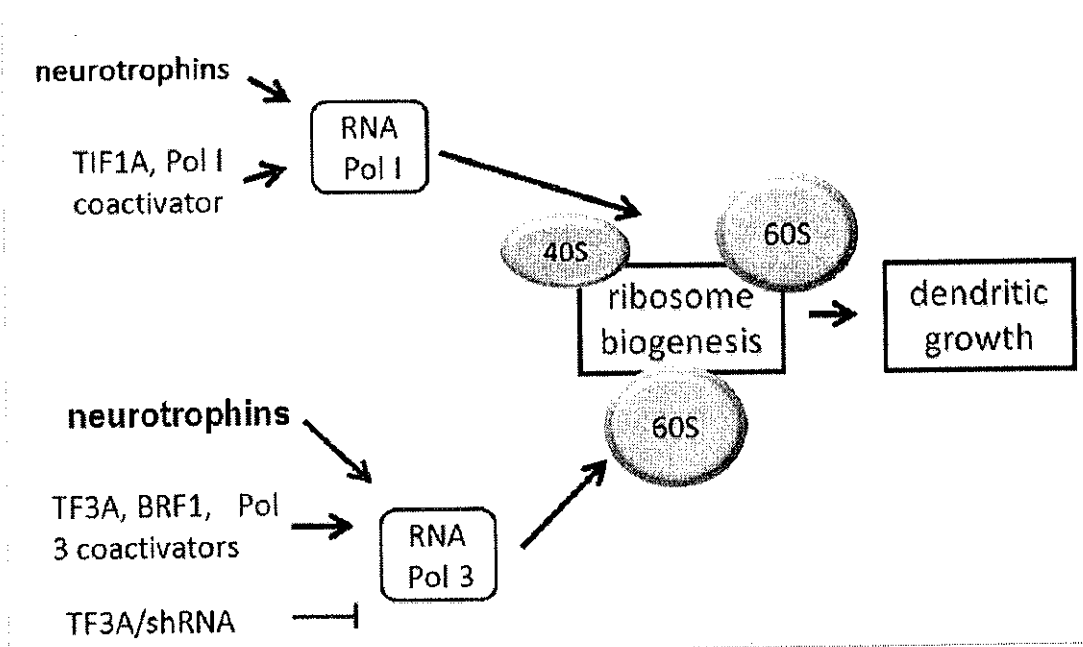
The role of RNA Polymerase III in the development of dendritic arbors. CHIDO MATARA¹, GIANNE MAIONE², LUCAKZ SLOMNISKI², MICHAL HETMAN²; ¹Biology Program, Berea College, Berea, Kentucky 40404; ²University of Louisville, Louisville, Kentucky 40202.

RNA polymerase I and III initiated transcription codes for the production of rRNA and tRNA genes which are essential for sustained protein synthesis, which is directly correlated to cellular growth. Studies have shown elevated levels of Pol III products (5S rRNA, tRNA and 7SL RNA) in tumor cells. (White, 2004). Pol III transcription is deregulated in tumor cells and previous research suggests that enhanced Pol III activity is required yet not sufficient for tumor genesis (Johnson, et al, 2008). These studies suggest that Pol III acts as a growth factor in cancerous cells. No studies have been administered to investigate the effect of Pol III on the growth and development of the neural system. This study serves to elucidate whether Pol III is a contributor in the growth of dendritic arbors and ribosome biogenesis. Dendritic tree development is vital as it determines great neuronal connectivity and, therefore, signal transduction.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Biochemistry Section)

Sponsored by National Institutes of Health



BIOLOGY PROGRAM

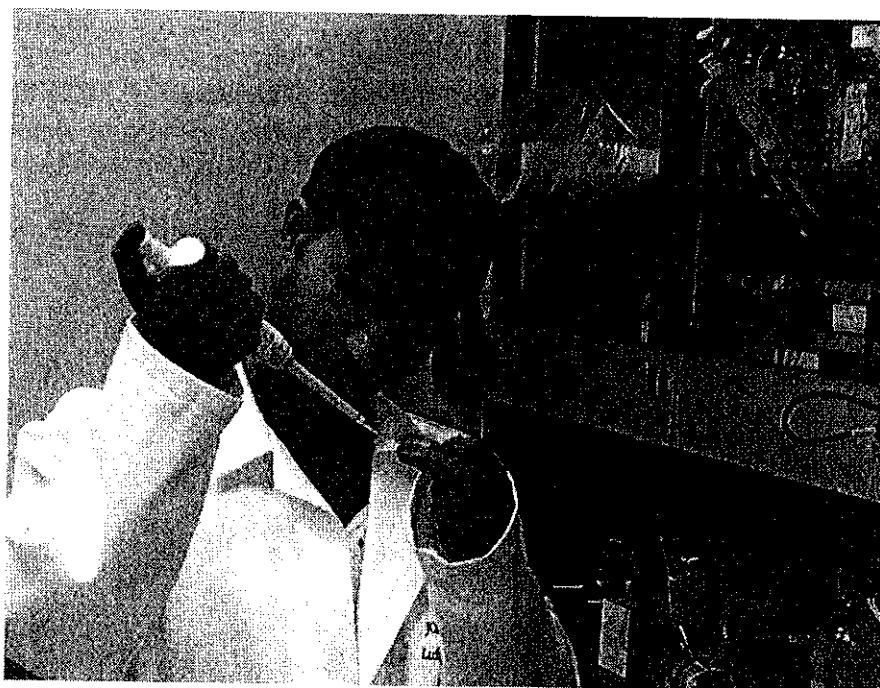
To clone Erkf gene from E.coliK12 in pET32a(+) expression vector. DIPENDRA SHARMA CHAPAGAIN¹ and GYANU LAMICHHANNE, PhD.² ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Johns Hopkins School of Medicine, Baltimore, Maryland 21218.

Pathogenic bacteria *Mycobacterium tuberculosis* (MTB) is the causative agent of Tuberculosis in most cases. It contains a waxy coating in outer cell surface called Peptidoglycan layer, which is cross linked by two main enzymes namely Transpeptidase and d-alalin-carbosypeptidase. L,D-transpeptidase belongs to the YkuD superfamily, which is also called the ErfK/YbiS/YcfS/YnhG family, and this conserved region is thought to give bacteria resistance to beta-lactam antibiotics that inhibit PBPs, which usually carry out the cross-linking reaction. The catalytic domain of L, D-transpeptidase in *Enterobacter fumarium* is the first functionally characterized member of a conserved family of proteins designated ErfK-YcfS-YhnG or pfam 03734 in databases. So, the main objective of this research was to clone erkf gene from E.colik12 in pET3z a+ expression vector and perform functional assay and protein expression of Erkf gene.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Microbiology Section; 1st place in undergraduate research competition)

Johns Hopkins Internship



BIOLOGY PROGRAM

Variation in Abundance of Salamanders in Four Selected Stream Habitats in Central Kentucky. ASHLEY N. CURTIS, JOSHUA A. HALL, NADIA A. KARKENNY, SARA A. KELLER, MICHON A. MARTIN, BRANDI L. VAUGHN, and ROY M. SCUDDER-DAVIS, Biology Program, Berea College, Berea, Kentucky 40404.

The abundance of salamanders in four streams in Central Kentucky was monitored during the summer of 2012. Two “habitat island” streams were selected because of their isolation from surrounding habitat by the north- and south-bound lanes of Interstate 75. Two other streams that are not isolated from the surrounding habitat (“mainland habitats”) were selected for purposes of comparison. Four, ten-meter long transects were established within each stream, and each stream was sampled six times during the study. Sampling sessions involved turning over objects in the stream bed, collecting the salamanders encountered, and photographing each specimen. The number of objects turned and the time spent sampling were recorded for each sampling session. The number of salamanders encountered did not show a consistent pattern between island and mainland habitats. Streams varied significantly from each other in salamander density as measured by the number of objects turned per salamander ($F=41.74$, df 3, 20, $p<0.001$). Two other density measures, salamanders per minute ($F=2.52$, df 3, 20, $p>0.05$) and salamanders per square meter ($F=1.70$, df 3, 20, $p>0.10$) did not differ among the streams. The variation in density as measured by the number of objects turned can be related to the topography of the streams rather than to any real difference in the density of salamanders. The streams did not differ significantly in number or density of salamanders. Although salamander abundance did not vary between mainland and island habitats, species diversity did vary between habitat types.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Ecology and Environmental Sciences section)

Funded by Berea College URCPP

BIOLOGY PROGRAM

Variation in Diversity of Salamander Species in Four Selected Stream Habitats in Central Kentucky. NADIA A. KARKENNY, ASHLEY N. CURTIS, JOSHUA A. HALL, SARA A. KELLER, MICHON A. MARTIN, BRANDI L. VAUGHN, and ROY M. SCUDDER-DAVIS, Biology Program, Berea College, Berea, Kentucky 40404.

The diversity of salamanders in four streams in Central Kentucky was monitored during the summer of 2012. Two “habitat island” streams were selected because of their isolation from surrounding habitat by the north- and south-bound lanes of Interstate 75. Two other streams that are not isolated from the surrounding habitat (“mainland habitats”) were selected for purposes of comparison. In accordance with the theory of island biogeography, we expected to find that the “habitat island” streams would have lower species diversity than the “mainland habitat” streams. Four, ten-meter long transects were established within each stream, and each stream was sampled six times during the study. Sampling sessions involved turning over objects in the stream bed, collecting the salamanders encountered, and photographing each specimen to determine maturity and for identification purposes. As expected, the two habitat islands had fewer species: two for one stream and three for the other. The mainland habitat streams had seven species each, though the species were not identical and the distribution of individuals among the species varied. The Shannon-Wiener Diversity Indices for the two mainland habitats were 4.21 and 2.21. The indices for the habitat islands were 1.13 and 1.03. Similarity measures indicate that the two mainland habitats are more similar to one another than they are to the two island habitats. Further investigation is needed to determine the possible causes of the distribution of salamanders in these streams.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Ecology and Environmental Sciences Section; 1st place in undergraduate research competition)

Funded by Berea College URCP



CHEMISTRY PROGRAM

Applications of Si-29 Magic-Angle Flipping Nuclear Magnetic Resonance Experiments to Silicate Glasses. PYAE PHYO¹, JAY BALTISBERGER¹, KEVIN SANDERS², ERIC KEELER², and PHILIP GRANDINETTI²; ¹Chemistry Program, Berea College, Berea, Kentucky 40404; ²Chemistry and Biochemistry Department, The Ohio State University, Columbus, Ohio 43210.

Various alkali and alkaline earth modified silicate glasses were studied using Si-29 Magic-Angle Flipping Nuclear Magnetic Resonance (MAF-NMR) spectroscopy. The chemical shift anisotropy (CSA) trends were extracted for glasses with a variety of Q(4), Q(3), and Q(2) sites. We observed that the CSA increases roughly linearly with respect to cation potential (cation charge divided by cationic radius). In a mixed glass consisting of K₂O and MgO modifiers, significant ordering was found for the cations near the non-bridging oxygen atoms on Q(3) sites. In particular we see one Q(3) site with a CSA similar to a pure K₂O modified glass and a second site with a CSA that is the average of K₂O and MgO modified glass CSA values. This proves that one of the sites has only K⁺ modifiers while the other is a mixture of K⁺ and Mg²⁺ modifying cations. This shows a remarkable degree of ordering in a disordered system such as this. Recent studies of Cs₂O modified glasses suggest that even with a single modifying cation there may be multiple kinds of Q(3) coordination environments. Again, having distinct coordination environments is surprising and shows that these glasses often possess greater ordering than expected for a purely random model.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation - Chemistry Section)

CHEMISTRY PROGRAM

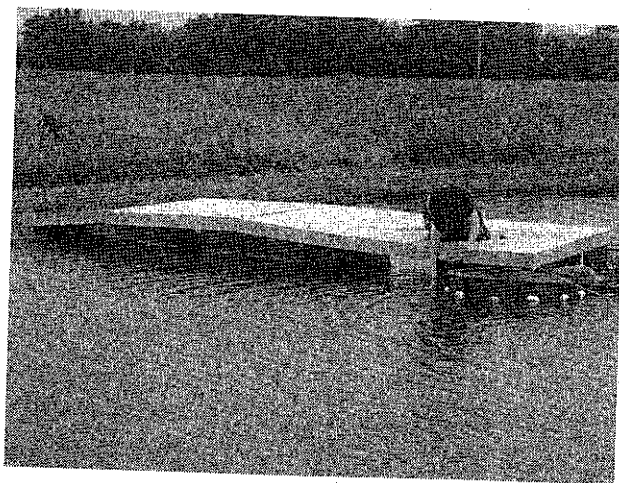
Buffer capacity and pH trends in Berea College's aquaculture and aquaponics facilities. GEORGIA DAHLQUIST, SOPHIA AL-MAAMARY, SARAH ELROD, BRITTANY SCHROEDER and PAUL C. SMITHSON, Chemistry, Biology, and the Sustainability and Environmental Studies Programs, Berea College, Berea, Kentucky 40404.

Berea College raises catfish (*Ictalurus punctatus*) and tilapia (*Oreochromis niloticus*) in two ponds at the College Farm and in a recirculating aquaponics (fish plus hydroponics) system at the Berea College Ecovillage. In this study, we measured pH daily at around 8 AM from late May to mid-July 2012, and continuously at 15-minute intervals for a 10 to 14 day period in July. We estimated buffer capacity of the water by titration with 0.02 M NaOH or 0.02 M HCl. Aquaponics tank pH was relatively stable, varying from pH 6.1 to 7.3 at the 8 AM sampling times. Continuous aquaponics pH monitoring from 18 to 30 July showed diurnal variation in pH, rising in the afternoons due to phytoplankton uptake of CO₂, but with similarly small amplitude. Buffer capacity of the aquaponics water was lowest in the pH 6 to 8 region of interest, measuring about 0.1 mmol OH⁻/L water per pH unit. Morning farm pond pH ranged from 6.4 to 8.5 in the lower pond and 6.5 to 10.1 in the upper pond. Continuous pH monitoring in the upper pond from 2 to 12 July showed large diurnal variations in pH, rising in the afternoons to nearly pH 11. Buffer capacity of the pond water was maximum near pH 6 at about 1 mmol OH⁻/L water per pH unit, while at pH 8 it was 0.2 mmol OH⁻/L water per pH unit. Knowledge of buffer capacity and pH excursions allows better planning for possible pH adjustments.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, East Kentucky University, Richmond, Kentucky (Poster Presentation – Ecology and Environmental Sciences section)

Funded by Berea College URCP



CHEMISTRY PROGRAM

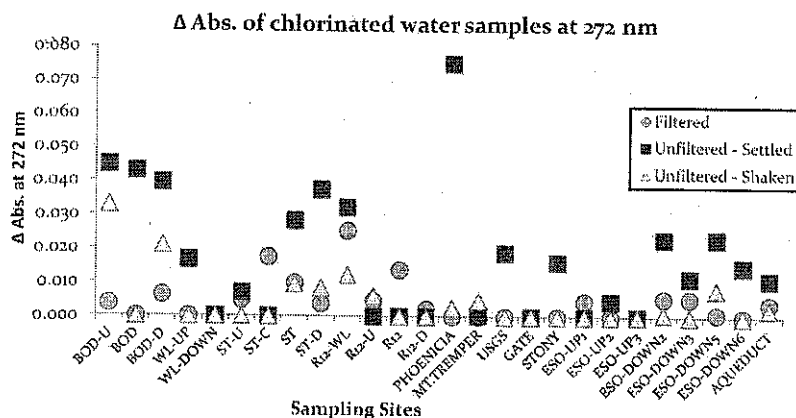
Characterization of disinfection byproduct (DBP) formation potential within the Ashokan watershed: Effects of filtered and unfiltered chlorinated water samples. TIMOTHY JOHNSON¹, IVAN TITALEY², and MEGAN FERGUSON³. ¹Department of Chemistry, Alfred University, Alfred, New York 14802; ²Chemistry Program, Berea College, Berea, Kentucky 40404; ³Department of Chemistry, State University of New York at New Paltz, New Paltz, New York 12561.

Chlorination of water containing dissolved organic carbon (DOC) can result in the formation of harmful halogenated compounds known as disinfection byproducts (DBP). The formation potential of DBP was characterized in the Ashokan Watershed. The issue of DBP is of particular interest due to the fact that New York City does not filter its drinking water. Since parts of the Ashokan Reservoir watershed have high turbidity, these sediments could affect the fate of DOC. Filtered, unfiltered-settled and unfiltered-shaken sample treatments were used to model filtered, settled down, and turbid water conditions in the Ashokan reservoir, respectively. Samples were taken at sites along the Warner, Stony Clove, and Esopus creeks as well as at the beginning of the aqueduct leaving the reservoir. Water samples were then chlorinated to model actual water supply. The chlorinated water was analyzed with UV-Visible spectroscopy to determine the extent of total halogenations and the amount of unused chlorine. Aliquots of the samples were further extracted with pentane and methyl tert-butyl ether (MTBE) and run on GC/MS to quantify chloroform (CHCl_3) and haloacetic acids (HAA), respectively. The majority of both chloroform and HAA results indicated less than limit of quantization for the chlorinated water samples—regardless of the different treatments. Of those that did have significant DBP signals, unfiltered-settled water samples tended to have higher DBP formation compared to filtered and unfiltered-shaken water samples. The results were as hypothesized because there were more DOC concentrations in the unfiltered water samples, which would lead to higher DBP potential formations.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation - Chemistry Section; 2nd place in undergraduate research competition)

**State University of New York at New Paltz Internship
Funded by National Science Foundation**



CHEMISTRY PROGRAM

Electrochemical and optical properties of chemically-synthesized Au nanoparticles ranging from below 4 nm to 30 nm in diameter. TITAY AYANO¹ and FRANK ZAMBORINI², ¹Chemistry Program, Berea College, Berea, Kentucky 40404; ²University of Louisville, Louisville, Kentucky 40202.

We describe the chemical synthesis of Au nanoparticles (NPs) from below 4nm to 30 nm in diameter. The chemical reduction of HAuCl₄ by NaBH₄ in the presence of trisodium citrate as a stabilizer for the NPs led to Au NPs with an average diameter of 4nm when stirred for 2hr and < 4 nm average diameter when stirred for 15 min. A seed-mediated growth method produced Au NPs from 10 nm to 30 nm average diameter. The procedure involved combining 2 ml of 0.1 M trisodium citrate, 4 mL of 4 nm diameter Au NP solution ("seeds") with 2.5×10^{-4} M Au, and varied amounts of 0.01 M HAuCl₄ (2 mL, 4 mL, 6 mL, or 8 mL). 98 mL, 96 mL, or 92 mL of nanopure water was added for the different amounts of HAuCl₄, respectively, to make the volume of HAuCl₄ plus water 100 mL for a total volume of 106 mL after addition of citrate and Au NP seed solution. The reaction proceeded at 30 °C instead of the usual boiling temperatures described in the literature. The size determined by the scanning electron microscopy (SEM) images correlated with the optical properties determined by UV-vis spectroscopy. The functionalization of indium-tin-oxide-coated glass electrodes (glass/ITO) with aminopropyltriethoxysilane (APTES) and soaking of the glass/ITO/APTES electrodes in a solution of the various sized Au NPs led to the electrostatic attachment of the negatively-charged NPs to the Positively-charged protonated amine of APTES on the electrode. Linear Sweep Voltammetry of the glass/ITO/APTES/Au NPs from 0 V to 1.2 V in a solution of 0.01 M KBr plus 0.1 HClO₄ led to electrochemical oxidation and dissolution of the Au NPs as AuBr₄⁻ or AuBr₂⁻. The coverage of Au NPs on the electrode depended on the soaking time and the Au oxidation potential decreased with decreasing Au NPs average diameter.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation - Chemistry Section)

University of Louisville Internship

CHEMISTRY PROGRAM

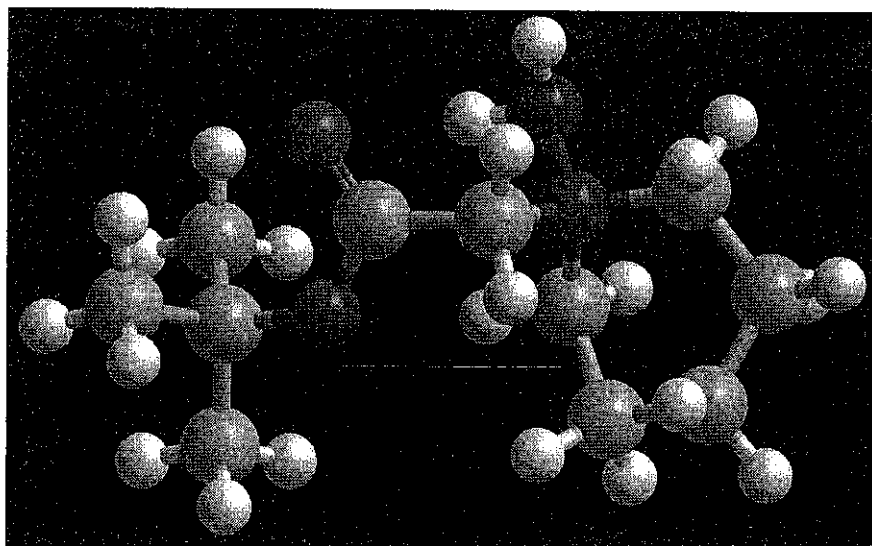
Introduction of Hydrogen Bonding Capabilities to Poly N-Substituted Glycines. IVAN L. SUAREZ-DIAZ¹, NATHAN BREIDENBACH², MODI WETZLER, Ph.D. ¹Chemistry Program, Berea College, Berea, Kentucky 40404; ²Chemistry Department, Clemson University, Clemson, South Carolina 29634-0973.

The interest for peptide mimics is vast. Since they were discovered, peptoids ignited curiosity due to the increased similarity with peptides which make them great candidates for therapeutic applications. However, the lack of defined and stable peptoid structures has presented a disadvantage to their use. Many attempts have been made to engineer more structured peptoids, but even though advancement in the field has been made, a defined peptoid structure has not been found yet. The plan in this research was to utilize biological structural principals to reintroduce hydrogen bonds to peptoid structures. Hydrogen bonds are present in peptides and this intramolecular force, allows peptides to be more structured. Thus, by reintroducing these hydrogen bonds, peptoids would obtain a more defined structure. That is why we decided to work with hydrazine. Hydrazine is a molecule that is convenient to become a part of the peptoid backbone since it allows hydrogen bonding capabilities. We used different variations of hydrazine and the one I primarily worked with was aminopiperdine. After the results given from spectra analysis, we determined that it was necessary to protect the most substituted side of the hydrazine in order to grow a longer chain.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Chemistry Section)

Clemson University Internship



CHEMISTRY PROGRAM

Modification of Amikacin and Tobramycin for Enhanced Antibacterial Activity. AMANUEL TESFAMICHAEL, Chemistry Program, Berea College, Berea, Kentucky 40404.

Over time, different strains of bacteria have developed resistance to the antibiotic drugs discovered to cure the infections they cause. The limited availability of new antibiotic drugs is a concern given the continuing and fast development of resistance by bacteria. Aminoglycosides are a class of antibiotics proven in previous studies to be effective drugs with scaffolds amenable to modification. In a previous study, guanidino-aminoglycosides showed increased antibacterial activity and RNA binding in many cases. In particular, the kanamycin class of derivatives modified at the 6'' alcohol showed major promise. Here we modify amikacin and tobramycin by replacing the 6'' primary alcohol with various other hydrogen bonding motifs. We hope to create other improved analogs with our new modifications.

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Chemistry Section)

CHEMISTRY PROGRAM

Multiple Quantum Transitions of ^{17}O . DANIEL PARDUE¹ and RICHARD WITTEBORT².
¹Chemistry Program, Berea College, Berea, Kentucky 40404; ²University of Louisville,
Louisville, Kentucky 40202.

We conducted preliminary studies on the feasibility of using ^{17}O multiple quantum (MQ) nuclear magnetic resonance (NMR) spectroscopy to measure quadrupolar coupling constants for H_2O acting as a molecular probe in a highly ordered but anisotropic medium such as a liquid crystal or a partially ordered collagen structure. Collagen is a unique protein because of its incredible flexibility and tensile strength. Previous workers have used similar techniques to study other nuclei such as ^2H in partially ordered systems. Studies using ^{17}O have the advantage of providing additional energy levels due to the spin $5/2$ nature of the nucleus. In particular, the observable central transition lacks first-order quadrupolar broadening and is therefore quite sharp (in contrast to ^2H). In addition, the triple-quantum (3Q) and five-quantum (5Q) transitions are also similarly sharp which is critical if a range of quadrupolar coupling constants is present due to a wide distribution of sample geometries experienced by the water molecules. The pulse sequence used consist of a two pulse preparation period to excite the MQ coherence followed by a t_1 evolution period and concluded with a conversion pulse back to 1Q for detection during t_2 . This sequence was tested on water molecules in a liquid crystal medium and allowed observation of all 10 possible MQ peaks (due to the very strongly ordered environments experienced by the water molecules). Using the same sequence and optimizing the length of the preparation period the sharp 3Q and 5Q peaks in the indirect dimension are seen with maximum sensitivity.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation - Chemistry Section)

University of Louisville Internship

CHEMISTRY PROGRAM

New Method of β -Ketoester synthesis. ANNA TRIBBLE, MARCELINE AENGWANAMA and MARY ROBERT GARRETT, Chemistry Program, Berea College, Berea, Kentucky 40404

The purpose of this research was to synthesize a β -ketoester through a new method. The point of this method was to create a less expensive route to synthesizing β -ketoesters using more natural and accessible materials. In this route, a ketene is formed via deprotonation and elimination of an acid chloride. The catalyst, benzoyl quinine, attacks the ketene forming the zwitterionic enolate, which then attacks an ester. After regeneration of the catalyst the β -ketoester is formed. Two new electronegative esters, perchlorophenyl 4-cyanobenzoate and perchlorophenyl 4-nitrobenzoate were synthesized and used for the reaction. These esters seemed to demonstrate some reactivity because there were signals by ^1H NMR that could not be identified as the ester or the hydrolyzed acid chloride which was a common side product. The greatest difficulty in this research was separating the compound from impurities. There were not satisfying results in separation by column nor purification by recrystallization.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Chemistry Section)

Funded by Berea College URCPP

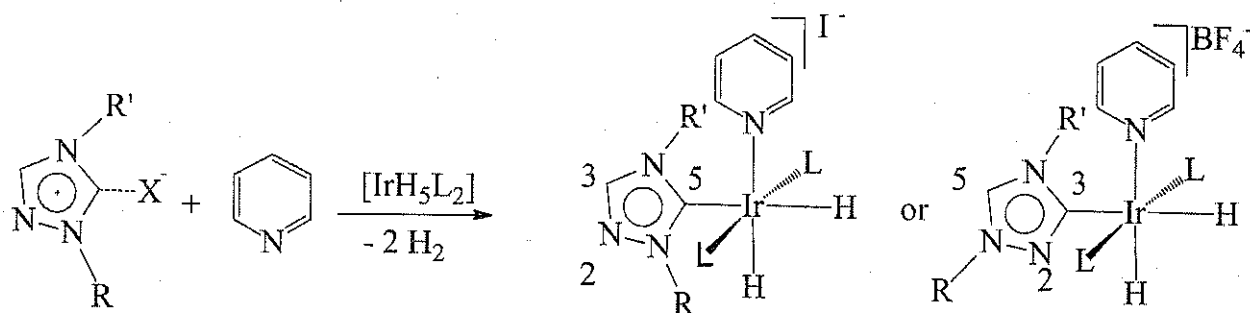
CHEMISTRY PROGRAM

New Synthetic Pathway to Triazolium Carbene Complexes. LEIF E.R. VAN LAAR, RUSSELL D. HAMMOND II, ALEXANDRIA A. SMITH, CHRISTA CHERRY and ANES KOVACEVIC, Department of Chemistry, Berea College, Berea, Kentucky 40404.

N-heterocyclic carbenes have become increasingly popular ligands for organometallic catalysis 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 triazolium carbene complexes. It involves C-H bond activation and $[\text{Ir}(\text{H})_5(\text{PPh}_3)_2]$ as a metal precursor. Preliminary results suggest different binding of iridium on triazole depending on counterion (BF_4 or I^-).

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Chemistry Section)



CHEMISTRY PROGRAM

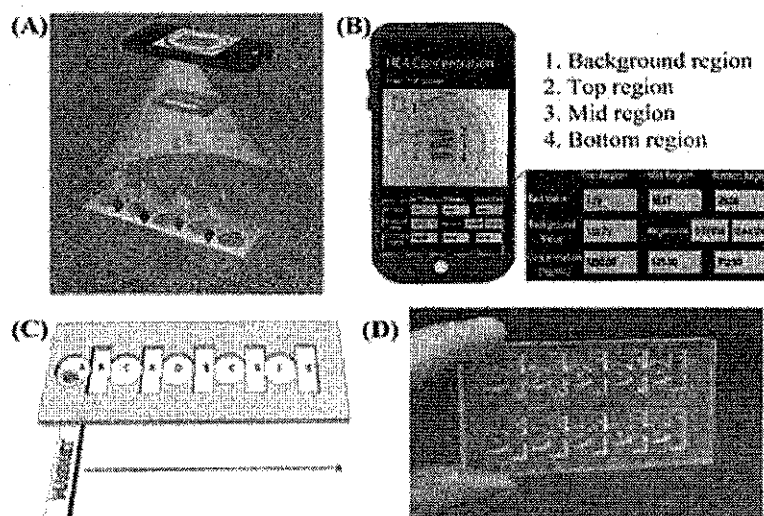
Novel Approach of Using Microvesicles as Biomarkers for Oral Cancer. HORTON LI¹ and WINSTON P. KUO, PhD². ¹Biology Program, Berea College, Berea, Kentucky 40404; ²Harvard School of Dental Medicine, Cambridge, Massachusetts 02138.

Early disease detection is a logical and imperative goal necessary to dramatically improve a patient's odds for successful treatment, survival and overall quality of life. It has become increasingly clear that existing methods are limited and falling short of these goals. Therefore, there is an urgent need to develop new prognostic and diagnostic assays that can detect initial stages of disease and accurately predict high and low risk patients and their early response to therapy. One such disease, oral squamous cell carcinoma (OSCC), has been diagnosed from saliva. This is a non-invasive and inexpensive diagnostic technique which utilizes microvesicles to enrich tissue-specific biomarkers. Salivary microvesicles are 30-120nm membrane-closed vesicles of endocytic origin that contain proteins, lipids and nucleic acids. In this study, we collected saliva from normal patients and patients diagnosed with OSCC. The aim was twofold: 1) to isolate microvesicles from saliva from the two groups and extract total RNA from these isolated microvesicles and 2) to examine the miRNA profiles performed on the NanoString nCounter miRNA expression assay of normal patient and patients diagnosed with OSCC.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Health Sciences Section; 3rd place in undergraduate research competition)

Harvard School of Dental Medicine Internship



CHEMISTRY PROGRAM

Soil phosphorus content in watersheds affected by waste lagoon overflows at Berea College Farm. SARAH ELROD, SOPHIA AL-MAAMARY, GEORGIA DAHLQUIST, BRITTANY SCHROEDER and PAUL C. SMITHSON, Chemistry, Biology, and the Sustainability and Environmental Studies Programs, 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 the watershed and 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 141 georeferenced topsoil (0 to 5 cm) samples from two small watersheds downslope from the lagoons, one watershed receiving lagoon overflow and the other not. Soils were extracted with Mehlich III solution (0.2M acetic acid, 0.25M ammonium nitrate, 0.015M ammonium fluoride, 0.013M nitric acid, and 0.001M EDTA), filtered, and analyzed for orthophosphate by the molybdate blue method. Spatial analysis using ArcGIS software showed elevated soil P in the watershed historically receiving lagoon overflow (mean 247 mg P/kg, SD 182), significantly higher ($P < 0.0001$ by t test) than in the unaffected watershed (mean 112 mg P/kg, SD 96). The former waste lagoons have been dredged out and converted to fish ponds, so excess P inputs to the watershed have ceased. We plan to continue monitoring soil P in the watershed to track the presumed decline in excess P loading to the receiving waters.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Ecology and Environmental Science Section)

Funded by Berea College URCP

CHEMISTRY PROGRAM

Synthesis of β -Ketoesters Through Ketene Intermediates. MICHAEL MCCANN, KATHRYN RISK, and MARY ROBERT GARRET, Chemistry Program, Berea College, Berea, Kentucky 40404.

β -Ketoesters have been found to be useful in the synthesis of many different types of pharmaceuticals and natural products. Claisen condensation is one of the most commonly used ways to form a β -ketoester. The purpose of this research is to effectively create β -ketoesters through the use of a ketene precursor. The ketene necessary for the desired reactivity was confirmed by IR spectroscopy. Reactions with numerous esters were examined and tested by the synthesis of diketones.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation - Chemistry Section)

Funded by Berea College URCP

CHEMISTRY PROGRAM

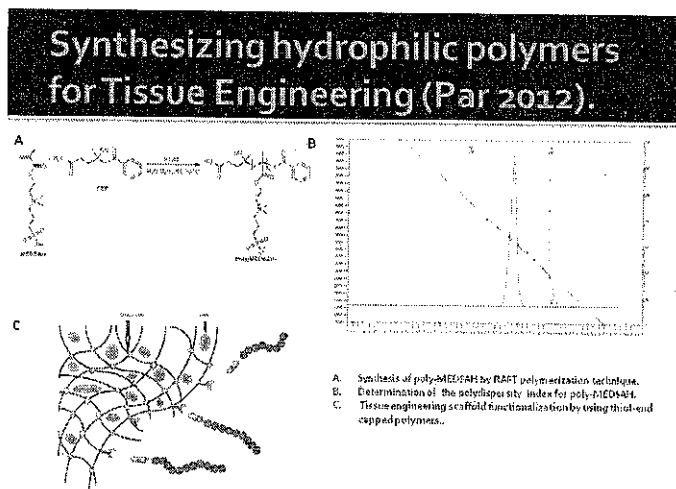
Synthesis of Hydrophilic Polymers Containing a Reactive Thiol Group by RAFT and Aminolysis. JIANWEN XU, GRACE PAR¹, SOCHETA LY and JIE SONG, ¹Chemistry Program, Berea College, Berea, Kentucky 40404; ²Department of Orthopedics and Physical Rehabilitation, Department of Cell Biology, University of Massachusetts Medical School, Worcester, Massachusetts 01655.

The tissue engineering field seeks innovative methods and materials for the treatment of musculoskeletal diseases. However, functional biocompatible and biodegradable polymers suitable for tissue engineering scaffolds are limited. Thiol-ene "click" chemistry has attracted wide interest as an efficient way to functionalize biomaterials. Therefore, polymers with thiol end-groups and defined structures are highly desired. Here, two types of thiol-functionalized hydrophilic polymers, poly(MEDSAH)_n and poly(PEGMA)_n, were successfully prepared by aminolysis of their corresponding polymers from reversible addition-fragmentation chain transfer polymerization (RAFT). The RAFT polymerization conditions, including temperature and solvent, were optimized to obtain narrow-dispersed polymers. Gel permeation chromatography (GPC), proton nuclear magnetic resonance (¹H NMR) and ultraviolet-visible (UV-Vis) spectroscopy measurements were used monitor reactions and characterize products. These RAFT-synthesized thiol functional polymers will be used to develop 3-D scaffolds that can recapitulate the dynamic environment of the extracellular matrix promoting the repair of tissues.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Chemistry Section)

Sponsored by National Institutes of Health (NIH)



CHEMISTRY PROGRAM

Synthesis of Internally-Quenched Fluorescent Peptide Substrates for the Peptidase Neurolysin. ELIJAH WHITAKER, GARRETT CAIRO, COURTNEY HOWARD, and MATTHEW SADERHOLM, Chemistry Program, Berea College, Berea, Kentucky 40404.

In an attempt to learn more about the “fuzzy specificity” of the peptidase neurolysin, we synthesized a number of peptides with a N-terminal fluorescent group (aminobenzoic acid) and a C-terminal fluorescence-quenching group (2,4-dinitroaniline) to measure the rate of cleavage of fluorescent analogs of the neuropeptide neurotensin. The fluorescence-quenching group was either attached to a lysine sidechain amino group or to a glutamate through a C-terminal carboxyl group via an ethylenediamine linker (EDDnp). Fmoc-Lys-Dnp was simpler to synthesize and a suitable substitute for Fmoc-Gln-EDDnp in the synthesized peptide chains. The peptides synthesized were AbzLYENKPRRPYILK(Dnp), AbzLYENKPRRPFILK(Dnp), AbzLYENKPRRPAILK(Dnp), AbzLYENKPRRPEILK(Dnp) and AbzLYENKPRRPYILQ(EDDnp).

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Chemistry Section)

Funded by Berea College URCP

CHILD AND FAMILY STUDIES PROGRAM

Gathering Stories of Appalachian Foodways: An Oral History Project. KATIE BILLS, CHELSEA BICKNELL, MARK ROSS, and MARGARET DOTSON, Child and Family Studies Program, Berea College, Berea, Kentucky 40404.

The purpose of this project was to collect and preserve oral histories regarding Appalachian foodways. Foodways is the study of the interactions among food, culture, environment, and history. Forty-four individuals who ranged in age from 69 to 95 years old who were born and raised in Appalachian counties in West Virginia and Kentucky were interviewed. Interview questions focused on gardening, farming, preparing food, preserving food, eating habits, food preferences, traditions with food, and the changes over time. These interviews provided first-hand accounts of Appalachian foodways and the changes that have occurred over the last 60 to 85 plus years. The interviews have been transcribed and are going to be preserved in the Berea College Sound Archives.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

Funded by the Appalachian College Association's Colonel Lee B. Ledford Research Award and the Berea College URCP

MATHEMATICS PROGRAM

3-D Digital Image Reconstruction Through Structured Light Illumination: The Camera and Projector Calibration Problem. JOSEPH T. SLAGEL, Mathematics Program, Berea College, Berea, Kentucky 40404.

Structured light illumination (SLI) refers to a class of imaging methods in which a 3-D reconstruction is obtained from a sequence of 2-D images that are captured under specifically varied lighting conditions. One important step in SLI is to accurately calibrate the camera and projector reference frames to a real-world coordinate system. In this talk, we present a method for determining the unknown parameters in both the world-to-camera and world-to-projector models using a known correspondence between the camera and projector coordinates. The 3-D reconstruction is then obtained, point by point, through simple triangulation.

Pi Mu Epsilon Conference, September 28th 2012, Miami University, Oxford, Ohio (Oral Presentation)

Funded by Berea College URCP

MATHEMATICS PROGRAM

3-D Digital Image Reconstruction Through Structured Light Illumination: The Phase Measuring Profilometry Problem. RACHEL V. BARBER, Mathematics Program, Berea College, Berea, Kentucky 40404.

Structured light illumination (SLI) refers to a class of imaging methods in which a 3-D reconstruction is obtained from a sequence of 2-D images that are captured under specifically varied lighting conditions. One important step in SLI is to obtain a correspondence between the camera and projector coordinate systems. In this talk, we present a method which utilizes a light pattern that varies sinusoidally in both space and time. The spatial correspondence between camera and projector coordinates is then determined through the phase shift of the time sequence at each location.

Pi Mu Epsilon Conference, September 28th 2012, Miami University, Oxford, Ohio (Oral Presentation)

Funded by Berea College URCP

NURSING PROGRAM

Incorporating an Academic Electronic Health Record into a Small Liberal Arts College Medical Surgical Nursing Curriculum. TERESA VILLARAN MSN APRN CCRN, GILBERT BANGHA, ALLISON YORK, MIKHEIL MATCHARADZE, Nursing Program, Berea College, Berea KY 40404

Healthcare is becoming increasingly dependent upon patient care technology, including electronic health records (EHRs)¹. The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009² created a mandate to build a health infrastructure for the country which included incorporating EHRs and demonstrating meaningful use of this technology by 2014. This impacts all health care providers, especially nurses. Nursing organizations, including the American Association of Colleges of Nursing³ and Quality and Safety Education for Nurses⁴, require informatics become an essential part of baccalaureate nursing education. The purpose of this project was to address a learning gap in the use of technology, specifically use of an academic electronic health record (AEHR). Three nursing students worked with a faculty member to incorporate an AEHR into the medical-surgical nursing course in the fall semester of 2012. The research model used for this project was Plan-Do-Study-Act (PDSA) a continuous improvement model often used to implement change⁵. The PDSA model will be used for implementing the AEHR across the curriculum. With the faculty member as facilitator, the students selected an AEHR and planned for implementation and evaluation. If the AEHR is a useful and effective learning tool in the medical surgical course the AEHR will be implemented across the curriculum. In the research, we discovered no information regarding utilizing students as part of the implementation team.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral and Poster Presentations)

Appalachian College Association Conference, October 12, 2012, Knoxville, Tennessee (Oral and poster presentations)

Kentucky Nurses Association Convention, October 25, 2012, Louisville, Kentucky (Poster Presentation)

Sponsored by Berea College URCP

PEACE AND SOCIAL JUSTICE STUDIES PROGRAM

Latino Migrants in Appalachia: Education, Access, and Social Barriers. EMILY HAGOOD and MICHELLE TOOLEY, Peace and Social Justice Studies Program, Berea College, Berea, Kentucky 40404.

Appalachia is thought of as a single shade of white, though "others" have come or been recruited to the region to compete with the majority white workforce, to break coal strikes, or in the case of migrant labor, to provide low-cost farm labor. Although we read about hate-group protests, stereotyping and resistance to the largely Latino migration, we found migrants who assimilated to the region and communities that built cultural bridges, provided bilingual and social-service programs, and defended the rights of Latino migrants. Using qualitative research and ethnographic methodology, our project examined the state of migrant education in Central and Southern Appalachia. The purpose of the present study was: (1) to explore education programs for migrants in Central and Southern Appalachia, (2) to identify social barriers to migrant education for Latino/a children and best practices for migrant education, and (3) to assess the effect of migrant education programs in Central and Southern Appalachia. Through reading and interviews, we observed obstacles and social barriers for migrants. First, isolation from immediate or extended family, ethnic group, language group, and religious community proved to be the greatest barrier to education and assimilation. Second, the funding inequity of state migrant education programs prevented some programs from developing programs that met the needs of migrants in their areas. North Carolina, a state with a cabinet member with Latino responsibilities, funded migrants at the highest level, while Tennessee funded migrants at the lowest level. Of the three states, Kentucky has the smallest migrant population and the least number of migrant education staff. Throughout our travel and research, we identified best practices of migrant education. State and federal programming was important, but when the programming was supplemented by strong allies and community initiatives, cultures were changed and the environment was more welcoming to outsiders. Henderson County, North Carolina offers structures of support and staff dedicated to early childhood education for migrant children and good school programs for migrants and their families. Their efforts are reinforced by a broad range of state and nonprofit organization services to migrants. The greatest success occurred in communities where Latinos and non-Latinos, citizens and migrants, churches and organizations, local and state government worked together to meet migrant needs and empower migrants to meet their own needs. Along with migrants, these individuals and groups reduce problems and increase justice for Latino migrants and offer better educational opportunities for migrant children and their families.

Paper Presentation in GSTR 410 Roberts/Tooley in January 2013.

Funded by Berea College URCP

PHILOSOPHY PROGRAM

Human Rights, Humanitarian Wars: Institutional Reforms? Post-Interventions? DR. ROBERT W. HOAG and BRENT COFFEY, Philosophy Program, Berea College, Berea, Kentucky 40404.

Genocide, crimes against humanity, and “ethnic cleansing” violate universal human rights of international law and global ethics; armed interventions to end atrocities – such as recently in Libya - rightly raise questions about whether waging humanitarian wars is warranted, legally or ethically. Especially since the Balkan horrors and Rwandan genocide of the 1990s, scholars of international law, political theory, and philosophic ethics have engaged many facets of humanitarian wars, including possibly reforming law and institutions. In what ways ought the United Nations Charter be altered to accommodate the world’s need to respond appropriately to the plethora of atrocities around the globe? Should permanent members of the Security Council retain a veto power? Ought the Security Council’s membership be expanded, and how so? Should there be a legally codified “right to defend others” parallel to the extant legal right of self-defense for states? Another area of focus is what follows humanitarian wars. To what extent should armed interventions conclude with arrests, trials, and justice for perpetrators of atrocities? Does the pursuit of (retributive) justice prevent, prolong, or promote reconciliation? Genuine peace? Should humanitarian wars lead to re-building nations as democracies? Our collaborative work - research, discussion, and writing about the multi-disciplinary literature on these two facets of humanitarian wars - revealed greater depth, unrecognized complexities, and novel connections among the myriad questions about the ethics and legalities of humanitarian wars to defend people’s basic human rights.

Funded by Berea College URCP

PHYSICS PROGRAM

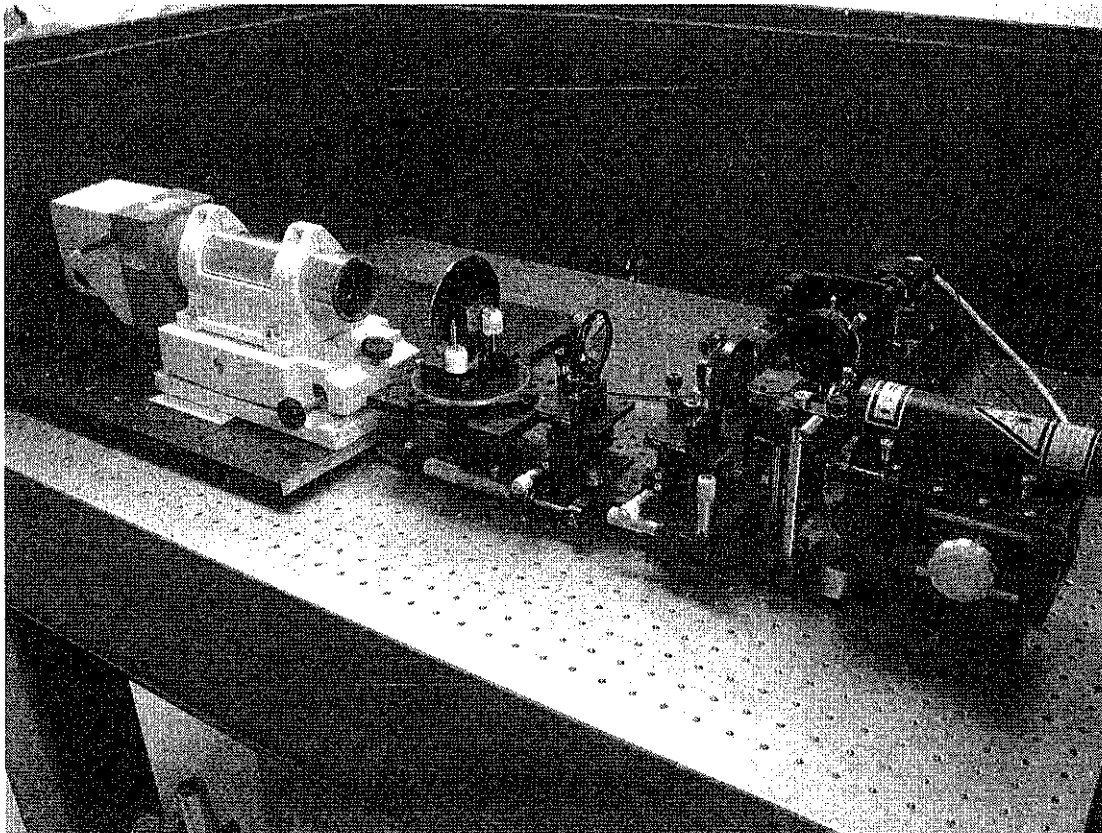
Evaluation of a compact CCD-based high-resolution autocollimator for use as a slope sensor. ROHAN ISAAC¹ and LAHSEN ASSOUFID², ¹Physics Program, Berea College, Berea, Kentucky 40404; ²Optics Group, Argonne National Laboratory, Lemont, Illinois 60439.

We evaluated the feasibility of high-resolution CCD-based autocollimator for use as a slope sensor. The compact autocollimator is based on a CCD detector with a small probe beam. We also explored several methods of determining the centroid of a laser beam spot to sub-pixel accuracy, and developed MATLAB and C++ software to calculate these values. The centroid algorithm developed is also used in aligning a laser for the Long Trace Profiler (LTP).

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Physics and Astronomy Section; 1st place in undergraduate research competition)

Lee Teng Internship



PHYSICS PROGRAM

Purification of Membrane Scaffold Proteins and Binding of Lipids by the C99 Domain of the Amyloid Precursor Protein. TOMMY O. BOYKIN, JOSEPH ELLIS, KATIE ARMSTRONG, JOHN CHEN, ARINA HADZISELIMOVIC, and CHARLES SANDERS, Center for Structural Biology, Vanderbilt University, Nashville, Tennessee 37212.

A Membrane Scaffold Protein (MSP) is an amphipathic α -helical protein that is designed to mimic apolipoproteins. The Membrane Scaffold Proteins MSP1D1 and MSP1E3D1 were purified using a previously established protocol. Cell colonies that harbor an expression vector for MSP1D1 and MSP1E3D1 were grown on Kanamycin-based agar plates. Small liquid cultures were then grown in rich Luria Bertani medium, which were then used to seed much larger cultures in M9 minimal medium in which protein expression was induced. The Amyloid-Precursor Protein (APP) is a protein that, when cleaved twice, produces the amyloid- β (A β) peptides, that form aggregates which have been associated with the promotion of Alzheimer's disease. APP is first cleaved by β -secretase to generate a protein called C99, which is the immediate precursor of A β . C99 is a C-terminal 99-amino acid protein. The Sanders lab recently found that C99 binds to cholesterol which is a type of lipid. We suspect that C99 may also bind to other lipids commonly found in brain cells. To test this possibility we used Pip Strips and SphingoStrips to determine whether C99 binds to other types of lipids. If C99 binds to other types of lipids, this could possibly impact the way C99 is cleaved therefore impacting the promotion of Alzheimer's disease. One type of glycosphingolipid was observed to complex with C99 based on SphingoStrips. Nuclear Magnetic Resonance (NMR) spectroscopy was then used in an attempt to both verify that complex formation between C99 and this glycosphingolipid and to determine the affinity of that interaction.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation - Physics and Astronomy Section; 1st place in undergraduate research competition)

Vanderbilt Summer Science Academy and the Vanderbilt Aspiring Astronaut Program presentation

Sponsored by Office of Internships at Berea College



PHYSICS PROGRAM

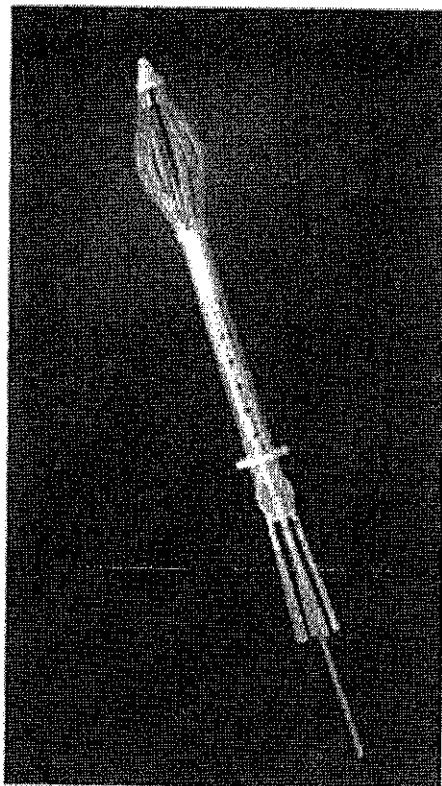
Simulation of the SAVI, Strut Adjusted Volumetric Implant, Brachytherapy Treatment. MACKENZIE ENDRES¹, ¹Biology Program, Berea College, Berea, Kentucky 40404.

The Strut Adjusted Volumetric Implant or SAVI is a relatively new device for breast cancer treatments. The goal of this project was to create a model of the geometry of the device and a template for actual treatment plan simulations. The template works in mcnp5, the newest Monte Carlo N-Particle code used for neutron, photon, electron, or coupled neutron/photon/electron transport. This creates accurate dose distributions for normalized breast cancer treatments, and corrections are made to the way of defining the radioactive source in brachytherapy models that will improve the accuracy of the dose calculations. The mcnp5 results will be useful as a second check of the treatment plan to verify that accurate doses could be delivered to SAVI treatment patients.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Physics and Astronomy section; 2nd place in undergraduate research competition)

**University of Toledo Internship
Sponsored by the NSF**



PHYSICS PROGRAM

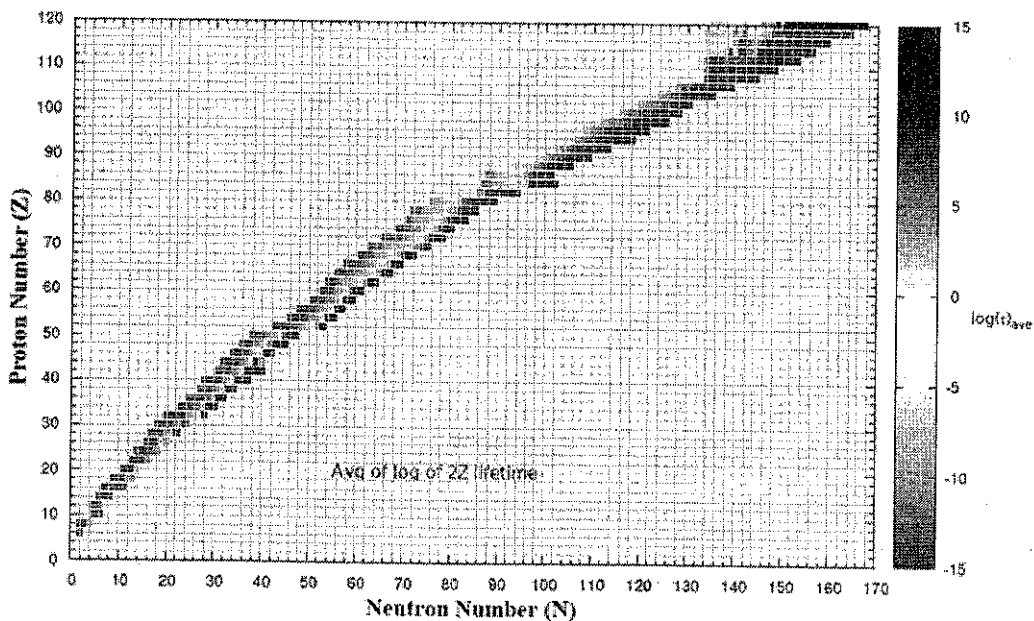
Theoretical Study of Diproton Emission, MARISSA BROWN¹, WITOLD NAZAREWICZ, PH.D.², NOAH BIRGE², ERIK OLSEN², and ALEXANDER PERHAC², Physics Department, Berea College, Berea, Kentucky 40404; ²Department of Physics and Astronomy, University of Tennessee, Knoxville, Tennessee 37996.

Two-proton emission is a rare type of nuclear radiation in which two protons are expelled from the nucleus. This type of emission occurs for certain nuclei, such as 45-Fe or 48-Ni, in which one-proton decay is energetically forbidden while two-proton decay is allowed. In such nuclei, one-proton separation energy (the energy required to remove one proton from the nucleus) is positive while the two-proton separation energy is negative (implying that the reaction heat is positive). Mass tables from several theoretical nuclear models based on the nuclear density functional theory were computationally analyzed to yield candidates that conform to this relationship, which may be used as a guide for future experimental study to further investigate two-proton emission.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Physics and Astronomy Section; 2nd place in undergraduate research competition)

**University of Tennessee Internship
Sponsored by Office of Internships at Berea College**



PSYCHOLOGY PROGRAM

Socio-economic stereotype threat: effects on academic performance and self-efficacy. SARA DEAN, Psychology Program, Berea College, Berea, Kentucky 40404.

The term "stereotype threat" refers to the idea that individuals perform worse on measures of achievement when reminded of negative stereotypes associated with their specific social group. Considering stereotypes associated with individuals of low socio-economic status in contemporary American society, this research sought to test whether or not inducing socio-economic stereotype threat affects the test taking performance and self confidence ratings of a sample of 39 Berea College students. Three groups of subjects were given different consent forms, either inducing stereotype threat, stereotype flattery, or neither, before taking a brief verbal reasoning and vocabulary test then asked to rate their level of self confidence. Results demonstrated economic stereotype threat and flattery affects student performance on a verbal reasoning measure. Student's self-reported annual family income was also found to have a significant negative influence on both test performance and self-efficacy ratings.

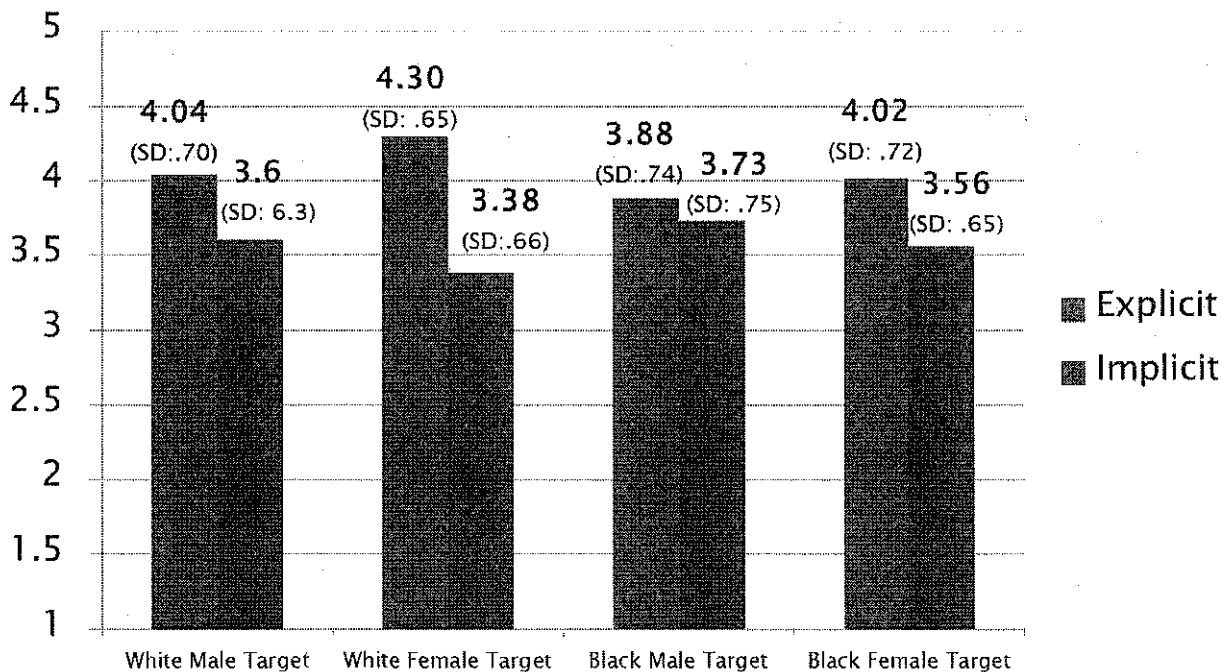
98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Oral Presentation – Psychology Section; 3rd place in undergraduate research competition)

PSYCHOLOGY PROGRAM

The effect of race and gender on likability of brand named products. CASSIE OELGESCHLAGER, Psychology Program, Berea College, Berea, Kentucky 40404.

Do an actor's race and gender affect how brand named products are perceived and remembered? Research shows that race and gender affect conscious processing, but do they affect unconscious processing as well? I showed participants a slideshow of pictures, some with targets holding products, and some without. Following the slideshow, the 38 Caucasian subjects were asked to rate likability of products (an implicit measure), whether they remembered seeing the product (an explicit measure), and how confident they were (another explicit measure). The results showed that the gender and race of the target affected implicit as well as explicit ratings, but in opposite ways. Participants remembered products with greater accuracy and more confidence if they were associated with a white female. However, they reported liking products more if the product was pictured with a black male.

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Psychology Section)



PSYCHOLOGY PROGRAM

Where's the action at? Factors that predict collective action. WENDY R. WILLIAMS, BRENNA MAHONEY, NICHOLE STETTEN, and SHELBY WILLIAMS, Psychology Program, Berea College, Berea, Kentucky 40404.

The gap between the rich and the poor has increased over the last few decades (U.S. Census Bureau, 2009). Without collective action to change the current economic situation, the poorest Americans are increasingly being cut off from the rest of the country. A vast literature in psychology, as well as in other disciplines including history, sociology, and political science, documents the factors that determine collective action (see van Zomeren, Postmes & Spears, 2008 for an overview and meta-analysis). The current project examined four different aspects of determining collective action. Project #1 empirically examines the personal factors of a homeless individual (their race, gender, or appearance) that affect whether others will help them. Project #2 is an empirical test of whether media portrayals of poverty affect attitudes towards welfare policy. Project #3 examines whether education correlates with students' perceptions of their social class and their belief in the "American dream." Project #4 is a correlational analysis of the factors that facilitate or impede engagement in collective action against classism. Data were collected for two weeks in late June and early July, but because of the small sample sizes (each project has between 15-25 participants), data collection is ongoing and analyses have not yet been run. By understanding how various factors affect engagement in collective action, researchers will be able to aid groups interested in mobilizing to fight classism in a variety of contexts including housing, education, and employment.

The projects will be submitted to the Association for Psychological Science (APS) national conference in Washington, DC on May 23rd-26th, 2013.

Funded by Berea College URCP

SOCIOLOGY PROGRAM

Connecting Effort and Attainment: Climate Change Knowledge and Environmental Engagement Among Berea Students. EVA A. GRIFFIN and DR. JILL BOUMA. Sociology Program, Berea College, Berea, Kentucky 40404.

Since the United Nations' declaration of a "Decade of Education for Sustainable Development," researchers have been consumed with attempts to study and assess efforts at such "education for sustainable development" (ESD)—an attempt to achieve an enormously broad and complex social goal through efforts focused in educational institutions. As an institution which demonstrates that it is quite conscious of such issues, and which has an acute desire to be "sustainable," Berea College offers a compelling location to evaluate one model for environmental education. How do Berea's practices translate in terms of the empirical environmental knowledge gains of its students? To answer this question, a survey was designed and administered via e-mail, addressing students' degree of environmental engagement, and comparing their understandings of the major causes of climate change to findings from the 2000 World Greenhouse Gas Emissions Flowchart published by the World Resources Institute. I hypothesized that environmental knowledge and engagement would increase with each year of attendance at Berea. Overall, engagement and climate change knowledge were positively linked. However, while students who had been at Berea longer were more engaged, they did not have a significantly greater level of knowledge. This indicates that environmental engagement is a precursor, but not a guarantee of environmental knowledge.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Oral Presentation)

SUSTAINABILITY AND ENVIRONMENTAL STUDIES PROGRAM

Routine water quality monitoring at the Berea College aquaponics facility and aquaculture ponds. BRITTANY SCHROEDER, GEORGIA DAHLQUIST, SOPHIA AL-MAAMARY, SARAH ELROD and PAUL C. SMITHSON, Chemistry, Biology, and the Sustainability and Environmental Studies Programs, Berea College, Berea, Kentucky 40404.

The Berea College aquaponics (aquaculture and hydroponics) facility and College Farm raise channel catfish (*Ictalurus punctatus*) and Nile tilapia (*Oreochromis niloticus*) for the campus and local community. In this study, procedures from *Standard Methods for Water and Wastewater Analysis* were used to measure dissolved oxygen, pH, chloride, ammonia-N, nitrite-N and nitrate-N at two ponds on the farm and two tanks in the aquaponics unit from late May to mid-July 2012. Dissolved oxygen levels were mostly acceptable (4 to 8 ppm), except in one pond in early July when the dissolved oxygen dropped to 3 ppm. The pH of the aquaponics system remained at 6.5 to 7.5 due to regular base additions, while the farm ponds were mostly 7.5 to 8.5, but reached pH 10 in the upper pond during a heat wave and algae bloom. Ammonia-N was below 0.5 ppm except for one 3-day period on the farm (~1 ppm). Nitrite-N was below 2 ppm except the same 3-day period on the farm, when it climbed to >3 and briefly to >10 ppm. Nitrate-N was 0 to 4 ppm in the ponds and 4 to 12 ppm in the aquaponics facility, trending upwards over the sampling period. The chloride levels in the aquaponics facility were about 10 ppm, which is ideal for good plant production. Chloride was higher in the ponds, 30 to 70 ppm, which is desirable for reduced nitrite toxicity. Overall, except for brief but significant excursions, all water quality parameters remained within tolerance limits for fish production.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

98th Annual Meeting of the Kentucky Academy of Science, October 19th - 20th 2012, Eastern Kentucky University, Richmond, Kentucky (Poster Presentation – Ecology and Environmental Science Section; 3rd place in undergraduate research competition)

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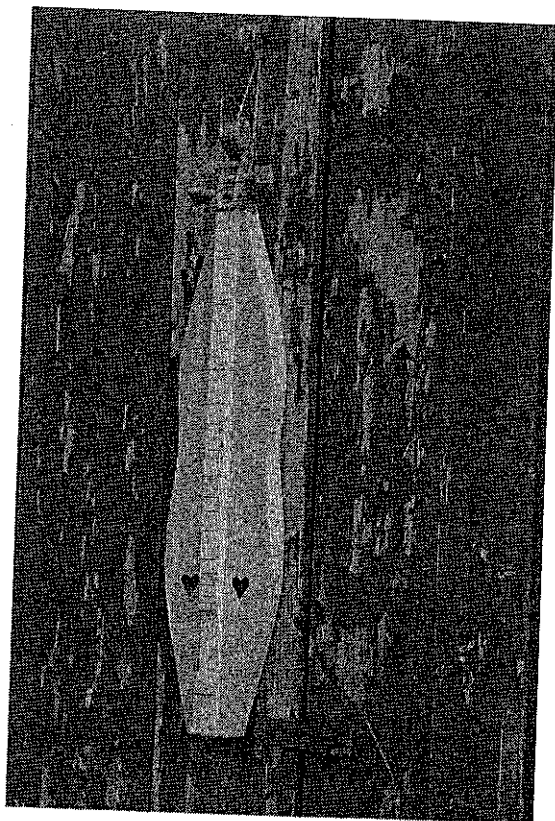
TECHNOLOGY AND INDUSTRIAL ARTS PROGRAM

Exploring the history, the construction, and the music of the Kentucky dulcimer. ALAN MILLS and SAMUEL HAWES, Technology and Applied Design Program, Berea College, Berea, Kentucky 40404.

The purpose of this creative project was to explore the history, construction, and music of the Kentucky dulcimer. Homer Ledford and Hubert Rodgers were the two Kentucky dulcimer builders that this project focused on. Exact replicas were made from an original Homer Ledford and a Hubert Rodgers dulcimer. These replicas were placed in Berea College's dulcimer collection to allow interested parties to play and experience the sound of a historically accurate instrument. Participants attended the Kentucky Music Week in Bardstown, Kentucky and video recorded professional dulcimer player, David Hass. This music was placed in the traditional music sound archives at Berea College. The participants organized two dulcimer exhibits to be held at Berea College in 2012. Homer Ledford and Hubert Rodgers replicas are available in the Teaching Collection located in the Loyal Jones Appalachian Center.

13th Annual Berea College Undergraduate Research Symposium, October 5th 2012, Berea College, Berea, Kentucky (Poster Presentation)

Funded by Berea College URCP



TECHNOLOGY AND INDUSTRIAL ARTS PROGRAM

Putting Down Roots in Shifting Sands: Design Adventures in Utila, Honduras. EVA A. GRIFFIN, KELLY KUSUMOTO, DAVID SCRIVENER, CORY SHENK, WILLIAM J. COOMES, and GARY MAHONEY, Technology and Industrial Arts Program, Berea College, Berea, Kentucky 40404.

Globalism has come to the shores of tiny Utila, Honduras. This once quiet island of fishermen is suddenly confronted with tourism, declining fisheries, population explosion, and soaring energy prices. How can the island's fragile coral and mangrove ecosystems, multiple endemic species, and unique Caribbean culture manage to thrive in the face of such rapid change? In the summer of 2012, Berea College sent a multidisciplinary team of students and faculty to Utila, to answer this question, laying the groundwork for a multi-year appropriate technology project, inspired by the D-Lab at the Massachusetts Institute of Technology. Using the principles of community resource mapping, the team collaborated with Utilians to identify daily problems on the island, and design technological solutions derived from abundant local skills and resources. Based on these interactions, the team led two workshops on the construction and installation of do-it-yourself solar panels using tabbed solar cells and recycled windows, and gave presentations to island school students on technological applications of solar energy. Upon returning home, the most promising opportunities for future collaborations on the island were identified, and findings were integrated into design briefs to be explored in designated Technology and Applied Design courses.

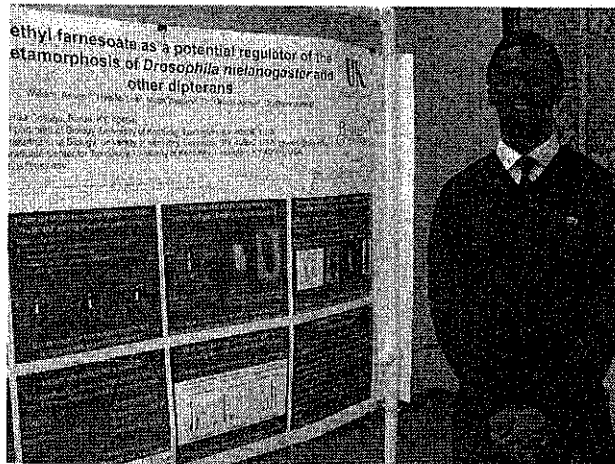
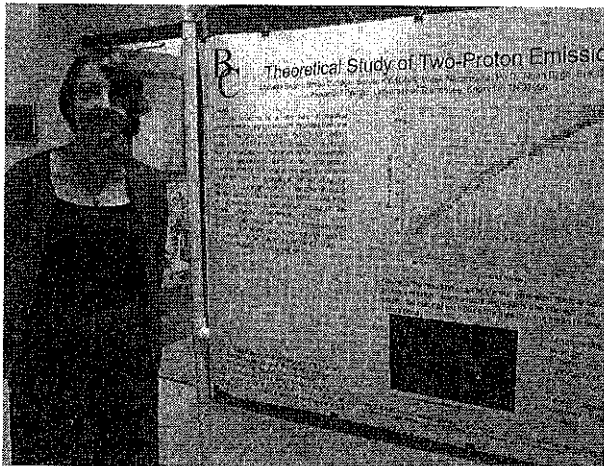
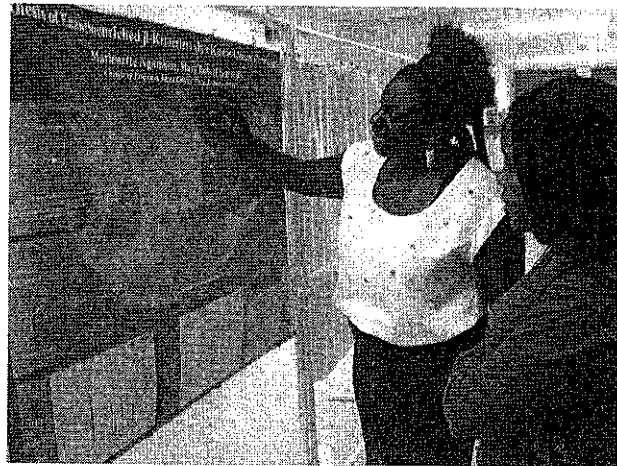
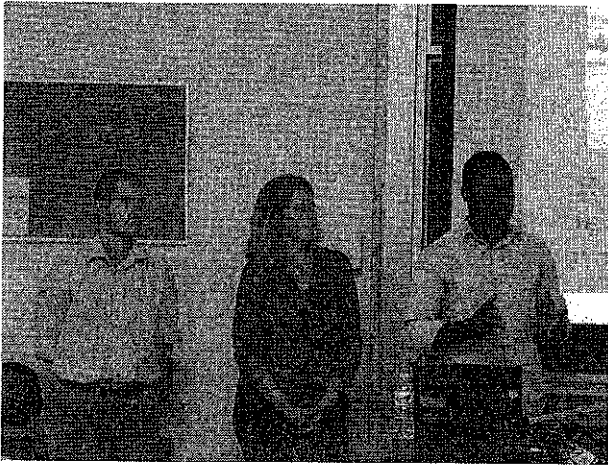
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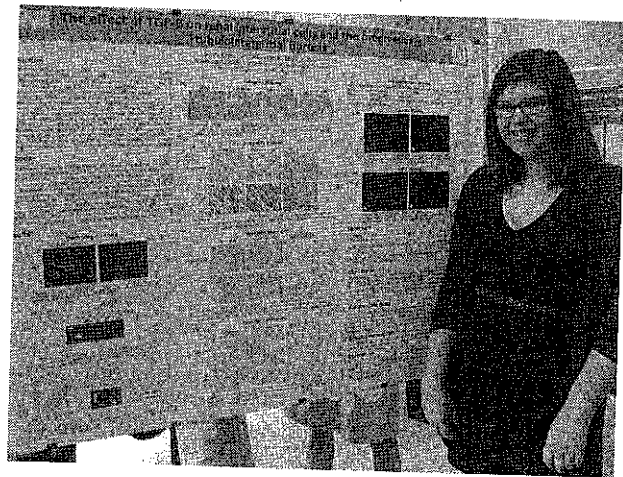
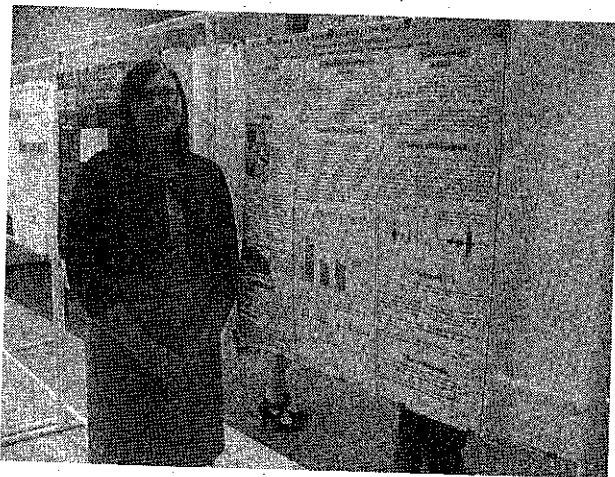
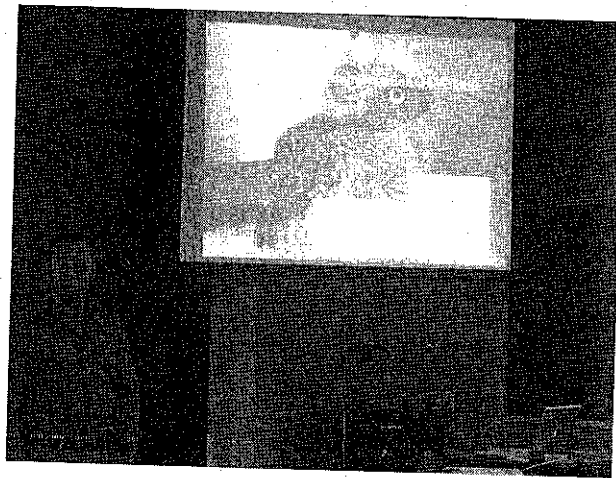
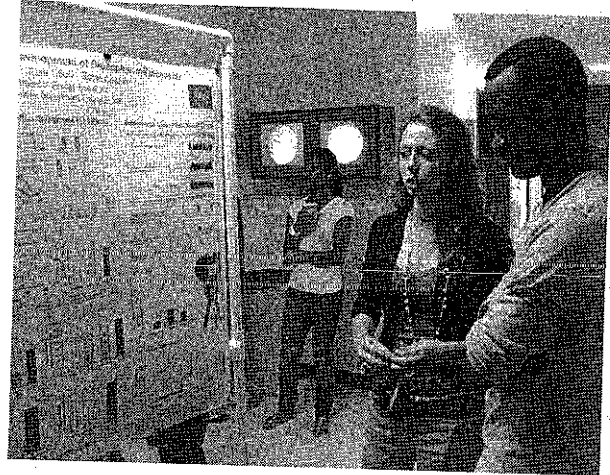
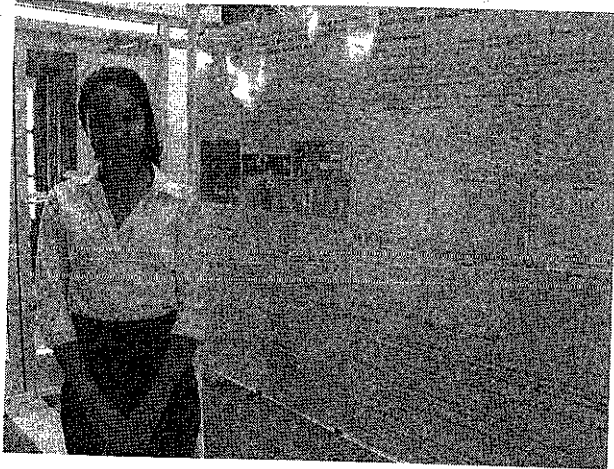
Funded by Berea College URCP

APPENDIX

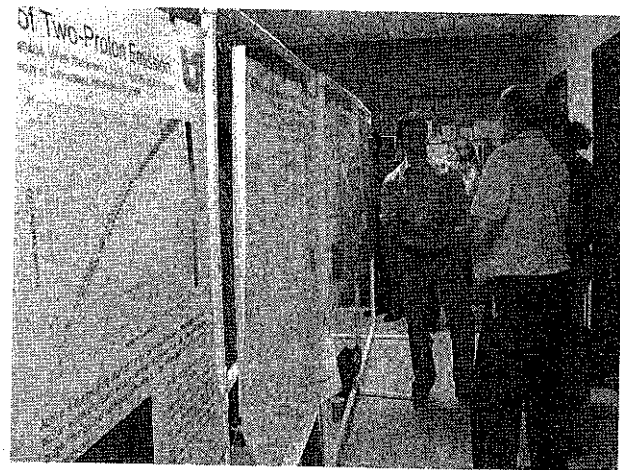
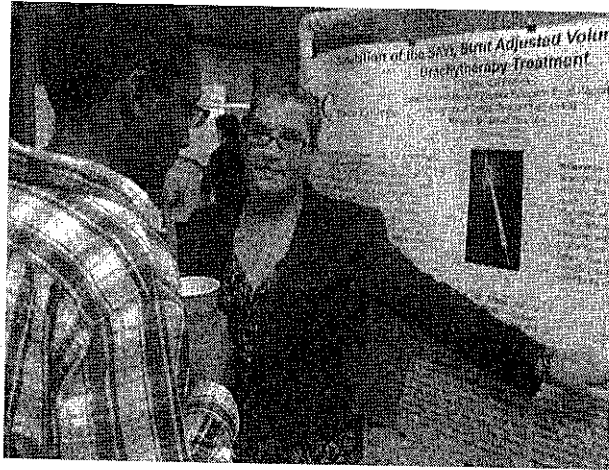
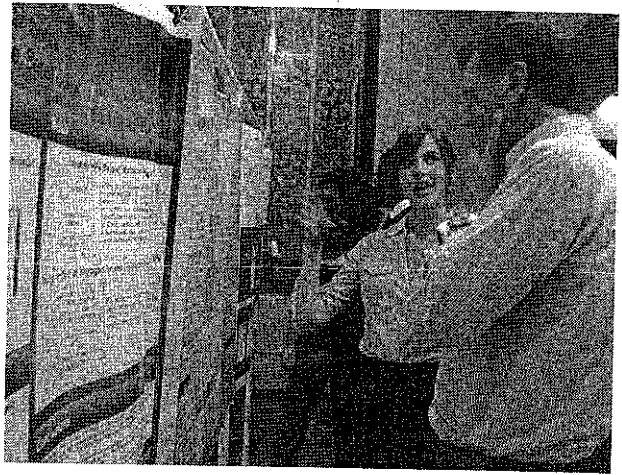
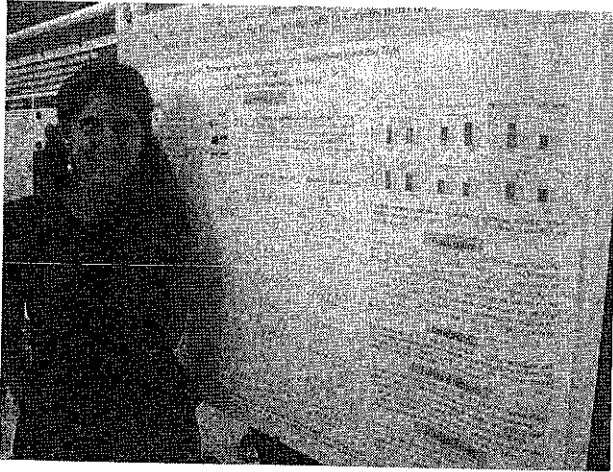
- 57 Berea College student presentations at the 13th Annual Berea College Undergraduate Research Symposium, October 5th 2012.
- 58 Berea College student presentations at the 13th Annual Berea College Undergraduate Research Symposium, October 5th 2012.
- 59 Berea College student presentations at the 13th Annual Berea College Undergraduate Research Symposium, October 5th 2012.
- 60 Berea College UR CPP Student Research, Summer 2012.
- 61 Berea College students and faculty at the 98th Annual Meeting of the Kentucky Academy of Science, October 19-20th 2012.
- 62-end Undergraduate Research and Creative Projects Program (UR CPP) Summer 2012 Assessment



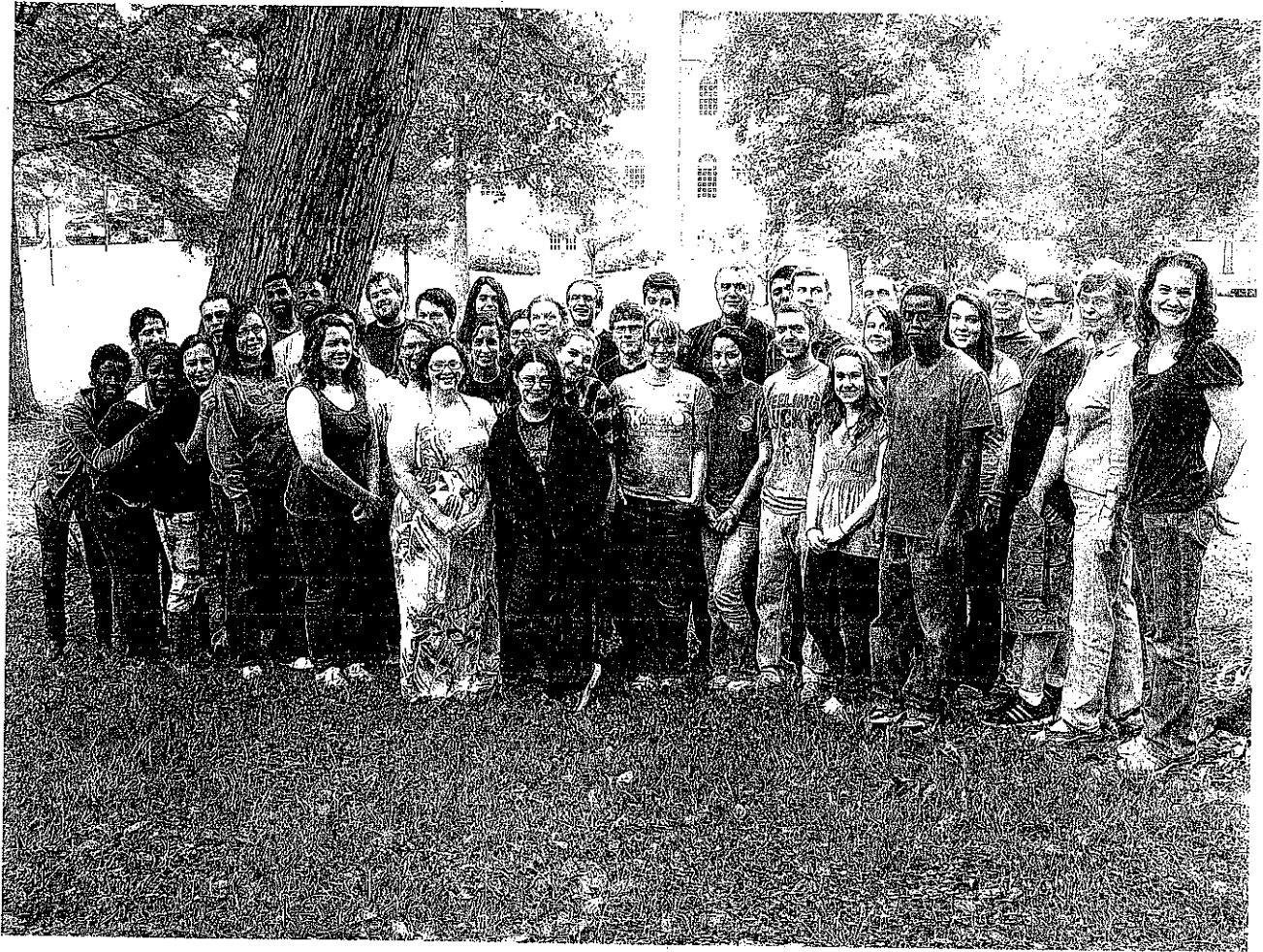
Berea College students present at the 13th Annual Berea Undergraduate Research Symposium



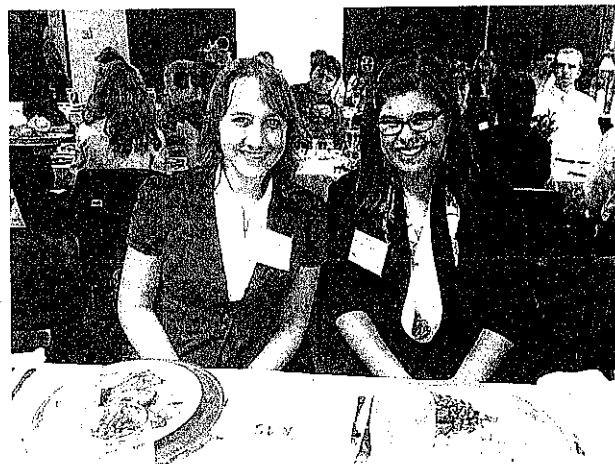
Berea College Students present at the 13th Annual Berea Undergraduate Research Symposium



Berea College Students present at the 13th Annual Berea Undergraduate Research Symposium



Berea College URCP Student Researchers, Summer 2012.



Berea College Students and Faculty at the 98th Meeting of the Kentucky Academy of Science, 2012.

Undergraduate Research
and Creative Projects
Program (URCPP)

Summer 2012 Assessment

All Respondents

Division One and Other than Division One Breakdowns

Default Question Block

The purpose of this survey is to help Division I (Biology, Chemistry, Mathematics, Nursing and Physics) assess the effectiveness of our undergraduate research program. Your feedback is important in helping us to improve the program and to ensure that participants have an educational and enjoyable summer research experience.

Dr. Ron Rosen
Division I Chairperson

Please complete the following.

Name

B Number

How did you first hear about the undergraduate research opportunity?

- Poster/flyer
- A faculty member told me about it
- A former participant told me about it
- My academic advisor told me about it
- Other, please list

Please indicate if each of the following was a major reason, a minor reason, or not a reason in your decision to apply.

Major Reason Minor Reason Not a reason

To gain experience doing research or a creative project.

To get an idea of what being a graduate student might be like.

To figure out if I might really be interested in a research career.

My participation would improve my chances of getting into graduate school.

My participation would improve my chances of getting into professional school.

My participation would make me a more attractive job candidate.

I needed something productive to do over the summer that would allow me to earn money for school next year.

An advisor/faculty member told me I should do it.

The subject of the research/project was of special interest to me.

To introduce me to a new area of study.

To introduce me to a new line of research/study in my major.

To improve my understanding of my major.

To investigate other areas of study or research.

To broaden the scope of my research or study interests.

To learn from a faculty mentor/expert.

Other, please list

At this time, what best describes your current post-graduation plans?

- I plan to attend graduate school.
- I plan to attend professional school (e.g., medical, dental, law, business, etc.).
- I don't plan to attend graduate or professional school.
- I am not sure of my plans at this time.

Describe your summer project if you know what it is about.

How confident are you in the following skills and abilities?

Very confident

Not at all confident

Keeping good notes on the progression of a project.

Reading and understanding a primary source document.

Giving a presentation in front of a group.

Working as part of a team.

Doing research on my own.

Preparing a well-documented paper.

Thinking critically.

Thinking creatively.

How important are each of the following goals to you?

Extremely important

Not at all important

To enhance my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with faculty.

To foster student-faculty interaction in creative work.

To help me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.

To enhance my communication skills.

To provide experience that would be helpful to me to pursue subsequent research and learning opportunities.

To allow me to build their self-confidence to pursue careers and further study beyond Berea.

To provide experience that will help me make informed career and graduate school decisions.

What are you most excited about regarding your summer project?

What are your concerns, if any, about your summer project?

Any additional comments?

Default Question Block

The purpose of this survey is to help Division I (Biology, Chemistry, Mathematics, Nursing, and Physics) assess the effectiveness of our undergraduate research program. Your feedback helps us to improve the program and to ensure that participants have an educational and enjoyable summer research experience.

Dr. Ron Rosen
Division I Chairperson

Please complete the following:

Name

B Number

Describe your summer project.

What was most interesting or exciting about your summer project?

What challenges or issues arose during your summer project?

For each of the following questions, please check the statement that best represents your current knowledge or thinking. Please select only one answer for each question unless otherwise directed.

What situation best describes with whom you worked during your summer project?

- I worked most closely with my faculty mentor.
- I worked with several other students and my faculty mentor.
- I worked mostly alone with occasional assistance.
- I worked on my own with little assistance.
- Other, please explain.

What was your overall satisfaction with this arrangement?

- It was perfect for me.
- It worked okay.
- I would have liked a bit more attention/direction.
- I would have liked a bit less attention/direction.
- I felt I was largely ignored or felt like a burden.
- Other, please explain.

How much individual contact did you have with your faculty research mentor?

- We worked side-by-side.
- We met/consulted daily.
- We met/consulted several times a week.
- We met/consulted once per week.
- He/she was seldom available to meet or consult with me.

Did you attend or participate in any on-campus seminars (for example, weekly peer-sharing over lunch, field trips or social activities)?

- Yes
- No

If yes, which ones? Please comment on how useful these were to you.

Which of the following statements best describes your current post-graduation plans?

- I am positive I want to attend graduate school.
- I am fairly certain I want to attend graduate school.
- I am uncertain I want to attend graduate school.
- I am positive I want to attend professional school.
- I am fairly certain I want to attend professional school.
- I am uncertain about attending professional school.

What impact did your summer experience have in helping you define your research interests?

- It introduced me to a new field of research I now might want to pursue.
- It introduced me to a new line of research in my major field that I now might want to pursue.
- It improved my understanding of the field and specialty I have already chosen.
- It encourage me to investigate other areas of study or research.
- It generally broadened the scope of my research interests.
- Other, please explain.

Please rate your confidence in your skills and abilities for the following:

	Very Confident	Not at all Confident
Keeping a research notebook or journal.		
Reading a primary research article.		
Giving a presentation in front of a group.		
Preparing a research poster.		
Working as part of a research team.		
Doing research on your own.		

To what extent did your summer experience contribute to the following:

	To a great extent	Not at all
Enhanced my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with faculty.		
Fostered student-faculty interaction in creative work.		
Helped me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.		
Enhanced my communication skills.		
Provided experience that would be helpful to me to pursue subsequent research and learning opportunities.		
Allowed me to build self-confidence to pursue careers and further study beyond Berea.		
Provided experience that will help me make informed career and graduate school decision.		

Any additional comments?

Thank you!

Default Question Block

The purpose of this survey is to help the Undergraduate Research and Creative Projects Program (URCPP) Committee assess the effectiveness of the program. Your feedback is important in helping us to improve the program and to ensure that participants have an educational and enjoyable summer research experience.

Dr. Jackie Burnside
Chair of the Undergraduate Research and Creative Projects Program Committee

Please complete the following.

Name

B Number

How did you first hear about the Undergraduate Research and Creative Projects Program (URCPP)?

- Announcement on the URCPP website
- Poster/flyer
- A faculty member told me about it
- A former participant told me about it
- My academic advisor told me about it
- Other, please list

Please indicate if each of the following was a major reason, a minor reason, or not a reason in your decision to apply to the URCPP.

Major Reason Minor Reason Not a reason

- To gain experience doing research or a creative project.
- To get an idea of what being a graduate student might be like.
- To figure out if I might really be interested in a research career.
- My participation would improve my chances of getting into graduate school.
- My participation would improve my chances of getting into professional school.
- My participation would make me a more attractive job candidate.
- I needed something productive to do over the summer that would allow me to earn money for school next year.
- An advisor/faculty member told me I should do it.
- The subject of the research/project was of special interest to me.
- To introduce me to a new area of study.
- To introduce me to a new line of research/study in my major.
- To improve my understanding of my major.
- To investigate other areas of study or research.
- To broaden the scope of my research or study interests.
- To learn from a faculty mentor/expert.
- Other, please list

At this time, what best describes your current post-graduation plans?

- I plan to attend graduate school.
- I plan to attend professional school (e.g., medical, dental, law, business, etc.).
- I don't plan to attend graduate or professional school.
- I am not sure of my plans at this time.

Describe your summer project if you know what it is about.

How confident are you in the following skills and abilities?

Very confident

Not at all confident

Keeping good notes on the progression of a project.

Reading and understanding a primary source document.

Giving a presentation in front of a group.

Working as part of a team.

Doing research on my own.

Preparing a well-documented paper.

Thinking critically.

Thinking creatively.

The following are the goals of the Undergraduate Research and Creative Projects Program (URCPP).

How important are each of the goals to you?

Extremely important

Not at all important

To enhance my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with faculty.

To foster student-faculty interaction in creative work.

To help me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.

To enhance my communication skills.

To provide experience that would be helpful to me to pursue subsequent research and learning opportunities.

To allow me to build their self-confidence to pursue careers and further study beyond Berea.

To provide experience that will help me make informed career and graduate school decisions.

What are you most excited about regarding your summer project?

What are your concerns, if any, about your summer project?

Any additional comments?

Default Question Block

The purpose of this survey is to help us improve the Undergraduate Research and Creative Projects program and to ensure that participants have an educational and enjoyable summer research experience.

Jackie Burnside, Chair
Undergraduate Research and Creative Projects Committee

Please complete the following:

Name

B Number

Describe your summer project.

What was most interesting or exciting about your summer project?

What challenges or issues arose during your summer project?

For each of the following questions, please check the statement that best represents your current knowledge or thinking. Please select only one answer for each question unless otherwise directed.

What situation best describes with whom you worked during your summer project?

- I worked most closely with my faculty mentor.
- I worked with several other students and my faculty mentor.
- I worked mostly alone with occasional assistance.
- I worked on my own with little assistance.
- Other, please explain.

What was your overall satisfaction with this arrangement?

- It was perfect for me.
- It worked okay.
- I would have liked a bit more attention/direction.
- I would have liked a bit less attention/direction.
- I felt I was largely ignored or felt like a burden.
- Other, please explain.

How much individual contact did you have with your faculty research mentor?

- We worked side-by-side.
- We met/consulted daily.
- We met/consulted several times a week.
- We met/consulted once per week.
- He/she was seldom available to meet or consult with me.

Did you attend or participate in any on-campus seminars (for example, weekly peer-sharing over lunch, field trips, or social activities)?

- Yes
- No

If yes, which ones? Please comment on how useful these were to you.

Which of the following statements best describes your current post-graduation plans?

- I am positive I want to attend graduate school.
- I am fairly certain I want to attend graduate school.
- I am uncertain I want to attend graduate school.
- I am positive I want to attend professional school.
- I am fairly certain I want to attend professional school.
- I am uncertain about attending professional school.

What impact did your summer experience have in helping you define your research interests?

- It introduced me to a new field of research I now might want to pursue.
- It introduced me to a new line of research in my major field that I now might want to pursue.
- It improved my understanding of the field and specialty I have already chosen.
- It encourage me to investigate other areas of study or research.
- It generally broadened the scope of my research interests.
- Other, please explain.

Please rate your confidence in your skills and abilities for the following:

Very Confident

Not at all
Confident

Keeping a research notebook or journal.

Reading a primary research article.

Giving a presentation in front of a group.

Preparing a research poster.

Working as part of a research team.

Doing research on your own.

To what extent did your summer experience contribute to the following:

To a great
extent

Not at all

Enhanced my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with faculty.

Fostered student-faculty interaction in creative work.

Helped me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.

Enhanced my communication skills.

Provided experience that would be helpful to me to pursue subsequent research and learning opportunities.

Allowed me to build self-confidence to pursue careers and further study beyond Berea.

Provided experience that will help me make informed career and graduate school decision.

Any additional comments?

Thank you!

PRE-SURVEY, ALL RESPONDENTS. Response Rate: 88.9% or 64/72.

How did you first hear about the undergraduate research opportunity?

	All Respondents
Announcement on the URCP website	0 0.00%
Poster/flyer	4 5.6%
A faculty member told me about it	33 46.5%
A former participant told me about it	8 11.3%
My academic advisor told me about it	11 15.5%
Other, please list	8 11.3%
Missing	7 9.9%

Please indicate if each of the following was a major reason, a minor reason, or not a reason in your decision to apply.

	Major Reason (3)	Minor Reason (2)	Not a reason (1)	Missing	Mean
To gain experience doing research or a creative project.	61 85.9%	3 4.2%	0 0.0%	7 9.9%	2.95
To get an idea of what being a graduate student might be like.	34 47.9%	19 26.8%	11 15.5%	7 9.9%	2.36
To figure out if I might really be interested in a research career.	42 59.2%	15 21.1%	7 9.9%	7 9.9%	2.55
My participation would improve my chances of getting into graduate school.	44 62.0%	15 21.1%	5 7.0%	7 9.9%	2.61
My participation would improve my chances of getting into professional school	29 40.8%	16 22.5%	19 26.8%	7 9.9%	2.16
My participation would make me a more attractive job candidate.	43 60.6%	16 22.5%	5 7.0%	7 9.9%	2.59
I needed something productive to do over the summer that would allow me to earn money for school next year.	25 35.2%	29 40.8%	10 14.1%	7 9.9%	2.23
An advisor/faculty member told me I should do it.	16 22.5%	26 36.6%	22 31.0%	7 9.9%	1.91
The subject of the research/project was of special interest to me.	42 59.2%	18 25.4%	4 5.6%	7 9.9%	2.59
To introduce me to a new area of study.	26 36.6%	27 38.0%	11 15.5%	7 9.9%	2.23
To introduce me to a new line of research/study in my major.	34 47.9%	21 29.6%	9 12.7%	7 9.9%	2.39
To improve my understanding of my major.	48 67.6%	12 16.9%	4 5.6%	7 9.9%	2.69
To investigate other areas of study or research.	32 45.1%	24 33.8%	8 11.3%	7 9.9%	2.38
To broaden the scope of my research or study interests.	43 60.6%	16 22.5%	5 7.0%	7 9.9%	2.59
To learn from a faculty mentor/expert.	46 64.8%	15 21.1%	2 2.8%	8 11.3%	2.70
Other, please list.	3 4.2%	0 0.0%	8 11.3%	60 84.5%	1.55

PRE-SURVEY, ALL RESPONDENTS. Response Rate: 88.9% or 64/72.

At this time, what best describes your current post-graduation	
I plan to attend graduate school.	28 39.44%
I plan to attend professional school (e.g., medical, dental, law, business, etc.).	21 29.58%
I don't plan to attend graduate or professional school.	4 5.63%
I am not sure of my plans at this time.	11 15.49%
Missing	7 9.86%

How confident are you in the following skills and abilities?

	Very confident (5)	(4)	(3)	(2)	Not at all confident (1)	Missing	Mean
Keeping a good notes on the progression of a project.	34 47.9%	24 33.8%	5 7.0%	1 1.4%	0 0.0%	7 9.9%	4.42
document.	22 31.0%	28 39.4%	11 15.5%	3 4.2%	0 0.0%	7 9.9%	4.08
Giving a presentation in front of a group.	19 26.8%	26 36.6%	14 19.7%	3 4.2%	2 2.8%	7 9.9%	3.89
Working as part of a team.	41 57.7%	19 26.8%	4 5.6%	0 0.0%	0 0.0%	7 9.9%	4.58
Doing research on my own.	25 35.2%	24 33.8%	12 16.9%	2 2.8%	1 1.4%	7 9.9%	4.09
Preparing a well-documented paper.	17 23.9%	21 29.6%	23 32.4%	3 4.2%	0 0.0%	7 9.9%	3.81
Thinking critically.	33 46.5%	23 32.4%	6 8.5%	2 2.8%	0 0.0%	7 9.9%	4.36
Thinking creatively.	29 40.8%	23 32.4%	12 16.9%	0 0.0%	0 0.0%	7 9.9%	4.27

How important are the following goals to you?

	Extremely important (5)	(4)	(3)	(2)	Not at all important (1)	Missing	Mean
To enhance my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with my faculty.	51 71.8%	12 16.9%	1 1.4%	0 0.0%	0 0.0%	7 9.9%	4.78
To foster student-faculty interaction in creative work.	38 53.5%	19 26.8%	7 9.9%	0 0.0%	0 0.0%	7 9.9%	4.48
To help me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.	37 52.1%	21 29.6%	5 7.0%	1 1.4%	0 0.0%	7 9.9%	4.47
To enhance my communication skills.	34 47.9%	21 29.6%	7 9.9%	2 2.8%	0 0.0%	7 9.9%	4.36
To provide experience that would be helpful to me to pursue subsequent research and learning	50 70.4%	13 18.3%	1 1.4%	0 0.0%	0 0.0%	7 9.9%	4.77
To allow me to build my self-confidence to pursue careers and further study beyond Berea.	48 67.6%	10 14.1%	6 8.5%	0 0.0%	0 0.0%	7 9.9%	4.66
To provide experience that will help me make informed career and graduate school decisions.	54 76.1%	10 14.1%	0 0.0%	0 0.0%	0 0.0%	7 9.9%	4.84

POST-SURVEY, ALL RESPONDENTS. Response Rate: 66.7% or 48/72.

What situation best describes with whom you worked during your summer project?		
I worked closely with my faculty mentor	3	4.2%
I worked with several other students and my faculty mentor	27	38.0%
I worked mostly alone with occasional assistance	8	11.3%
I worked on my own with little assistance	2	2.8%
Other, please explain	8	11.3%
Missing	23	32.4%

What was your overall satisfaction with this arrangement?		
It was perfect for me	25	35.2%
It worked okay	11	15.5%
I would have liked a bit more attention/direction	9	12.7%
I would have liked a bit less attention/direction	1	1.4%
Other, please explain	1	1.4%
Missing	24	33.8%

How much individual contact did you have with your faculty research mentor?		
We worked side-by-side	10	14.1%
We met/consulted daily	26	36.6%
We met/consulted several times a week	5	7.0%
We met/consulted once a week	4	5.6%
me	2	2.8%
Missing	24	33.8%

Which of the following statements best describes your current post-graduation plans?		
I am positive I want to attend graduate school	20	28.2%
I am fairly certain I want to attend graduate school	9	12.7%
I am uncertain I want to attend graduate school	3	4.2%
I am positive I want to attend professional school	10	14.1%
I am fairly certain I want to attend professional school	3	4.2%
I am uncertain about attending professional school	3	4.2%
Missing	23	32.4%

POST-SURVEY, ALL RESPONDENTS. Response Rate: 66.7% or 48/72.

What impact did your summer experience have in helping you define your research interests?	
It introduced me to a new field of research I now might want to pursue.	10 14.1%
It introduced me to a new line of research in my major field that I now might want to pursue.	6 8.5%
It improved my understanding of the field and specialty I have already chosen.	13 18.3%
It encouraged me to investigate other areas of study or research.	7 9.9%
It generally broadened the scope of my research interests.	8 11.3%
Other, please explain.	4 5.6%
Missing	23 32.4%

Please rate your confidence in your skills and abilities for the following

	Very confident (5)	(4)	(3)	(2)	Not at all confident (1)	Missing	Mean
Keeping a research notebook or journal.	23 32.4%	17 23.9%	6 8.5%	1 1.4%	1 1.4%	23 32.4%	4.25
Reading a primary research article.	19 26.8%	23 32.4%	4 5.6%	2 2.8%	0 0.0%	23 32.4%	4.23
Giving a presentation in front of a group.	22 31.0%	23 32.4%	2 2.8%	0 0.0%	1 1.4%	23 32.4%	4.35
Preparing a research poster.	17 23.9%	19 26.8%	10 14.1%	2 2.8%	0 0.0%	23 32.4%	4.06
Working as part of a research team.	25 35.2%	18 25.4%	5 7.0%	0 0.0%	0 0.0%	23 32.4%	4.42
Doing research on your own.	23 32.4%	17 23.9%	5 7.0%	2 2.8%	1 1.4%	23 32.4%	4.23

To what extent did your summer experience contribute to the following

	To a great extent (5)	(4)	(3)	(2)	Not at all (1)	Missing	Mean
Enhanced my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with faculty.	30 42.3%	11 15.5%	7 9.9%	0 0.0%	0 0.0%	23 32.4%	4.48
Fostered student-faculty interaction in creative work.	32 45.1%	7 9.9%	6 8.5%	3 4.2%	0 0.0%	23 32.4%	4.42
Helped me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.	31 43.7%	11 15.5%	5 7.0%	1 1.4%	0 0.0%	23 32.4%	4.50
Enhanced my communication skills.	18 25.4%	23 32.4%	5 7.0%	2 2.8%	0 0.0%	23 32.4%	4.19
Provided experience that would be helpful to me to pursue subsequent research and learning	33 46.5%	13 18.3%	2 2.8%	0 0.0%	0 0.0%	23 32.4%	4.65
Allowed me to build self-confidence to pursue careers and further study beyond Berea.	28 39.4%	15 21.1%	4 5.6%	1 1.4%	0 0.0%	23 32.4%	4.46
Provided experience that will help me to make informed career and graduate school decision.	29 40.8%	12 16.9%	6 8.5%	1 1.4%	0 0.0%	23 32.4%	4.44

PRE-SURVEY, Division One Response Rate: 97.1% or 33/34. Other than Division One Response Rate: 81.6% or 31/38.

Please indicate if each of the following was a major reason, a minor reason, or not a reason in your decision to apply.

	Major reason (3)	Minor reason (2)	Not a reason (1)	Missing	Mean
To gain experience doing research or a creative project.					
Division One	33 100.0%	0 0.0%	0 0.0%	0 0.0%	3.00
Other than Division One	28 90.3%	3 9.7%	0 0.0%	0 0.0%	2.90
To get an idea of what being a graduate student might be like.					
Division One	22 66.7%	8 24.2%	3 9.1%	0 0.0%	2.58
Other than Division One	12 38.7%	11 35.5%	8 25.8%	0 0.0%	2.13
To figure out if I might really be interested in a research career.					
Division One	27 81.8%	5 15.2%	1 3.0%	0 0.0%	2.79
Other than Division One	15 48.4%	10 32.3%	6 19.4%	0 0.0%	2.29
My participation would improve my chances of getting into graduate school.					
Division One	26 78.8%	5 15.2%	2 6.1%	0 0.0%	2.73
Other than Division One	18 58.1%	10 32.3%	3 9.7%	0 0.0%	2.48
My participation would improve my chances of getting into professional school					
Division One	19 57.6%	6 18.2%	8 24.2%	0 0.0%	2.33
Other than Division One	10 32.3%	10 32.3%	11 35.5%	0 0.0%	1.97
My participation would make me a more attractive job candidate.					
Division One	20 60.6%	9 27.3%	4 12.1%	0 0.0%	2.48
Other than Division One	23 74.2%	7 22.6%	1 3.2%	0 0.0%	2.71
I needed something productive to do over the summer that would allow me to earn money for school next year.					
Division One	10 30.3%	17 51.5%	6 18.2%	0 0.0%	2.12
Other than Division One	15 48.4%	12 38.7%	4 12.9%	0 0.0%	2.35
An advisor/faculty member told me I should do it.					
Division One	7 21.2%	14 42.4%	12 36.4%	0 0.0%	1.85
Other than Division One	9 29.0%	12 38.7%	10 32.3%	0 0.0%	1.97
The subject of the research/project was of special interest to me.					
Division One	19 57.6%	11 33.3%	3 9.1%	0 0.0%	2.48
Other than Division One	23 74.2%	7 22.6%	1 3.2%	0 0.0%	2.71

PRE-SURVEY, Division One Response Rate: 97.1% or 33/34. Other than Division One Response Rate: 81.6% or 31/38.

Please indicate if each of the following was a major reason, a minor reason, or not a reason in your decision to apply., continued:

	Major reason (3)	Minor reason (2)	Not a reason (1)	Missing	Mean
To introduce me to a new area of study.					
Division One	11 33.3%	17 51.5%	5 15.2%	0 0.0%	2.18
Other than Division One	15 48.4%	10 32.3%	6 19.4%	0 0.0%	2.29
To introduce me to a new line of research/study in my major.					
Division One	19 57.6%	10 30.3%	4 12.1%	0 0.0%	2.45
Other than Division One	15 48.4%	11 35.5%	5 16.1%	0 0.0%	2.32
To improve my understanding of my major.					
Division One	24 72.7%	8 24.2%	1 3.0%	0 0.0%	2.70
Other than Division One	24 77.4%	4 12.9%	3 9.7%	0 0.0%	2.68
To investigate other areas of study or research.					
Division One	16 48.5%	15 45.5%	2 6.1%	0 0.0%	2.42
Other than Division One	16 51.6%	9 29.0%	6 19.4%	0 0.0%	2.32
To broaden the scope of my research or study interests.					
Division One	23 69.7%	7 21.2%	3 9.1%	0 0.0%	2.61
Other than Division One	20 64.5%	9 29.0%	2 6.5%	0 0.0%	2.58
To learn from a faculty mentor/expert.					
Division One	21 63.6%	10 30.3%	1 3.0%	1 3.0%	2.63
Other than Division One	25 80.6%	5 16.1%	1 3.2%	0 0.0%	2.77
Other, please list.					
Division One	2 6.1%	0 0.0%	3 9.1%	28 84.8%	1.80
Other than Division One	1 3.2%	0 0.0%	5 16.1%	0 0.0%	1.33

At this time, what best describes your current post-graduation plans

	Division One	Other than Division One
I plan to attend graduate school	14 42.4%	14 45.2%
I plan to attend professional school (e.g., medical, dental, law, business, etc.)	14 42.4%	7 22.6%
I don't plan to attend graduate or professional school	0 0.0%	4 12.9%
I am not sure of my plans at this time	5 15.2%	6 19.4%
Missing	0 0.0%	0 0.0%

Undergraduate Research and Creative Projects Program Survey.
Source: Office of Institutional Research and Assessment, November 2012.

PRE-SURVEY, Division One Response Rate: 97.1% or 33/34. Other than Division One Response Rate: 81.6% or 31/38.

How confident are you in following skills and abilities

	Very Confident (5)	(4)	(3)	(2)	Not at all Confident (1)	Missing	Mean
Keeping notes on the progression of a project.							
Division One	16 48.5%	14 42.4%	3 9.1%	0 0.0%	0 0.0%	0 0.0%	4.39
Other than Division One	18 58.1%	10 32.3%	2 6.5%	1 3.2%	0 0.0%	0 0.0%	4.45
Reading and understanding a primary document.							
Division One	6 18.2%	16 48.5%	9 27.3%	2 6.1%	0 0.0%	0 0.0%	3.79
Other than Division One	16 51.6%	12 38.7%	2 6.5%	1 3.2%	0 0.0%	0 0.0%	4.39
Giving a presentation in front of a group.							
Division One	9 27.3%	15 45.5%	5 15.2%	3 9.1%	1 3.0%	0 0.0%	3.85
Other than Division One	10 32.3%	11 35.5%	9 29.0%	0 0.0%	1 3.2%	0 0.0%	3.94
Working as part of a team.							
Division One	18 54.5%	11 33.3%	4 12.1%	0 0.0%	0 0.0%	0 0.0%	4.42
Other than Division One	23 74.2%	8 25.8%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	4.74
Doing research on my own.							
Division One	8 24.2%	14 42.4%	9 27.3%	1 3.0%	1 3.0%	0 0.0%	3.82
Other than Division One	17 54.8%	10 32.3%	3 9.7%	1 3.2%	0 0.0%	0 0.0%	4.39
Preparing a well-documented paper							
Division One	6 18.2%	9 27.3%	16 48.5%	0 0.0%	2 6.1%	0 0.0%	3.52
Other than Division One	11 35.5%	12 38.7%	7 22.6%	0 0.0%	1 3.2%	0 0.0%	4.03
Thinking critically.							
Division One	11 33.3%	17 51.5%	4 12.1%	1 3.0%	0 0.0%	0 0.0%	4.15
Other than Division One	22 71.0%	6 19.4%	2 6.5%	1 3.2%	0 0.0%	0 0.0%	4.58
Thinking creatively.							
Division One	10 30.3%	14 42.4%	9 27.3%	0 0.0%	0 0.0%	0 0.0%	4.03
Other than Division One	19 61.3%	9 29.0%	3 9.7%	0 0.0%	0 0.0%	0 0.0%	4.52

PRE-SURVEY, Division One Response Rate: 97.1% or 33/34. Other than Division One Response Rate: 81.6% or 31/38.

The following are the goals of the Undergraduate Research and Creative Project Program (URCPP):

How important are the following goals to you?

	Extremely Important (5)	(4)	(3)	(2)	Not at all important (1)	Missing	Mean
To enhance my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with my faculty.							
Division One	27	5	1	0	0	0	4.79
Other than Division One	24	7	0	0	0	0	4.77
To foster student-faculty interaction in creative work.							
Division One	18	9	6	0	0	0	4.36
Other than Division One	20	10	1	0	0	0	4.61
To help me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.							
Division One	18	11	3	1	0	0	4.39
Other than Division One	19	10	2	0	0	0	4.55
To enhance my communication skills.							
Division One	19	7	5	2	0	0	4.30
Other than Division One	15	14	2	0	0	0	4.42
To provide experience that would be helpful to me to pursue subsequent research and learning opportunities.							
Division One	25	7	1	0	0	0	4.73
Other than Division One	25	6	0	0	0	0	4.81
To allow me to build my self-confidence to pursue careers and further study beyond Berea.							
Division One	24	4	5	0	0	0	4.58
Other than Division One	24	6	1	0	0	0	4.74
To provide experience that will help me make informed career and graduate school decisions.							
Division One	28	5	0	0	0	0	4.85
Other than Division One	26	5	0	0	0	0	4.84

POST-SURVEY, Division One Response Rate: 61.7% or 21/34. Other than Division One Response Rate: 71.1% or 27/38.

What situation best describes with whom you worked during your summer project?	Division One		Other than Division One	
	Count	Percentage	Count	Percentage
I worked closely with my faculty mentor	2	9.5%	1	3.2%
I worked with several other students and my faculty mentor	9	42.9%	18	58.1%
I worked mostly alone with occasional assistance	6	28.6%	2	6.5%
I worked on my own with little assistance	0	0.0%	2	6.5%
Other, please explain	4	19.0%	4	12.9%
Missing	0	0.0%	0	0.0%

What was your overall satisfaction with this arrangement?	Division One		Other than Division One	
	Count	Percentage	Count	Percentage
It was perfect for me.	8	38.1%	17	63.0%
I worked okay.	7	33.3%	4	14.8%
I would have liked a bit more attention/direction.	4	19.0%	5	18.5%
I would liked a bit less attention/direction.	1	4.8%	0	0.0%
I felt I was largely ignored or felt like a burden.	0	0.0%	0	0.0%
Other, please explain.	0	0.0%	1	3.7%
Missing	1	4.8%	0	0.0%

How much individual contact did you have with your faculty research mentor?	Division One		Other than Division One	
	Count	Percentage	Count	Percentage
We worked side-by-side.	3	14.3%	7	25.9%
We met/consulted daily.	10	47.6%	16	59.3%
We met/consulted several times a week.	3	14.3%	2	7.4%
We met/consulted once per week.	3	14.3%	1	3.7%
He/she was seldom available to meet or consult with me.	2	9.5%	0	0.0%
Missing	0	0.0%	0	0.0%

Undergraduate Research and Creative Projects Program Survey.
 Source: Office of Institutional Research and Assessment, November 2012.

POST-SURVEY, Division One Response Rate: 61.7% or 21/34. Other than Division One Response Rate: 71.1% or 27/38.

	Division One		Other than Division One	
I am positive I want to attend graduate school	9	42.9%	11	40.7%
I am fairly certain I want to attend graduate school	2	9.5%	7	25.9%
I am uncertain I want to attend graduate school	0	0.0%	3	11.1%
I am positive I want to attend professional school	6	28.6%	4	14.8%
I am fairly certain I want to attend professional school	2	9.5%	1	3.7%
I am uncertain about attending professional school	2	9.5%	1	3.7%
Missing	0	0.0%	0	0.0%

	Division One		Other than Division One	
It introduced me to a new field of research I now might want to pursue.	5	23.8%	5	18.5%
It introduced me to a new line of research in my major field that I now might want to pursue.	3	14.3%	3	11.1%
It improved my understanding of the field and speciality I have already chosen.	6	28.6%	7	25.9%
It encouraged me to investigate other areas of study or research.	5	23.8%	2	7.4%
It generally broadened the scope of my research interests.	1	4.8%	7	25.9%
Other, please explain.	1	4.8%	3	11.1%
Missing	0	0.0%	0	0.0%

POST-SURVEY, Division One Response Rate: 61.7% or 21/34. Other than Division One Response Rate: 71.1% or 27/38.

Please rate your confidence in your skills and abilities for the following:

	Very Confident (5)	(4)	(3)	(2)	Not at all confident (1)	Missing	Mean
Keeping a research notebook or journal.							
Division One	10 47.6%	8 38.1%	3 14.3%	0 0.0%	0 0.0%	0 0.0%	4.33
Other than Division One	13 48.1%	9 33.3%	3 11.1%	1 3.7%	1 3.7%	0 0.0%	4.19
Reading a primary research article.							
Division One	3 14.3%	14 66.7%	4 19.0%	0 0.0%	0 0.0%	0 0.0%	3.95
Other than Division One	16 59.3%	9 33.3%	0 0.0%	2 7.4%	0 0.0%	0 0.0%	4.44
Giving a presentation in front of a group.							
Division One	5 23.8%	15 71.4%	1 4.8%	0 0.0%	0 0.0%	0 0.0%	4.19
Other than Division One	17 63.0%	8 29.6%	1 3.7%	0 0.0%	1 3.7%	0 0.0%	4.48
Preparing a research poster							
Division One	6 28.6%	11 52.4%	3 14.3%	1 4.8%	0 0.0%	0 0.0%	4.05
Other than Division One	11 40.7%	8 29.6%	7 25.9%	1 3.7%	0 0.0%	0 0.0%	4.07
Working as a part of a research team.							
Division One	8 38.1%	10 47.6%	3 14.3%	0 0.0%	0 0.0%	0 0.0%	4.24
Other than Division One	17 63.0%	8 29.6%	2 7.4%	0 0.0%	0 0.0%	0 0.0%	4.56
Doing research on your own.							
Division One	5 23.8%	11 52.4%	5 23.8%	0 0.0%	0 0.0%	0 0.0%	4.00
Other than Division One	18 66.7%	6 22.2%	0 0.0%	2 7.4%	1 3.7%	0 0.0%	4.41

POST-SURVEY, Division One Response Rate: 61.7% or 21/34. Other than Division One Response Rate: 71.1% or 27/38.

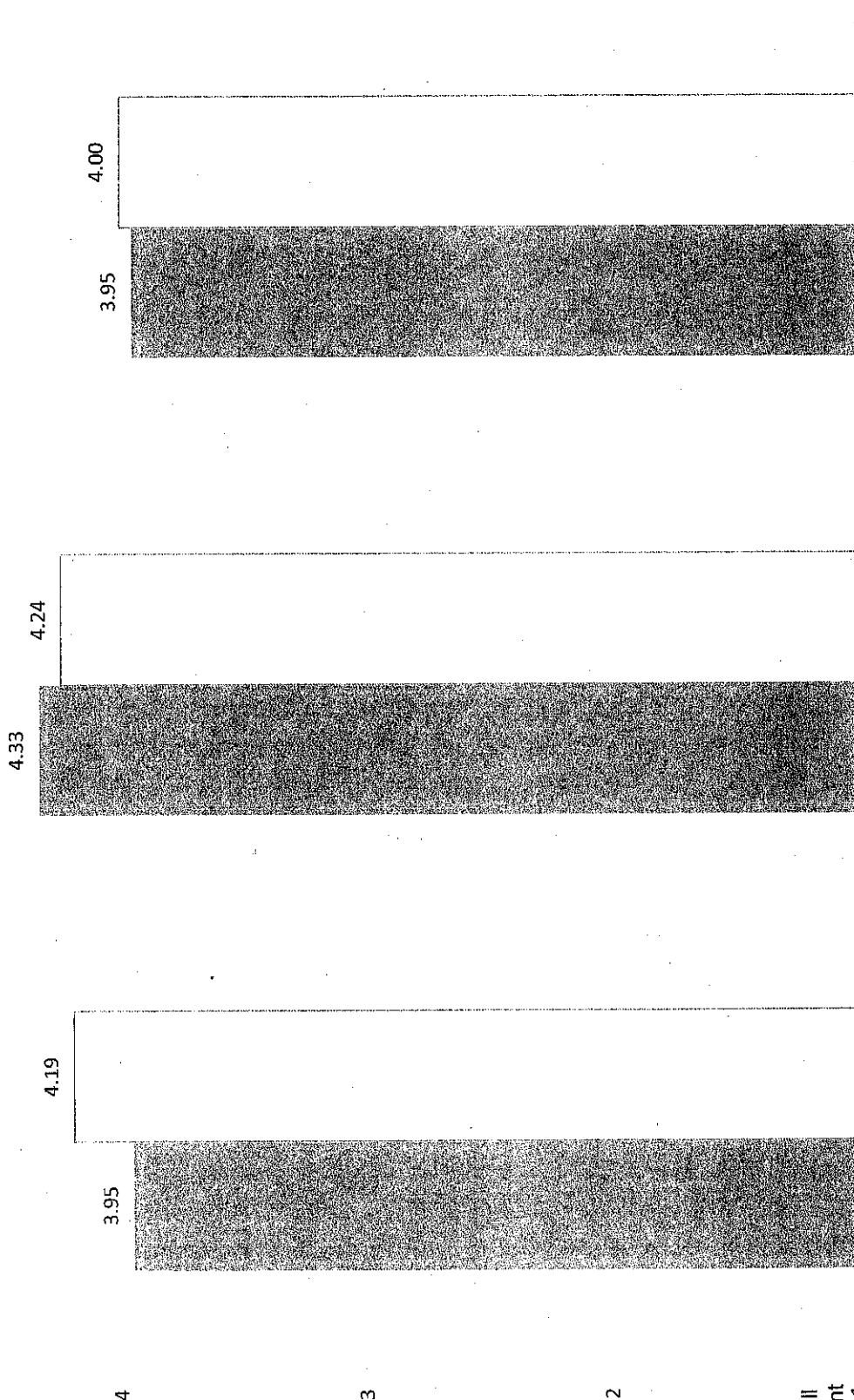
		To what extent did your summer experience contribute to the following					Mean		
		(5)	(4)	(3)	(2)	(1)	Missing		
		To a great extent				Not at all			
Enhanced my learning by providing opportunities to engage challenging, collaborative and directed projects in an apprentice-mentor relationship with faculty.									
Division One	9	42.9%	6	28.6%	6	28.6%	0	0.0%	4.14
Other than Division One	21	77.8%	5	18.5%	1	3.7%	0	0.0%	4.74
Fostered student-faculty interaction in creative work.									
Division One	8	38.1%	5	23.8%	5	23.8%	3	14.3%	3.86
Other than Division One	24	88.9%	2	7.4%	1	3.7%	0	0.0%	4.85
Helped me understand the interplay between collaboration and independent thought and action in a complex, open-ended project.									
Division One	9	42.9%	8	38.1%	4	19.0%	0	0.0%	4.24
Other than Division One	22	81.5%	3	11.1%	1	3.7%	0	0.0%	4.70
Enhanced my communication skills.									
Division One	5	23.8%	12	57.1%	3	14.3%	1	4.8%	
Other than Division One	13	48.1%	11	40.7%	2	7.4%	1	3.7%	4.00
Provided experience that would be helpful to me to pursue subsequent research and learning opportunities.									
Division One	12	57.1%	8	38.1%	1	4.8%	0	0.0%	4.52
Other than Division One	21	77.8%	5	18.5%	1	3.7%	0	0.0%	4.74
Allowed me to build self-confidence to pursue careers and further study beyond Berea.									
Division One	8	38.1%	11	52.4%	2	9.5%	0	0.0%	4.29
Other than Division One	20	74.1%	4	14.8%	2	7.4%	1	3.7%	4.59
Provided experience that will help me make informed career and graduate school decision.									
Division One	9	42.9%	9	42.9%	2	9.5%	1	4.8%	4.24
Other than Division One	20	74.1%	3	11.1%	4	14.8%	0	0.0%	4.59

Pre: How confident are you in the following skills and abilities?

Post: Please rate your confidence in your skills and abilities for the following:

Division One (Based on 21 students who completed both pre and post assessments)

Very 5
confident



Not at all
confident 1

Giving a presentation in front of a group.

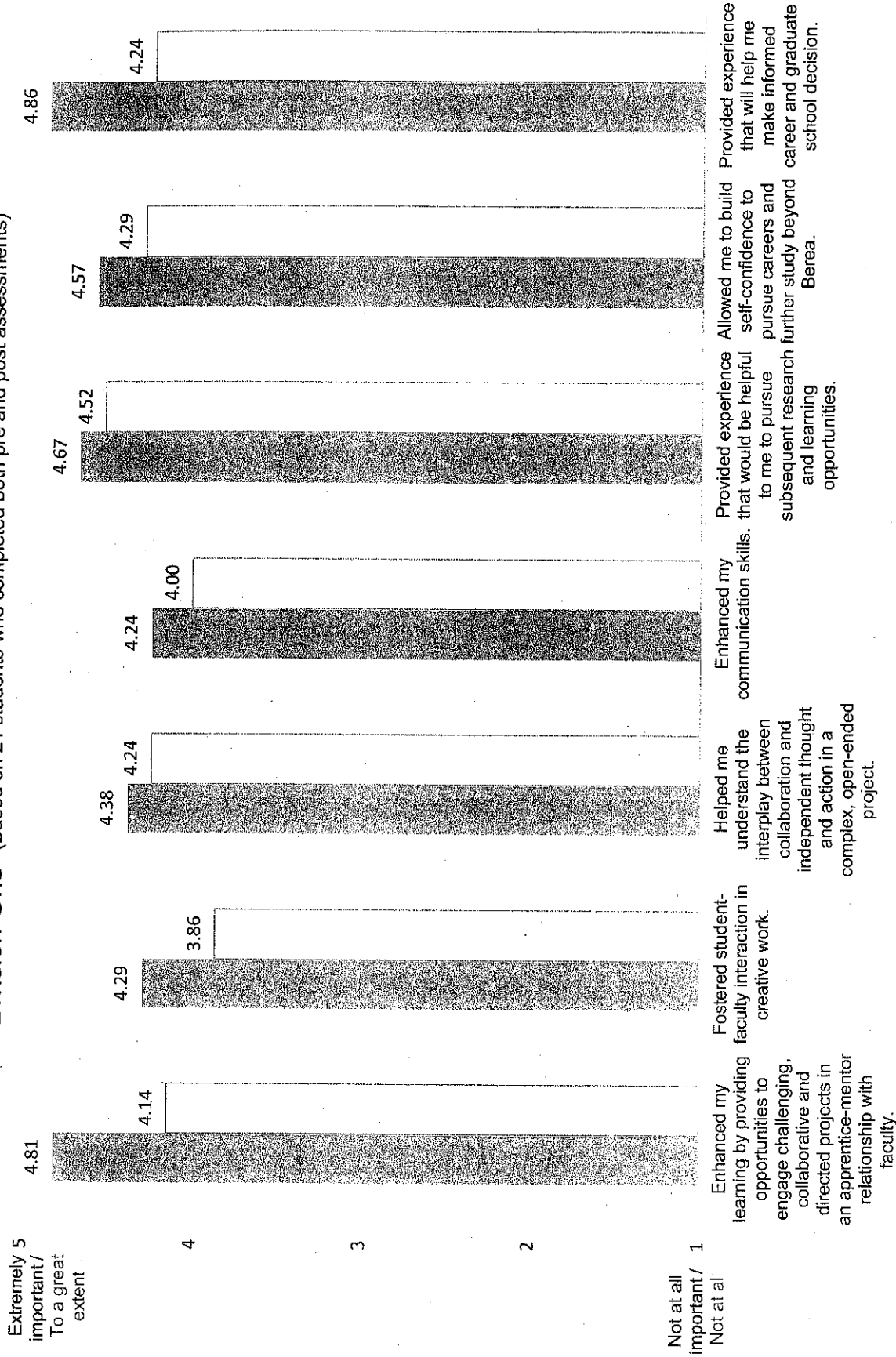
Working as part of a research team.

Doing research on your own.

Pre: How important are each of the following goals to you?

Post: To what extent did your summer experience contribute to the following:

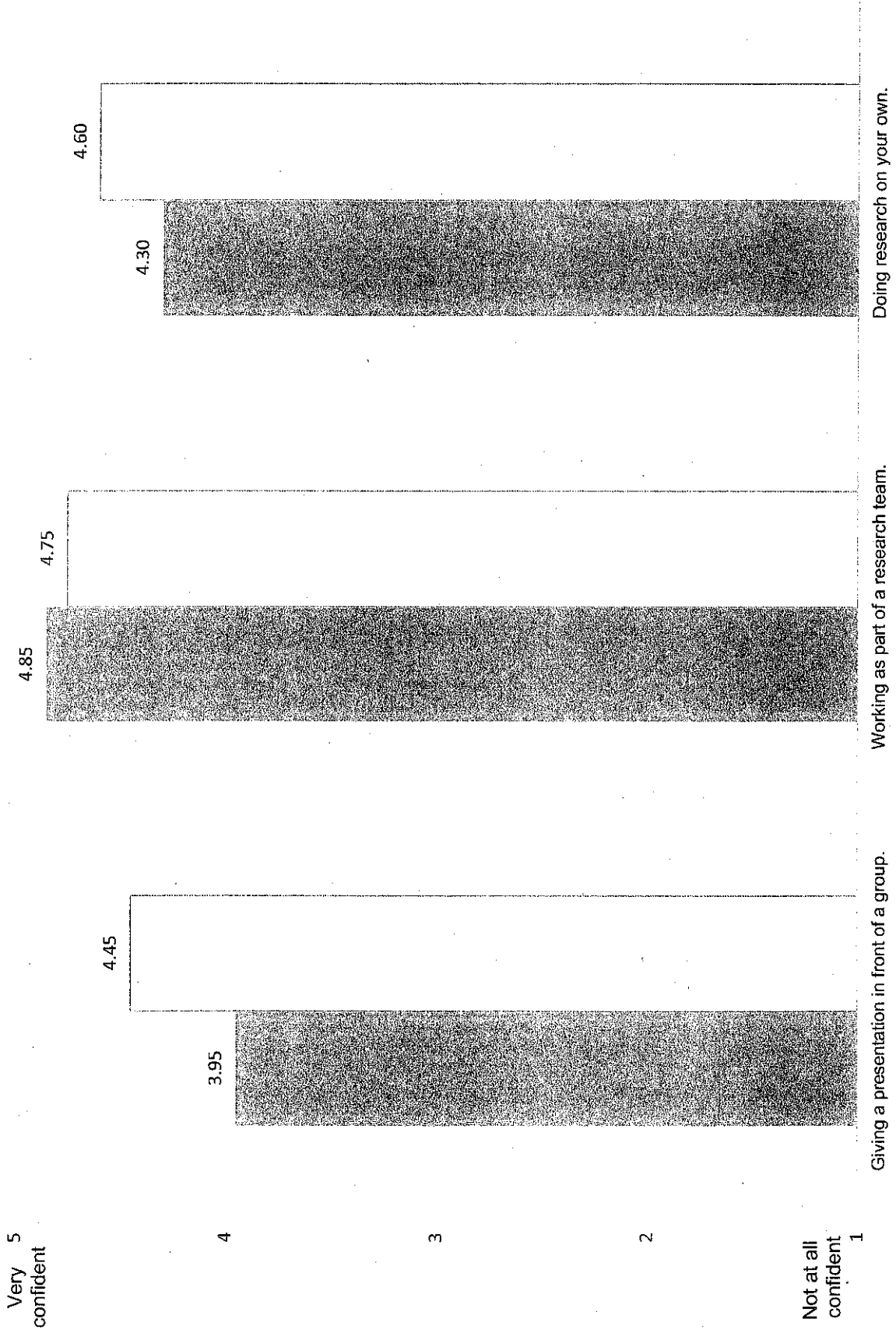
Division One (Based on 21 students who completed both pre and post assessments)



Pre: How confident are you in the following skills and abilities?

Post: Please rate your confidence in your skills and abilities for the following:

Other than Division One (Based on 20 students who completed both pre and post assessments)



Pre: How important are each of the goals to you?
Post: To what extent did your summer experience contribute to the following:

Other than Division One (Based on 20 students who completed both pre and post assessments)

