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# Oswald Research and Creativity Program

UK Office of Undergraduate Research

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# Spotlight On

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## Oswald Research and Creativity Program

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 Program competition and may submit papers and 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 the winners of the 2009 – 2010 competition:

### Biological Sciences

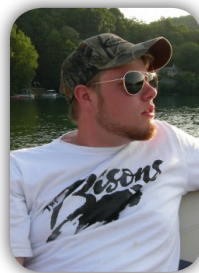


**1st Place**  
**Sudipa Chowdhury**  
Junior Chemistry Major

**Frizzled-subtype Specific Localization of Dishevelled and its Potential Effect on the mTOR Pathway.**

In canonical Wnt signaling, the interaction between Frizzled (Fz), Dishevelled (Dvl), and the Axin/glycogen synthase kinase 3 (GSK 3 $\beta$ )/ adenomatous polyposis coli (APC) complex influences the stabilization of  $\beta$ -catenin. While the localization and function of Dvl has been mainly identified in the cytoplasm, more recent reports suggest a nuclear function of Dvl. Our cellular imaging studies have indicated an Fz subtype-specific nuclear localization of Dvl, and we have observed the mammalian target of rapamycin (mTOR) pathway activation by the same Fz subtypes in a separate study. Here, we attempt to confirm the Fz subtype-specific nuclear localization of Dvl, and also to investigate the mechanism of mTOR pathway activation by Fz. We hypothesize that Dvl recruits GSK3 $\beta$  and Axin to the nucleus, preventing cytoplasmic TSC2 from inhibiting the mammalian target of the rapamycin (mTOR) pathway. Our results reveal that GSK3 $\beta$  does indeed enter the nucleus. However, its unclear localization is not based on the Fz-subtype. Despite promising results from the imaging studies, the mechanism by which Fz transduces a signal to Dvl is still uncertain. Further research is required to untangle the complexity of the Wnt and mTOR pathway in order to gain insights into various types of human diseases, including cancer.

### Design



**1st Place**  
**Jared Kaelin**  
Senior Landscape  
Architecture Major

**Ag North Entrance**

The idea behind the newly designed Ag North entrance was inspired by Stuart Davis' art piece titled, "Lucky Strike." This work of art, completed in 1921, features strong lines and curves that overlap and confront each other. There is also a sense of organization in the painting. When an individual walks up to the redesigned space at Ag North, there will be an interesting experience from one side to the other. This design for Ag North features two different experiences, one from each end of the site, that are separately unique yet mesh in the middle where the entrance to the building stands. While one side will develop a very linear focus, the other will create jazzy and curvature motion. At the entrance of the building is a glass atrium that can serve as an academic and aesthetic conservatory for the university. Across from the building will be a green wall that will serve to hide and distract individuals from the construction trailers at the university hospital. Strong motion through structure will allow students, faculty, and guests to freely flow from one end of Ag North to the other while also allowing the overlapping canopies, interesting planters, and swaying steel ribbons to create a unique, functional, and fun outdoor space for the University of Kentucky.

## 2nd Place

### Joshua Berry

Senior Landscape Architecture Major

#### Alternative Energy Solutions

One of the most critical components of becoming a sustainable community is to use energy smarter and more efficiently. While natural resources are being depleted, people are using ever-increasing amounts of energy to satisfy a variety of lifestyles. However, there is hope. New technologies and methods can be implemented to harness and utilize energy more efficiently and economically. These solutions to current energy problems not only help maintain a healthier living environment, but also provide financial benefits to each household.



## Honorable Mention

### Katrina Kelly

Senior Landscape Architecture and Music Major

#### Garden Mods in Place of Sods

This project looks at the current issue of urban agriculture and the effects of the American lawn and seeks to increase the practice of urban agriculture by making it simple, portable, and appealing.

## Humanities: Critical Research



## 1st Place

### Jenna Brashear

Senior International Studies and German Major

#### Memorialization in Contemporary Berlin: Lessons from the Neue Wache and the Holocaust Memoria

This paper was completed in fulfillment of requirements for the Gaines Fellowship in the Humanities. The paper details the histories, debates, and controversies of the two aforementioned sites of World War II memory in Germany, and uses that background to illustrate the ways in which memorialization is more valuable as a process than strictly an event that manufactures a monument. The flaws of the physical medium are shown in the sharp contrasts between the two memorials, and these lend themselves to the emphasis given to the total process of memorialization and the necessity

of broader involvement from all corners of society. In the memorialization processes of these two sites, special attention is given to acts of collective remembrance – including protests and vandalism – that enable a diverse cast of social players to invest these structures with rich and disparate meanings.

## 2nd Place

### Iredell Bouldin

Senior Art History Major

#### Leonardo and the Mystery of the Two Biancas

“*Leonardo and the Mystery of the Two Biancas*,” takes a critical look at the newly discovered Leonardo da Vinci portrait entitled “La Bella Principessa.” While Dr. Martin Kemp, Professor Emeritus of Art History at Oxford, has proposed the sitter is the illegitimate daughter of Ludovico Sforza, Bianca Sforza in 1496, I disagree. I present social conventions, biographical data, developments in Milanksi fashion, and an assessment of Leonardo’s technical and stylistic evolution, that indicates the portrait actually portrays the legitimate daughter of Galeazzo Sforza, Bianca Maria Sforza, in approximately 1485.

## Honorable Mention

### Michelle Combs

Senior Art History Major

#### Ages of Man...and Woman: A Comparison of the Ages of Man Cycles in the de Lisle Psalter and de Lisle Hours

The most popular type of manuscript produced in the medieval era was the small, portable devotional manuscript illustrated with miniatures. The function of these texts was to allow the laity a form of private worship away from church and a method to study the Word of God literally day and night. I am interested in the function of these devotional manuscripts as personal objects, particularly the role of the illuminated miniatures in illustrating the life of the patron. This paper will investigate the differences and similarities in the Ages of Man cycles of two fourteenth-century English manuscripts: the de Lisle Hours belonging to a female patron, Margaret de Beauchamp, and the de Lisle Psalter belonging to her husband, Robert de Lisle. I am investigating these two manuscripts, both produced around the same time in England for the same family, to better understand how medieval gender roles are reflected in the imagery of the miniatures, specifically focusing on images of ideal men and women.

## Physical and Engineering Sciences



**1st Place**

**Alexander Lee Heilman**  
Senior Chemical Engineering Major

**Investigation of Dynamic Relaxation Properties of Poly(Methyl Methacrylate)/Silica Nanocomposites**

Understanding the relaxation characteristics of polymers and polymer nanocomposites can offer insight into the nature of the chain motion and, in the case of nanocomposites, potential chemical and physical interactions at the particle-polymer interface. Using dynamic mechanical analysis and broadband dielectric spectroscopy, we studied the sub-glass and glass-rubber transitions of poly (methyl methacrylate) nanocomposites containing up to 30 wt% native and surface-modified silica nanoparticles. In systems containing the latter, favorable surface interactions between the polymer and the nanoparticles were observed: at sufficiently high concentrations a second glass transition event was detected, suggesting a restriction of local chain motion in the vicinity of the nanoparticle surface. Dielectric spectroscopy was used to probe the influence of increasing nanoparticle concentration on the sub-glass and glass-rubber transitions, as well as the polarizability of the nanocomposite system, namely the interfacial polarization encountered at high temperatures and low frequencies. Although an expected increase in interfacial polarization was observed with increased nanoparticle loading, the presence of particles did not have a discernable effect on either the sub-glass or glass-rubber transitions of the nanocomposite systems.

## Social Sciences



**1st Place**

**Jessalyn Ubellacker**  
Senior Biology, Spanish, and International Studies Major

**Healthcare Without Borders: of Tango and Tummy Tucks**

Healthcare outsourcing is a term used to describe the rising trend of middle and upper class citizens who travel across international borders to receive cheaper medical treatments. A drastic outsourcing of medical procedures from the United States will have a significant impact on the healthcare

situation of the country providing treatment to foreigners. The first part of this investigation is devoted to understanding why healthcare outsourcing occurs in the United States, which consequently establishes an international market for healthcare. Next, Buenos Aires, Argentina, is used as a case study for understanding the perception of how a country providing treatment to foreigners is affected by medical outsourcing. Opinions regarding foreigners seeking treatments in Buenos Aires were measured by fifty surveys of current Argentinean hospital patients, four interviews with physicians, three interviews with medical tourism program coordinators and a panel discussion with Argentina's Ministry of Health. The research collected presents an intriguing dichotomy of opinions on the effects of healthcare outsourcing. Currently, physicians and medical tourism program coordinators do not believe that medical outsourcing is diverting healthcare resources from the underserved, while Argentinean patients voice concerns regarding the exacerbation of a two-tiered public/private healthcare system.

**2nd Place**

**Amanda Barnes**  
Senior Psychology Major

**The Interaction Between Adderall and Nicotine – Implications for the Abuse of this Combination**

A conditioned place preference paradigm was used with male Japanese quail to show that Adderall and nicotine, both alone and in combination, can be rewarding and potentially addictive. These findings are extremely relevant to a population of college students in light of the widespread abuse of Adderall, especially during periods of high academic stress. This study postulates that extremely small doses of Adderall and nicotine (i.e. on the order of what is being abused) can be potentially addicting.

## Fine Arts



### 1st Place

#### Katrina Kelly

Senior Landscape Architecture and  
Music Major

#### Led Zeppelin

This paper looks at the history of the Led Zeppelin song, “When the Levee Breaks,” and how history influenced the making of this song.



### 2nd Place

#### Michelle Combs

Senior Art History Major

#### Ambiguous Spaces

“Ambiguous Spaces” is a photographic project that asks the viewer to think about the nature of reality. As humans, we depend on sensory input to tell us about the nature of the world, but is this the whole story? With the advent of modern technology and the all-too-human desire to manipulate the truth for his or her advantage, such sensory perception cannot always be trusted. By presenting the expected in an unexpected way, this project is a challenge to perception, which is unique from person to person and is dependent upon his or her life experiences as sensory input. The project’s aim is to show the viewer that one cannot always believe what is before his or her eyes, but also that distortions of the truth can reveal to one, a greater truth. By inviting the viewer to step beyond the realm of visual reality, these photographs operate as a portal to a world beyond the sensory and into the subconscious. Artistic influences on this project include: Surrealism, and the work of many photographers, including Jerry Ulesmann and Duane Michals. Philosophic influences include Plato and Immanuel Kant. The series was created using digital photographs that were combined in Adobe Photoshop CS4 and printed as archival inkjet prints.