September 2015

Oswald Research and Creativity Program

UK Office of Undergraduate Research

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Any current UK undergraduate (full- or part-time, enrolled for either semester) who does not already have a four-year degree is eligible for the Oswald Research and Creativity competition and is invited to submit papers and other projects in the following categories:

1. Biological Sciences
2. Design (architecture, landscape architecture, interior design, etc.)
3. Fine Arts (film, music, painting, sculpture, videotape, etc.)
4. Humanities: Creative
5. Humanities: Critical Research
6. Physical and Engineering Sciences
7. Social Sciences

Entries are judged on originality; clarity of expression; scholarly or artistic contribution; and the validity, scope, and depth of the project or investigation.

The following are representative winners in the 2006-2007 Oswald Research and Creativity Program:

(Extended versions of some of these entries are available at www.uky.edu/kaleidoscope.)

### CATEGORY 1: Biological Sciences

**Honorable Mention**

**NAME:** Peter S. Wulff  
**TITLE:** A New Mouse Model to Study Gene Function in Skeletal Muscle

Using a muscle specific promoter, I will drive expression of Cre-recombinase to make a muscle specific gene knock-out. Because of the transgenes used, the knock-out event can be temporally regulated via an enducer (doxyxcline).

**2nd Place**

**NAME:** Nathan Landrum  
**TITLE:** Characterizing potential Environment Controls on Stromatolite Morphology Using of Stable-Isotope Analysis and Micro-Stratigraphy

This project is for a geological/paleobiological study done on stromatolites, a type of colonial extremophile which lives in the Storrs Lake on the island of San Salvador in the Bahamas. Isotopic data was taken from 100 locations on a single stromatolite found in Storrs lake to determine if the variable morphology (growth) of the carbonate structure produced by the colonial organisms: bacteria, archea, and eukartotes, which form the stromatolite, was caused by a traceable environmental variation.

### CATEGORY 2: Design

**1st Place (tie)**

**NAME:** Aaron Scales  
**TITLE:** The Sustainable Stop

Due to the nation’s security threats, rising gasoline prices, and effects of a warming global climate, it is becoming increasingly important for mass transportation providers to become a more appealing and convenient option for travelers. Through the joint support of the National Railroad Passenger Corporation (Amtrak), Central Ohio Transit Authority (COTA), U.S. Department of Transportation (U.S. D.O.T.), and the City of Columbus, Ohio, we intend to deliver a center for transportation suitable for the diverse demands of the participating organizations.

**1st Place (tie)**

**NAMES:** Brian Buckner, Ivan Cheung and Matthew Storrie  
**TITLE:** Stop Gap

A drug that prevents serotonin synthesis, pCPA, was fed to fruit fly larvae and the impacts were observed. The flies were monitored for time to pupation, body length at two stages of development, mouth hook and body wall movements, and were dissected and stained for serotonin presence in the brain. All larvae fed pCPA were compared to control animals fed the same food in the same conditions without the drug.

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CATEGORY 3: Fine Arts

1st Place
NAME: Lisa Woods
TITLE: Belle of Amherst
This abstract consists of dual components: the visual/oral dramatic creation of a character role and the visual/construction element of the costume. The Belle of Amherst is a one-woman play about the great American poet Emily Dickenson, written by William Luce. I performed the role of Emily in an hour long production and also constructed the 19th century costume. Under the direction of Dr. Andrew Kimbrough, I researched the character and life of Emily Dickenson and rehearsed the performance of The Belle of Amherst. I created the costume for my character of Emily Dickenson from the design by Professor Nelson Fields of the theatre department. The costume is silk with antique lace and includes a bodice, separate skirt, and a corset and chimes all built by me. The dress is worn with three additional petticoats and a crinoline. Specially built to fit me and to withstand the rigors of performance, the entire costume is fully functional as a wearable garment and has served me for nine performances of The Belle of Amherst. The costume is now part of the UK theatre costume stock.

CATEGORrY 4: Humanities: Creative

2nd Place
NAME: Christopher Clark
TITLE: Short Story: The Land of Nog and Crystalline Wall
This story is merely one of a series of short stories that I have written, which I one day hope to turn into a fantasy series of epic proportions. This story does not capture the picture of the whole world, simply because it would end up being too long-winded and complicated for such a task. This particular entry is the back story to how two of my characters originally meet — a lost tale in a world forgotten in time.

1st Place
NAME: Nathan Landrum
TITLE: Short Story: The Dreamer
This is a speculative fiction story that envisions a future in which the hailed explorers, the Ponce De Leon’s, the Lewis and Clark’s, the Marco Polo’s, once again have a new frontier to conquer. With the help of a technology that allows single pilots to travel the stars in search of promised treasures every bit as enticing as the fountain of youth, sleeping away their journeys, forever staying young, this story focuses on the homecoming of one of these explorers, and the impact of having family and friends separated not only by distance but also by time. What would it mean to remain young of body and mind, as the people you know grow old, die, and are replaced?

CATEGORY 5 Humanities: Critical Research

Honorable Mention
NAME: Amanda Duncan
TITLE: Saving the Commonwealth through its Women: The Works Progress Administration in Kentucky 1935-1937
The Works Progress Administration was implemented in 1935 by an Executive Order of President Franklin Roosevelt. President Roosevelt expected the W.P.A. to provide work for the millions of Americans on welfare, while also providing valuable improvements to the communities where these individuals lived. The W.P.A. has been viewed as a failure by many historians because it did not truly modernize most of the country, due to a lack of funds and President Roosevelt’s fear of deficit spending. In Kentucky, from the program’s inception to 1937, the public and those who sponsored and worked on W.P.A. projects felt quite differently. Based on the Goodman-Paxton Papers, the W.P.A. provided jobs and improvements that would not have otherwise been available. For women, the W.P.A. provided gender specific work. The Training Work Centers (which employed 86 percent of women working for the W.P.A. in Kentucky), housed in various communities throughout the state, and funded by both state and federal money, provided women with the chance to support their families and learn valuable skills. Women learned to sew, make a complete family wardrobe, and learned basic hygiene and family health skills. Women also worked as teachers, educating both adults and nursery school children. This service taught Kentuckians to read and write, and gave children an early start on education. In short, the W.P.A. in
Kentucky, while not creating social change, provided the mechanisms needed to modernize the state. Not only were women learning how to care for themselves and their families, they were providing valuable services to the state.

2nd Place
NAME: Ryan Zeller
TITLE: A Cultural Anthropological Explanation of the Dispute between Jefferson and Marshall

This paper attempts to answer the question: “How does competition related to status in the context of the cultural expectations for behavior and rituals held by the Virginia gentry help to explain the social and political rift between cousins Thomas Jefferson and John Marshall?”

My purpose was not to uncover new facts about the Jefferson-Marshall rivalry: rather it was to present the well-known evidence of their conflict from a different perspective. I chose to emphasize competition, honor, and cultural rituals and expectations, rather than offer traditional political explanations for their differences. I did not intend to downplay the importance of political differences, but wanted to place the rift in a broader context of competition, honor, and cultural rituals.

1st place
NAME: Anna Sewell
TITLE: The Births of Babies of Beliefs: How Ancient Roman Women Rose Above their Bodies

This historical research thesis addresses the position of women in ancient Roman society. After examining the historiography on Roman women, I concluded that no scholar has examined the implications on the objectification of women. Therefore, I used ancient medical evidence to prove that Roman women were objectified due to the obsession with their reproductive bodies, much like modern women. However, this objectification is only theoretical, and women still managed to usurp power from their families and, through inheritances, education, and other methods. Because Roman women were objectified, but were also uniquely powerful in their age, I argue that they laid the foundation for future feminism movements.

CATEGORY 6: Physical and Engineering Sciences

Honorable Mention
NAME: Matthew A. Borns
TITLE: Reverse-selective Membrane Networks for the Purification of CO₂ Gas Mixtures

The relaxation characteristics of rubbery reverse-selective membranes designed for the preferential transport of CO₂ over light gases have been investigated using dynamic mechanical thermal analysis and dielectric spectroscopy. Short-branch networks with varying crosslink density were created by a copolymerizing poly(ethylene glycol) diacrylate [PEGDA] crosslinker with two separate species of mono-acrylate co-monomer. Results and data analysis demonstrate a significant contrast in relaxation characteristics between the two types of networks as well as these “short branch” copolymers as compared to other reverse-selective membranes.

2nd Place (tie)
NAME: Andrew Lynch
TITLE: Evaluating the reliability of groundwater samples taken from wells potentially impacted by residual drilling fluids multiple reduction-oxidation indicators

The summer after my sophomore year I was accepted into NASA's Undergraduate Student Research Program (USRP). At Los Alamos National Laboratory I conducted research evaluating various geochemical oxidation-reduction couples as indicators of in-situ biogeochemical groundwater conditions. I developed these couples into a multi-tiered redox protocol that allows rapid, reliable analysis of groundwater samples for impaction by residual drilling fluid from well construction. Essentially, the protocol analyzes the speciation of four geochemical species and, based on this analysis, can quite accurately determine the oxidation-reduction state of the groundwater and, from there, the level of impaction by residual drilling fluids. I don’t discuss the implementation of this research in the report, but this protocol was so successful that it has actually been implemented by LANL and is used to screen all new groundwater data as it is collected. I also presented this research at the Geological Society of America’s annual meeting in the Innovations in Groundwater Monitoring topical session. My report is regularly referenced by LANL both for implementation efforts and in new research reports.

Category 6 winners Levon Ter-Isahakyan, Andrew Lynch, Matthew Borns, and Mehul Suthar
2nd Place (tie)
NAME: Levon Ter-Isahakyan
TITLE: OsiriX plugin for reconstructing 3D medical images from segmented slices
As a part of my undergraduate research work in my advisor’s Collaboratory in Computing for Bioinformatics and Biomedical Research, I developed and implemented the Area-Isolator, a program that helps to visualize medical images. The Area-Isolator uses a number of image processing techniques, such as segmentation, noise reduction and hole detection. Although all three are well studied for 2-dimensional (2D) images, their combination that allows the user to reconstruct good 3-dimensional views of human organs is an interesting contribution of the Area-Isolator. Implemented as a plug-in the Area Isolator, it extends the functionality of a popular, open-source medical image viewer, OsiriX.

1st Place
NAME: Mehul Suthar
TITLE: Synthesis and Characterization of Hydrogel Nanocomposites
The recent developments in biomedicine and pharmacy have brought new questions about biomaterials and their characteristics. This study aims to determine some of the physical swelling characteristics of a specific composite hydrogel nanoparticle system. This synthesized hydrogel nanoparticle composite is capable of being safely implanted in the body, being actuated from an external alternating magnetic field, and is capable of swelling or collapsing under varied temperature. The characterization studies of this hydro gel complete the initial step in the larger goal of developing a hydrogel system for controlled drug delivery devices. These hydrogels can provide a basis for future controlled drug delivery therapies, microchip delivery devices, and self regulating devices.

CATEGORY 7:
Social Sciences
Honorable Mention
NAME: Brenton Kenkel
TITLE: Irredentism First: How Leaders use Annexationist Claims
Much of the literature on “ethnic conflict” in international relations contains arguments based on stereotypes and misconceptions about the political behavior of ethnic groups. In this paper, I develop a theory of irredentism — international conflicts in which an ethnic group in one country tries to “rescue” its brethren in a neighboring country — that does not rely on problematic assumptions about ethnic identification or political behavior. Using rational-choice theory and contemporary studies of ethnicity-based political mobilization, I find that state leaders have incentives to seek the backing of ethnic (rather than ideological) coalitions and that a rallying cry for the “rescue” of ethnic kin in a neighboring state is a salient issue around which to unite such a coalition. From this theory, I develop empirical predictions, and I examine how those are borne out in the case of Somalia’s irredentist campaigns, contrary to assertions elsewhere that Somalia’s annexationist campaigns provide evidence for an innate desire for nation-state unity.

2nd Place
NAME: Logan Kistler
TITLE: Rock Art Mammoth Cave
This paper is to be submitted as my undergraduate senior honors thesis in the Anthropology Department and Honors Program. Therein, I discuss a number of prehistoric pictographs and petroglyphs, collectively referred to as rock art, with regard to their archaeological context and the probable circumstances surrounding their origin. I explore the neuropsychological model of Lewis-Williams and Dowson’s 1988 publication Signs of All Times: Entoptic Phenomena in Upper Paleolithic Art, as a possible avenue of explanation, and construct a hypothesis to support this idea based on numerous factors of the prehistoric cave experience. I spent ample time in the cave system, conducting research for this project, and will use the photographs of Charles Swedlund to illustrate my work. A version of Logan’s thesis appears on pages (69-82) of this issue of Kaleidoscope.

1st Place
NAME: Chris Garnett
TITLE: Accessibility of Poison Control Centers’ Hotlines to Spanish Speaking Callers
Latinos/as are the largest and fastest growing minority group in the United States. Estimates show that 14 million Americans have limited English proficiency (LEP). LEP persons face barriers to accessing many public services. Roughly one in five Spanish speaking Latinos/as does not seek medical care due to language barriers that persist within the nation’s health care system. This thesis puts forth a culturally informed, scientific approach to evaluate the linguistic accessibility of public health services, with particular interest in health services offered to non-English speaking Latinos/as in the United States.