BEST
Building Excellent Scientists for Tomorrow

CREST
Clinical Research for Excellent Scientists for Tomorrow

RESEARCH SUMMARY
Summer 2013

Grant No. 2011112
BEST Interns

Lydia Anderson
Dunlap High School

Christy Dail
University High School

Joshua Han
Dunlap High School

Phoebe Huang
Dunlap High School

Roy Kim
Illinois Math & Science Academy

Paul Lee
Dunlap High School

Anna Liu
Richwoods High School

Matthew Park
Illinois Math & Science Academy

John Tian
University High School

CREST Interns

Mahliyah Adkins-Threats
Richwoods High School

Erendira Anaya
Manual High School

Sierra Doss
Peoria Notre Dame High School

Melissa Faginkrantz
Manual High School

Kamiya Hayden*
Manual High School

Shane Jackson
Manual High School

Ciera Ruffin
Peoria High School

Richard Serrano*
Richwoods High School

Amelia Stagg
Peoria High School

Catrina Warren*
Manual High School

Brianna Williams
Manual High School

*second consecutive year in program
Program Mentors

Robert Behle, PhD
USDA NCAUR

Craig Cady, PhD
Bradley University

Melinda Faulkner, PhD
Bradley University

Marjorie Getz, PhD
Methodist College UnityPoint Health

Sherri J. Morris, PhD
Bradley University

Erich Stabenau, PhD
Bradley University

Sarah Zallek, MD
OSF St. Francis Medical Center

Mark Berhow, PhD
USDA NCAUR

Dean Campbell, PhD
USDA NCAUR

Theodore Fleming, MS
Bradley University

Wen-Ching Liu, PhD
OSF St. Francis Medical Center

Kate Pastucha, MPH
ELM Consulting

Nicholas Stover, PhD
Bradley University
Center for STEM Education

Mission
The Bradley University Center for STEM Education: Research, Teaching and Learning is dedicated to increasing STEM literacy and improving STEM education and career opportunities for all citizens.

Vision
The Center for STEM Education will enable Bradley University to become a leader in the development of programs that challenge and advance the scholarship on the practice of learning and teaching in STEM fields and that provide educational opportunities and training for the next generation of STEM educators, STEM professionals and STEM-literate citizens.

Center for STEM Education
Bradley University Olin Hall 3
stemed@bradley.edu
http://www.bradley.edu/academic/cio/stem/
All too often students see science as hard and uninteresting, because there are so many facts to memorize. While the content is important, students need to see that science is a process. Students in our BEST and CREST programs have the opportunity through research immersion experiences to participate in the process of science and contribute to the generation of knowledge. That is the essence of science. It is exciting to see when students make that link. Although the program is only a few months long, they make important contributions to the field through their research projects and have a great time doing so. We are grateful to the Doris Duke Foundation for their interest in STEM Education and funding these great programs!

Sherri J. Morris, PhD
Center for STEM Education
Program Co-Director
Bradley University
Summer 2013 Research Symposium
- August 9, 2013 -
BEST Poster Abstracts

Water Conservation at Komatsu America Corp – Peoria Manufacturing Operations
Dail, Christy1,3,4, Taeyoung Kim2,3,4, and Kate Pastucha3
1University High School, Normal, IL, 2Illinois Math and Science Academy, Aurora, IL, 3ELM Consulting, Komatsu, Peoria, IL, 4Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

In the recent years, companies have been beginning to make efforts in "going green" in order to both help out the environment and improve their bottom line. As such, many companies are currently searching for better ways to reduce their overall water consumption. Following the U.S. Environmental Protection Agency’s WaterSense at Work guidelines, water meter records from the past 5 years at Komatsu America Corp - Peoria were analyzed in order to evaluate their water usage. Whenever there was data missing or something was not metered, estimates were made based on other available data. The assessment indicated that as much as 33% of Komatsu’s overall water consumption, about 3.3 million gallons, may have been wasted in 2012 alone. In order to reduce the amount of wasted water as much as possible in the future, several solutions, such as forming a Water Reduction Committee, training and informing employees on the importance of water conservation, and upgrading to more efficient bathrooms fixtures, were proposed.  
Mentor: Kate Pastucha

Chitin Synthase Genes in Tetrahymena thermophila
Anderson, Lydia1,2,3, William Moser2, and Dr. Nicholas Stover2
1Dunlap High School, Dunlap, IL, 2Department of Biology, Bradley University, Peoria, IL, 3Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

The Tetrahymena thermophila genome contains 12 chitin synthase (CHS) and 4 chitinase (CHN) genes. Chitin is a polysaccharide found abundantly in nature and used commonly for structural support and/or protection. However, the specific purpose of these Tetrahymena genes has yet to be characterized. A cladogram was constructed using the protein sequences of chitin synthase genes from Tetrahymena Thermophila as well as those from additional Tetrahymena species and other closely related organisms. Additionally, two strains of Tetrahymena Thermophila were cultured, starved, mixed to induce conjugation, and then inspected for chitin at hour intervals. Expression levels for the chitin synthase genes were also investigated. These analyses have suggested a connection between expression and the Tetrahymena life cycle, namely increased expression during conjugation. However, the specific role of these genes during conjugation is still unknown.  
Mentor: Nicholas Stover
Hydrogenation of Benzylic Alcohols and Benzaldehydes Catalyzed by Noble Metal Colloids Encapsulated in Polydimethylsiloxane

Bailey, Giuliana¹, Qiaoyu Lu¹, John Tian¹,²,⁴, Paul Lee¹,³,⁴, Dr. Brad Andersh¹, and Dr. Dean Campbell¹
¹Mund-Lagowski Department of Chemistry and Biochemistry, Bradley University, Peoria, IL, ²University High School, Normal, IL, ³Dunlap High School, Dunlap, IL, ⁴Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

The small size of colloidal palladium particles has enabled them to be used as catalysts for many organic reactions. However, the small particles tend to aggregate, so support systems, such as carbon, are typically used. Some supported palladium systems become pyrophoric after exposure to hydrogen. Another problem is that the small colloidal particles tend to pass through filters and can be difficult to separate from reactions. Encapsulating palladium nanoparticles in a polydimethylsiloxane polymer stops the pyrophoric properties of palladium and allows the catalyst to be more easily removed from the reaction. This catalyst has been shown to catalyze the hydrogenolysis of methyl (4-hydroxymethyl)benzoate and hydrogenation followed by hydrogenolysis of the product methyl 4-formylbenzoate. The reactant was placed under the pressure of a hydrogen filled balloon and the reaction mixture was stirred overnight. The reaction mixture was then analyzed via NMR spectroscopy. The goal of this research was to determine conditions that would allow the hydrogenation of these compounds to consistently go to completion and to determine conditions that would allow the catalyst to be reused, including varying solvents and the addition of p-toluenesulfonic acid, acetic acid, and mineral acids.

Mentor: Dean Campbell

A Comparison of the Soil Microbiota Existing in Garlic Mustard Soils and Non-Garlic Mustard Soils

Han, Joshua¹,²,³, Theodore Fleming², and Dr. Sherri Morris²
¹Dunlap High School, Dunlap, IL, ²Department of Biology, Bradley University, Peoria, IL, ³Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

Garlic mustard is a biennial herb that is nonnative and invasive to many forests across North America. It has the potential to adversely affect the forest environment. Garlic mustard has also been known to release certain allelochemicals that can suppress the growth of microorganisms needed by many native plants for optimum growth. To examine the effects garlic mustard can have on the surrounding soil microbial composition, we collected garlic mustard plants and non-garlic mustard plants in a forest near Glen Oak Park in central Illinois. The soil near the roots of these plants was separately collected and examined for its culturable microbial composition. The most commonly occurring soil microbiota present in these soils were examined and identified. Overall, we found that there were slightly more bacterial colonies present in soils near the garlic mustard roots than near the non-garlic mustard plant roots. However, there were no significant differences in the types of bacteria found between garlic mustard soils and non-garlic mustard soil. Most of the microorganisms were Gram-positive bacilli, along with several fungi and Gram-negative bacilli. Thus, there was no discernable difference between the types of microorganisms found only in garlic mustard or non-garlic mustard soils. Still, the study of changes in soil microbiota following garlic mustard invasion warrants further study because it has the potential to affect forest structure and function.

Mentors: Sherri Morris and Theodore Fleming
The Study of Antibiotic Activity in Phenolic Compounds within the Grape Pomace of Norton and Frontenac Gris
Huang, Phoebe1,2,3, Dr. Erica Bakota2, and Dr. Mark Berhow2
1Dunlap High School, Dunlap, IL, 2U.S. Department of Agriculture, Peoria, IL, 3Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

Mark Berhow, Erica Bakota, and I were testing Norton and Frontenac gris grape pomace for phenolic compounds. Grape pomace is the solids left over after making wine or juice from grapes. It often consists of skin, seeds, and twigs. It is said that the grape pomace has a lot of phenolic compounds which may have antibiotic activity in them. To test this, we separated the pomace into different fractions using flash chromatography. Then we tested each fraction using the total phenolics assay which uses the spectrophotometer that told us which fraction had the most phenolic compounds. We hypothesized that fractions D of both Norton grapes and Frontenac gris grapes would have the most phenolic compounds because it had the highest peak in the evaluation of the flash chromatography. After finishing the total phenolics assay, we found that fraction E of Frontenac gris grapes and fraction D2 of Norton grapes had the most phenolic compounds, which did not match my hypothesis. My theory that the amount of phenolic compounds would correspond to the peaks of the evaluation from the flash chromatography was also inconsistent with our data. I am not sure why my hypothesis did not correspond to our data; the peaks only represented the amount of compounds in the fraction and not the amount of phenolic compounds, so there seems to be little correspondence between amounts of compounds and amounts of the specific type of compound. Otherwise, our experiment went well. We were very accurate in making solutions to test the samples and making the standard curve we used to compare the samples. The r^2, which represented our accuracy was close to over .99 for both experiments (the closer it is to 1, the more accurate it is). After this experiment, we hope to produce a drug that may help defend humans against diseases.

Mentor: Mark Berhow

Titration Synthesis and Magnetic Characterization of Mn – Zn Ferrites
Lee, Paul1,3,4, John Tian2,3,4, Giuliana Bailey3, Qiaoyu Lu3, Angela Maughan3, and Dr. Dean Campbell3
1Dunlap High School, Dunlap, IL, 2University High School, Normal, IL, 3Mund-Lagowski Department of Chemistry and Biochemistry, Bradley University, Peoria, IL, 4Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

Six ferrite compounds with the general formula MFe_2O_4 (where M = Mn, Fe, Co, Ni, Cu, and Zn) were synthesized by aqueous co-precipitation methods. The transition metal chlorides in the appropriate mole ratios were dissolved in water, and aqueous base (NaOH or NH_3) was added to produce the appropriate oxides. With the aid of the Vernier LabQuest™ system, the base was added in a drop-by-drop fashion while monitoring both the change in pH and volume of base added, producing titration curves. The equivalence points of the titrations were determined through their second derivatives, and the stoichiometric ratios between the amount of base added, the amount of MCl_2, and the amount of FeCl_3 were analyzed and compared with the ideal stoichiometric ratios predicted from the balanced synthetic equation. Overall, most syntheses displayed anticipated stoichiometric ratios, supporting the fact that the magnetic particles were being synthesized with the expected formulae. The magnetization of the ferrites were then quantified by using an electronic balance to measure their interaction with the magnetic field of a strong magnet. Most of the precipitates synthesized, particularly Fe_3O_4 and CoFe_2O_4, exhibited some magnetization, although some needed to be heated first in a hot water bath.
Stem Cell Migrations Towards Ovarian Cancer is Enhanced by Pretreatment

Liu, Anna1,2,3, Kate Lipovsky2, Erin Koch2, and Dr. Craig Cady2
1Richwoods High School, Peoria, IL, 2Neurophysiology Laboratory, Department of Biology, Bradley University, Peoria, IL, 3Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

Ovarian cancer is one of the leading causes of cancer deaths in women in the US. In 2013, there will be an estimated 22,240 new cases and 14,030 deaths. Ovarian cancer is hard to detect, as the symptoms are subtle while the survival rate for advanced ovarian cancer has not changed in 40 years. We have reported that human bone marrow mesenchymal stem cells (hBMSCs) migrate toward ovarian cancer cells, suggesting a potential role as a drug carrier for targeting and treating ovarian cancer. Our proposed model uses genetically engineered hBMSCs to carry the cytosine deaminase (CD) protein to the tumor to convert a prodrug 5-fluorocytosine (5-FC) into 5-fluorouracil (5-FU), a cytotoxic chemotherapy agent. Our current research focuses on improving this model by increasing the migration rate of hBMSCs toward ovarian cancer cells. We hypothesize that pretreating hBMSCs with either ovarian cancer cell conditioned media, serum free media or VEGF-165 will increase the rate of hBMSC migration. To enhance migration, we pretreated hBMSCs for 24 hours with three different reagents/factors including serum-free hCCM media, ovarian cancer cell conditioned media and vascular endothelial growth factor 165 (VEGF 165). VEGF is produced by ovarian cancer cells promoting vascular growth and our previous work has shown that VEGF is important in mediating hBMSC migration. Following pretreatment, migration was evaluated using a Boyden chamber. Pretreated hBMSCs with ovarian cancer cell conditioned media had an increased migration rate compared to cells pretreated with either serum-free hCCM or VEGF 165. These findings have the potential to improve the efficacy of our proposed treatment model; however, multiple experiments will be needed to further validate these results.

Mentor: Craig Cady

Metarhizium Microsclerotia Granules Incubated at Various Temperatures

Park, Matthew1,2,3 and Dr. Robert Behle2
1Illinois Math and Science Academy, Aurora, IL, 2US Department of Agriculture, Peoria, IL, 3Doris Duke Foundation BEST Summer Internship, Bradley University, Peoria, IL

For most of the 21st century, chemical pesticides were widely used in insect control. However, interest in biological pesticides was sparked by concerns about chemical pesticides on public health and environment. Additionally, pests started to gain resistance to commonly used chemical pesticides. As a biological pathogen, Metarhizium fungus is very prevalent in insect control. It has various mechanisms to create spores and can stay viable for long periods of time when in the structure microsclerotia. We investigated the effects of different temperature on the spore production of Metarhizium microsclerotia granules especially in the agricultural field. Additionally, we experimented with variances between temperatures by incubating the granules on neutral and selective media to determine whether Metarhizium sporulated, as opposed to other fungal contaminants. Greater temperatures slowed Metarhizium spore production significantly and facilitated fungal contamination growth. Additional plating onto D-SDA selective media verified the inverse relationship between incubation temperature and spore production. Overall, there is a significant relationship between increasing temperature and Metarhizium spore production.

Mentor: Robert Behle
Culturing Human Cardiomyocytes and Hepatocytes

Doss, Sierra\(^1,3\), Amelia Stagg\(^2,3\), and Dr. Erich Stabenau\(^4\)
\(^1\)Peoria Notre Dame High School, Peoria, IL, \(^2\)Peoria High School, Peoria, IL, \(^3\)Doris Duke Foundation CREST Summer Internship, Bradley University, Peoria, IL, \(^4\)Department of Biology, Bradley University, Peoria, IL

Human cardiomyocytes and hepatocytes are useful cells for conducting research. These cells can be used in a wide variety of cellular studies (such as the effects of various agents on cells, regulatory volume increase), and can be used in place of a non-human model (i.e. snakes, rats, frogs). Currently, our lab has no protocol for culturing these cells and keeping them alive for research purposes. Therefore, our main goal was to develop such a protocol. We researched this by following culturing protocol provided by the company from which we purchased the cells, observing the cultures, and making decisions regarding the cells. We found that both cell types could be cultured and kept alive; however, cardiomyocytes could not be subcultured after two days and hepatocytes displayed difficulty adhering to culture plates. Research on cardiomyocytes and hepatocytes can only take place if they can be cultured and sustained. Therefore, our work will provide a base for others to accomplish their research goals.

Mentor: Erich Stabenau

Converting Human Adipose Mesenchymal Stem Cells into Neurons

Adkins-Threats, Mahliyah\(^1,2,3\), Kate Lipovsky\(^2\), Erin Koch\(^2\) and Dr. Craig Cady\(^2\)
\(^1\)Richwoods High School, Peoria, IL, \(^2\)Department of Biology, Bradley University, \(^3\)Doris Duke Foundation CREST Summer Internship, Bradley University, Peoria, IL

Stem cells can play a significant role in regenerative medicine. They can be used to recreate or repair damaged or lost cells and tissues without the risk of rejection by the patient. However, in order for a specific damaged cell or tissue to be repaired, stem cells must be guided to differentiate into the desired cell or tissue type. The use of certain factors in the media in which the stem cells are cultured could be used to influence and guide the differentiation of stem cells. It was hypothesized that the usage of retinoic acid and media conditioned with avian embryonic spinal cord cells would encourage neural transdifferentiation of human Adipose Mesenchymal stem cells (hAdiposeMSCs). To test this hypothesis hAdiposeMSCs were cultured in six different medias and neural transdifferentiation was observed. PDL slips with 5000 cells each were cultured in 24 well plates and 500µL of media. The control groups were stem cells in NBA/B27 and avian embryonic neurons in NBA/B27. The experimental groups included hAdiposeMSCs in 50% Conditioned Media (CM)+ NBA/B27, 100%CM, 100%CM+Retinoic Acid (RA), and NBA/B27+RA. The experiment was conducted in duplicate with time points at Day 2 and Day 4 at which time the PDL slips were photographed and fixed for immunocytochemistry. Evidence of neural transdifferentiation was verified using morphology and immunocytochemistry.

Mentor: Craig Cady
Investigating the Characteristics of Sleep-Isolated Trichotillomania
Hayden, Kamiya¹,²,₄,₅, Richard Serrano²,₄,₅, Kate Lipovsky³,₄, and Dr. Sarah Zallek⁴

¹Manual High School, Peoria, IL, ²Richwoods High School, Peoria, IL, ³Bradley University, Peoria, IL, ⁴Illinois Neurological Institution, OSF St. Francis Medical Center, Peoria, IL, ⁵Doris Duke Foundation CREST Summer Internship, Bradley University, Peoria, IL

Trichotillomania (TTM) is an impulse control disorder characterized by an uncontrollable urge to pluck one’s hair. Conscious TTM can occur when the individual is fully aware of his or her hair plucking as it happens. TTM can also occur subconsciously. Subconscious TTM can be further categorized as sleep-isolated trichotillomania (SITTM). SITTM is a recently reported disorder characterized by hair pulling that occurs only while one is asleep. SITTM is an under-recognized sleep disorder because most individuals suffering from this disorder are not aware of their hair pulling habits. Due to the subconscious plucking being confined only to sleep, the true prevalence and characteristics of SITTM are unknown. The purpose of this study is to better describe the characteristics of SITTM by providing qualitative analysis using a ten-question survey. Responses were collected anonymously from September 2010-May 2013. Fifty-seven subjects (44 [76%] female) completed the survey. Mean age of symptom onset was 20 years. A majority of subjects (35 [61.4%]) pulled their hair every night. Thirty-eight (68.4%) subjects were experiencing depression during the time SITTM began. Forty-three (75.4%) subjects have not tried any treatments. Fifty-two subjects (91.2%) reported that sleep-isolated trichotillomania had a slight to substantial impact on the subject’s life, and 28 subjects (49.1%) reported that sleep-isolated trichotillomania had a moderate to substantial impact on the subject’s life. Only one subject (1.8%) reported the SITTM to have resolved. This study provides important information concerning the characteristics of SITTM which up until now have not been well described. Limitations to the study are largely due to experimental design. Because the study was based on a survey made only available on the internet, only individuals with internet access were able to complete the survey. Also, the authors assumed that each subject response was answered honestly. Future studies hope to analyze a larger sample of individuals through different sources (newspaper ads, internet, mail, public bulletins) so as not to limit the study to subjects from a particular socioeconomic background.

Mentor: Sarah Zallek
Resources for Family Caregivers: Using Qualitative Research to Update Caregiving 101
Anaya, Erendira1,3,4, Ciera Ruffin2,3,4, Brianna Williams1,3,4, and Dr. Marjorie Getz3
1Manual High School, Peoria, IL, 2Peoria High School, Peoria, IL, 3Health Science Program, Methodist College UnityPoint Health, Peoria, IL, 4Doris Duke Foundation CREST Summer Internship, Bradley University, Peoria, IL

Recently, the focus in healthcare has been to encourage healthcare professionals to develop the skills necessary to establish evidence-based practices (EBP). EBP allows a healthcare professional to systematically use the best available evidence integrated with clinical expertise and patient values/preferences to make clinical decisions. Learning how to apply research studies to healthcare practice starts early while a professional is still a student. In addition, healthcare professionals must be knowledgeable consumers of research—one who can appraise research evidence to determine the merit and readiness for use in clinical practice. This study was designed to expose students participating in the CREST Program at Bradley University to the concept of qualitative research as it applies to family care provision. Three students used benchmarking skills to learn about family caregiving, interviewed family care providers about the lived experience of being a care provider and used this information to revise a community health resource: Caregiving 101: Caring for the Physical Needs of Someone at Home. This resource had been developed by the Institute for Physical Medicine and Rehabilitation in 2004 and needed to be revised and updated. Interviewing family care providers using a phenomenological research design allowed students to revise the manual to make it more user friendly.

Mentor: Marjorie Getz

Investigating the Antioxidant Defense of Bacillus subtilis
Faginkrantz, Melissa B.1,2,3, Shane D. Jackson1,2,3, and Dr. Melinda J. Faulkner2
1Manual High School, Peoria, IL, 2Department of Biology, Bradley University, Peoria, IL, 3Doris Duke Foundation CREST Summer Internship, Bradley University, Peoria, IL

Organisms that live in the presence of oxygen (such as us!) generate toxic oxygen-containing molecules such as hydrogen peroxide (H2O2). These reactive oxygen molecules damage enzymes and membranes, and may cause mutation or even cell death. Thus, our immune systems generate similar toxic oxygen species to combat bacterial infections. The ability of cells, both microbial and human, to sense these damaging molecules and respond to them with an appropriate antioxidant defense is vital for their survival. In our following studies, we used the bacterium Bacillus subtilis as a model organism to better understand how cells respond under conditions of oxidative stress. Two primary classes of peroxide detoxifying enzymes can be found in nearly all organisms: catalase and alkylhydroperoxide reductase (AhpC). Catalase quickly degrades high concentrations of H2O2. In contrast to catalase, AhpC is best at degrading low levels of peroxides, and furthermore is capable of detoxifying multiple types of peroxides. AhpC is very similar to another enzyme known as YkuU; however, there are likely some differences between these two enzymes which lead us to investigate the function of YkuU. In these studies, we seek to understand the roles of these three peroxide detoxifying enzymes in the bacterium’s defense system against peroxide molecules. Furthermore, we hope to gain insight into why, evolutionarily speaking, some bacterial species maintain two or more seemingly redundant enzymes (e.g. AhpC and YkuU) involved in the protection against reactive oxygen molecules.

Mentor: Melinda J. Faulkner
Brain Responses of ADHD Population Using fMRI
Warren, Catrina¹,²,³, Dr. Lori Russell-Chapin⁴, and Dr. Wen-Ching Liu³
¹Manual High School, Peoria, IL, ²Doris Duke Foundation CREST Summer Internship, Bradley University, Peoria, IL, ³Department of Radiology, OSF St. Francis Medical Center, Peoria, IL, ⁴Bradley University, Peoria, IL

Functional Magnetic Resonance Imaging (fMRI) is an MRI procedure that measures brain activity by detecting associated changes in blood flow. This technique relies on the fact that cerebral blood flow and neuronal activation are coupled. When an area of the brain is in use, blood flow to that region also increases. Children with Attention Deficit Hyperactivity Disorder (ADHD) may have different activation patterns associated with the counting stroop paradigm. This study randomly assigned 12 children diagnosed with ADHD and currently on a stimulant medication into either treatment or control group. Neurofeedback (NFB) treatment sessions usually last about 20 minutes, patients need to experience about 30 to 40 sessions. fMRI was administered for the patients on pre and post treatment. It was difficult reaching a consensus as to what brain regions are responsible for producing the symptoms of ADHD but we found some regions using our fsl program.

Mentor: Wen-Ching Liu
Summer Fun!

Interns spent the majority of their summer doing research with mentors. However, another goal of the program was expose them to the vast array of STEM-related jobs in the Peoria area and give them social events to talk and share their experiences with other BEST and CREST students! Here are some of the events.

At the Peoria Zoo students had a behind the scenes tour of one of zoo’s most popular exhibits - the Californian sea lion (Zalophus californianus californianus). Interns viewed all of the various aspects of caring for this mammal including habitat water testing, medical care, diet, training, and development of interactive games. Afterwards, students had the opportunity to tour the zoo.

Anyone in Central Illinois can tell you how important Caterpillar is to local industry. Dawned with headsets and toe protectors interns toured the Mossville location, which is home to CATs Technical Research Center. Here interns were able to view various areas of research and development relating to the assembly, manufacture, and testing of machine components as well as what goes into making a successful company.
This field trip started in at the museum’s River Science Lab, part of the Illinois River Encounter. Here interns were challenged to think about a problems our river ecosystem faces due to human activities.

Next, interns viewed private showings of Extreme Planets and The Science of Inquiry in the museum’s state of the art planetarium.

Interns were then able to challenge themselves physically and mentally by exploring the rest of the exhibits and the art gallery.
If you are interested in the BEST and CREST programs, or any other Center for STEM Ed. program at Bradley, please visit us at:
http://www.bradley.edu/academic/cio/stem/

**Center for STEM Education**
Bradley University, Olin Hall 3
(309) 677-3001
stemed@bradley.edu