



EMORY  
COLLEGE  
OF ARTS AND  
SCIENCES

# Undergraduate Research Symposium

Emory Undergraduate Researchers  
in all fields in the College

Family Weekend  
Friday, October 17, 2008  
and  
Saturday, October 18, 2008

Friday, 3:00pm-5:00pm  
Saturday, 10:00am-12:00pm

Coca-Cola Commons (Dobbs University Center)

sponsored by

**SCHOLARLY INQUIRY & RESEARCH AT EMORY**  
Emory College of Arts & Sciences

## SYMPOSIUM SCHEDULE

All posters will be displayed for from 3:00 pm Friday afternoon until 9:00 Monday morning. Each presenter will be available for questions and comments at their posters according to the following schedule:

### Friday, 3:00pm - 4:00pm

Thinh Bui	Candace Coffman	Benjamin Fisher
Tiffany Hammond	Anna Heilbrun	Kenneth Hong
Jonathan Jackson	Frank Lemmon	Gillian Locascio
Ali Madani & Wes Pickard	Ranjani Prabhakar	Sara Raiser
Lauren Spiegel		

### Friday, 4:00pm - 5:00pm

Rafael Davis	Zoe Fine	Iman Folayan
Tiffany Hammond	Hayley Heaton	Kenneth Hong
Frank Lemmon	Peter Lido	Jared Moreines
Adams Sibley	Haley Steed	Ramone Williams
Wenjie Xiao	Pearl Young	

### Saturday, 10:00am – 11:00am

Rafael Davis	Zoe Fine	Tiffany Hammond
Anna Heilbrun	Zachary Hudson	Peter Lido
Jared Moreines	Michael Park	Emily Pinto
Sara Raiser	Miguel Rovira	Scot Seitz
Adams Sibley	Michael Williams	Ramone Williams
Pearl Young		

### Saturday, 11:00am – 12:00am

Candace Coffman	Benjamin Fisher	Iman Folayan
Tiffany Hammond	Hayley Heaton	Zachary Hudson
Jonathan Jackson	Gillian Locascio	Ali Madani & Wes Pickard
Michael Park	Emily Pinto	Ranjani Prabhakar
Miguel Rovira	Scot Seitz	Lauren Spiegel
Haley Steed	Michael Williams	Wenjie Xiao

## HUMANITIES / CREATIVE AND PERFORMING ARTS

*Fine, Zoe D.*

### **Bones: a collaboratively generated documentary theater piece about race at Emory**

Faculty Mentor: Dr. Amy Cook, Theater Studies

Co-Authors: Dr. Jody Usher (Co-director of the Transforming Community Project); Lisa Paulsen (Director of the Playwriting Center of Theater Emory); Ken Hornbeck (Director of the Issues Troupe)

#### **Abstract:**

In the words of Dr. Amy Cook, “underneath present flesh lie eternal bones. Whether buried, hidden, or hung in closets, they remain and scaffold who we are today.” These bones will tell our secrets after we have been gone for hundreds of years. The play *Bones* will provide voices and bodies for the once enigmatic, hidden stories of Emory’s bones.

This collaboratively generated documentary theater piece uses bones as a structuring metaphor to investigate how Emory’s racial past and present are stored, represented, and buried at Emory and was written to uncover a multitude of voices on a single topic. Some of the unearthed aspects of Emory that *Bones* addresses include Dooley, the medical school library skeleton, and the Oxford and Clairmont campus cemeteries.

Our process began by gathering key historical documents from MARBL at the Woodruff Library and visiting Oxford and Clairmont cemeteries. From our research, we created a list of individuals we wanted to interview. The questions we formulated for each interview were based on the interviewee's relationships to the idea of bones and, or, race at Emory. We also organized a two-day group workshop intensive comprised of students, faculty, staff, and alumni. Finally, we used our varied notes to generate the theater piece *Bones*.

The final script will be read and work-shopped in Theater Emory’s Brave New Works in February of 2009. Thanks to TCP and SIRE, *Bones* should serve as a creative record of different perspectives on Emory’s racial history and experiences, a staging of Emory’s formerly buried and silenced voices, images, and narratives.

---

*Jackson, Jonathan*

### **Translation of novel "Das Blaue Mal"**

Faculty Mentor: Dr. Peter Hoeyng, German Studies

#### **Abstract:**

Dr. Hoeyng and I have translated the Austrian novel "Das Blaue Mal" by Hugo Bettauer from German to English. The book had never been translated previously so a translation would make the text available for English speakers for the first time. The book merits attention because it offers a European perspective on the problems of racism in the United States during the early twentieth century.

The process of translation involved a first draft prepared by myself. Upon completion of the first draft I would assess my work and make changes where I thought necessary. After

the changes were made, I posted the work onto a common server that both Dr. Hoeyng and I could access. He would evaluate the translation and edit any mistakes. Between these phases we would hold telephone meetings to collaborate and review the drafts already completed.

The novel has been completely translated but additionally editing is needed. The intended product of the work is a final draft which can be published. A final draft of the entire novel should be achieved by the end of 2008.

By working on a translation, I gained a sense of how to deeply engage a text. I also learned how subjective the process of translating a text is and how important it is to carefully translate in a way that both conveys the original meaning of the text and can be understood by the reader.

---

### *Lemmon, Frank*

#### **Upsides to Suffering: Tragedy and Philosophy**

Faculty Mentor: Dr. Cynthia Willett, Philosophy Department

##### **Abstract:**

In his *Republic*, Plato's "most serious charge" against tragedy is that it presents us with a view of suffering that is contradictory to values that we hold outside of the theater. In the theater we praise the poet that can elicit the most pity and sympathy from his audience, while outside of the theater we praise those who deal with personal sufferings gallantly and "manly." Fearful that the reactions of those suffering on stage may become habituated into our personal lives and that we would express our suffering in ignoble ways, Plato deems tragedy unfit for his perfectly just polis. He does, however, issue a challenge. If anyone can show that poetry and tragedy (and suffering) are beneficial he would willingly listen. This project takes up that challenge. I attempt to argue that our strictly negative views of suffering may be mislead, and that, in reality, suffering has its upsides. To attempt such an argument I examine what I labeled "the three stages of tragedy:" the creative process, tragedy itself, and the effects of tragedy on the viewer. In examining these three stages through the philosophical writings of Nietzsche, Aristotle, Martha Nussbaum, Walter Kaufmann, and Dennis Schmidt, alongside classical tragedies such as Sophocles' *Antigone* and *Oedipus the King*, I began to realize that suffering can, and in some instances has to be, a positive force in one's life.

---

### *Lido, Peter*

#### **Post-War Rebels: Locating the Queer in 1950s Cinema**

Faculty Mentor: Dr. Paul Kelleher, English Department

##### **Abstract:**

In the late 1940s and early 1950s, as the gaze of post-WWII America turned inward, a different kind of leading man began to appear nationwide on silver screens—one that was more tortured, more sensitive, and more sexual. Replacing charming and bulletproof leads like Cary Grant and Humphrey Bogart were men who were wounded, vulnerable, and often dangerous. The three most visible and influential of them—Marlon Brando,

Montgomery Clift, and James Dean—are the focuses of my research project. Both on- and off-screen, together they ushered in a new kind of post-war American male sexuality that engaged directly with queer desires, breaking from the normative heterosexualities of 1940s melodramas and films noirs. My research inquiry, focusing on Dean, Clift, and Brando, investigates this “new kind” of sexuality; in exploring it, I argue its significance as a major, if not the major, presence of queer male sexuality within the Hollywood system—one whose influence still extends over contemporary American Hollywood stars.

---

### *Madani, Ali and Wes Pickard*

#### **The Complete Prose of T.S. Eliot**

Faculty Mentor: Dr. W. Ronald Schuchard, English Department

##### **Abstract:**

Nearly a century after the height of his career, T.S. Eliot remains one of the most influential figures in the literary world. While popularly viewed in light of his poetry, Eliot’s work as critic and essayist continues to impact much of contemporary literary thought. This project focuses on the complete prose of the author. Through the use of various literary reviews, journals, newspapers, and personal correspondences, the project attempts to retrieve and incorporate all the author’s prose – both the previously unpublished and the popular – into a complete volume series. Our research focused on the first two volumes of the project in three areas: The Lloyd’s Bank European economic articles, annotating the critical and editorial works, and locating undocumented articles. The collection of all of Eliot’s prose into one source will allow easier and more comprehensive access to a largely unstudied body of work. In addition to a seven-volume printed set, the project aims to create a digital version – in collaboration with the Emory Beck Center – of original pieces and their annotations.

---

### *Prabhakar, Ranjani*

#### **Styles of Pedagogy and Performance Practices in Carnatic Vocal Music**

Faculty Mentor: Dr. Tong Soon Lee, Music Department

##### **Abstract:**

Carnatic music is the classical tradition of South India and can be traced back 2500 years. The teaching and training of Carnatic music has developed through the years in the course of the century. Originally, the gurukulam tradition, an apprenticeship between student and teacher, was the dominant form of music education. In this form of pedagogy, the student lives with the teacher to gain optimum exposure to the music by constantly listening and being surrounded by the art, and observing the teacher’s teaching and performance activities.

In modern teaching, students do not live with or directly observe the teacher’s everyday activities. Rather, they sit in time-allotted classes to learn to perform specific pieces, thereby

giving them less exposure to the processes of music-making. Modern teachers generally prefer taping lessons and writing notation for students to repeatedly listen and memorize.

I focused my study on the differences in teaching techniques and patterns between the gurukulam and modern styles and the differences between performing teachers and non-performing teachers. I observed to what extent students skillfully foster composition, creativity, aesthetics, notation, authenticity, originality, and spontaneity in their singing. In order to assess the pedagogical techniques of teachers, I interviewed performing teachers and non-performing teachers with a set of questions regarding his history of teaching, learning, and performing Carnatic music. I concluded that pedagogical techniques between performing artists and non-performing artists differed in that performing artists focused more on aesthetic value of singing and non-performing artists focused more on musicology in teaching the student.

---

## *Steed, Haley*

### **The Medicean Castle-Villa**

Faculty Mentor: Dr. Sarah McPhee, Art History Department

#### **Abstract:**

The concept of the castle-villa, a type of structure from the early fifteenth century, is still relatively unexplored in the literature of architectural history. The Medici family had three Tuscan castle-villas named Cafaggiolo, Trebbio, and Careggi. All three of these structures were renovated by the architect Michelozzo di Bartolomeo from pre-existing castles and all feature aspects of fortification, including crenellations and towers. While these aspects are characteristic of the castle-type, another possible source for such features is the fortified villa of the fifth century in the Roman Empire. In addition to the fortification typical of the castle-type, these three structures also feature aspects typical of the villa-type. Analysis of tax documents from the 15th century show that the gardens of these villas were likely agricultural in nature rather than the pleasure gardens of later villas, but evidence from letters of the Medici family indicates that they drew pleasure from these agricultural spaces. A villa is defined by its use as a pleasurable country residence; therefore, despite the castle-like structures of these three residences, Cafaggiolo, Careggi, and Trebbio are also villas. The castle-villa is a seemingly contradictory hybrid of architecture, but exists in the form of these three Tuscan residences.

---

## *Williams, Michael B.*

### **Anti-Semitism on Trial: The Case of Julius Streicher at Nuremberg**

Faculty Mentor: Dr. Astrid Eckert, History Department

#### **Abstract:**

This study focuses on the outcome of one defendant in what many scholars describe as the most important case in regards to international law ever tried—Julius Streicher at the Trial of the Major War Criminals before the International Military Tribunal (IMT) at Nuremberg. Specifically, it examines the judicial thinking that led to his conviction. Preliminary research at the archives of Judge Francis Biddle at Syracuse and Georgetown Universities indicated that his conviction was not discussed among the Judges at great length. In fact,

this research indicates that he may have been sent to the gallows due in large part to the fact that he was a rabid anti-Semite, and despite a great deal of evidence that his crimes did not in fact fit the charges that were laid against him. For a trial that sought to dispel the notion of victor's justice by maintaining strict procedural rules aimed at ensuring full legal rights for all defendants, leaving even one defendant without those rights is a stinging indictment. To this day, pro-Nazi groups use this perceived injustice against Streicher as a means of calling into question the entire IMT, which by all measures was an enormous step in the right direction in the quest to bring war criminals to justice. In societies in which the rule of law is held in highest regards, lack of justice for any person, no matter how ruthless, is not acceptable.

---

*Young, Pearl J.*

**Cultivating genius: Motives and experiences of life in Methodist female colleges of the Confederacy**

Faculty Mentor: Dr. Christine Jacobson Carter, History Department

**Abstract:**

For elite southern Methodists, female education was a means to develop the mind through careful training and discipline, marking the true refinement of a woman. Citizens and conferences of Methodist churches established female colleges throughout the southern United States as part of a greater effort to produce refined and godly women within an elite circle. Both parents and daughters valued the intellect obtained through such education, recognizing religion and friendships as an important complement to a trained mind. Because such college education formed an integral part of the elite life the Confederates fought to protect, the outbreak of civil war in 1861 did little to interrupt the pace of college life.

---

## SOCIAL SCIENCES

*Coffman, Candace*

### **The History of Public Housing in New Orleans**

Faculty Mentor: Dr. Leslie Harris, History

**Abstract:**

When we think of public housing today, we often envision only African Americans as living in such spaces. Few people today know or discuss the fact that federally funded public housing was built to address the needs of impoverished whites and blacks in the 1930s; only in the 1960s and after did public housing become associated almost solely with African Americans. This project is an attempt to address the history of public housing in New Orleans, Louisiana, from the first housing projects funded in the late-1930s and built in the early-1940s to their current status, following the 2005 hurricane season.

---

*Davis, Rafael*

### **Desegregation, Anti-Busing Legislation and the Questions that Arise from the Two**

Faculty Mentor: Dr. Brett Gadsden, African American Studies

**Abstract:**

The work I did over the summer is a part of a larger work of my faculty mentor's project on desegregation in Delaware. I looked at desegregation debates and other busing issues and tried to see how they relate to the time period of the area, roughly from 1972 into the 1980s. I also began to look at Delaware's senior senator's early career in the Senate and how he transformed into one of the leading figures against using busing as a means of desegregation.

In order to research the issue, first I had to define a historical problem. Dr. Gadsden would give me a piece of legislation to research and I would find debates, votes, etc. to determine the importance around the issue. I also identified the major players in the issue as well as take my own position in regards to the action taken. Basically, I had to begin shape a narrative for the work. Joe Biden on at least three times stood up to busing in the Senate and led the charge to get rid of it as a remedy. These instances were in 1975 (Biden amendment), 1977 (Eagleton-Biden amendment), and again in 1977 (Roth-Biden). From these pieces of legislation I was able to determine the mood of America, the ongoing class struggle in America, the importance on the equality of education than racial balance, and some of the power struggles that go on in the Senate.

## *Fisher, Benjamin*

### **South African History - 1948-Present**

Faculty Mentor: Dr. Pamela Scully, African Studies; Dr. Clifton Crais, African Studies

#### **Abstract:**

My SIRE research project involved compiling a primary source database relevant to South African history from 1948 to present day. The objective of the project is the composition of a South Africa "reader" focusing on history, culture, and politics. Based on Duke University Press's *The Brazil Reader*, *The Costa Rica Reader*, and *The Mexico Reader*, my advisors, Dr. Scully and Dr. Crais, wished to address the average person with the "reader" - the volume might interest a college professor who teaches a survey history course, an informed traveler who wishes to discover more before making a visit, or a curious reader who wants to learn about an unfamiliar region of the world. Compiling sources was rather tedious because the aforementioned period of history is perhaps the most eventful, encompassing the apartheid regime and the violent transitions leading up to and following the 1994 elections. While the election victory of the National Party in 1948 or the Soweto Uprisings of 1976 merit inclusion, covering every pivotal event after 1948 has been an arduous task. The multitude of voices and perspectives became a confounding issue. The perspectives of the African National Congress, Pan Africanist Congress, and Black Consciousness Movement are pivotal to this volume; clearly, pivotal figures like Nelson Mandela, Desmond Tutu, and Steve Biko merit inclusion. But what about the perspectives of sympathetic white liberals, South African women (both black and white), Indian South Africans, and foreign nations? How do we fit all of these wide-ranging perspectives into one thousand-page volume?

---

## *Folayan, Iman*

### **Emory's 1st African Students and Injustice and the Monsanto Plant**

Faculty Mentor: Dr. Ellen Spears, Environment Studies and Ms. Portia Allen, School of Medicine

#### **Abstract:**

Over the summer I worked on two research projects. In one project I documented the first African students to attend Emory. The driving question for the second project asked what factors contributed to the social injustice present in Anniston, Ala specifically in the case of the Monsanto Plant's environmental pollution.

The main objectives for documenting the first African students included searching through yearbooks, graduation records and matriculation records. When an African student was found, I then took pictures of all the sources and documented them accordingly. In order to gather a full perspective of the social climate of Anniston, Ala I searched the local newspaper, *The Anniston Star* (years 1928 and 1961), using microfilm, for any reference to Monsanto as well as any racial conflicts that were occurring. Any articles that I found were scanned onto a disk in PDF form and uploaded to a database.

Both projects yielded fruitful results. I found over 20 African students, the first dating back to 1923. Although I was able to find a lot of African students, further research is necessary to discover more about the students and how their experiences contribute Emory's racial history. The results from the second project provided a more concise view of Anniston's

racial and social environment as well as information about the Monsanto Plant in its early stages.

---

### *Heaton, Hayley*

#### **Accent, Stereotypes, and Language Comprehension**

Faculty Mentor: Dr. Lynn Nygaard, Psychology

##### **Abstract:**

The main purpose of this project is to examine how context influences attitudes towards and comprehension of standard and non-standard accents. I am interested in the range of attitudes and judgments we form about how people speak and how these perceptions interact with what the person is saying. This project will examine factors that influence accent perception and will constitute my honors thesis in psychology. Participants will listen to passages with differing content spoken either in an American Southern English accent or in Standard American English. The passage topics are medicine, investment, hunting, and cooking and were designed to be more or less typical topics for each accent group. Participants will then engage in a comprehension task as well as complete questionnaires evaluating attitudes towards the speakers based on their accent. I predict that those passages, which are congruent with activities associated with certain accents, will be comprehended better than those that are not congruent. I also predict, based on previous research, that speakers of the southern accent will be judged as more friendly but less competent than speakers of the standard accent. However, the relationship between accent and linguistic attitudes are predicted to change as a function of passage content.

---

### *Heilburn, Anna*

#### **Deciphering Patterns in Children's Interpretation of Arbitrary Printed Symbols: A Study of Symbol Learning at 26 Months of Age**

Faculty Mentor: Dr. Laura Namy, Psychology

##### **Abstract:**

The role of iconicity—the resemblance between a symbol and its referent—in children's interpretation of symbols has been heavily debated. Previous research has demonstrated an advantage for iconic over arbitrarily related symbols that emerges around two years of age. But more recent research has shown that children also interpret non-iconic, arbitrary symbols as meaningful for some symbol types. In particular, two-year-old children can learn both spoken words and printed symbols despite their arbitrary relationship to their referents. Previous research has found variability across children in their success at learning arbitrary pictorial symbols. The present study is designed to identify possible sources of this variability. The goal of this study is to clarify why children assign meaning to arbitrary printed symbols. I plan to use a correlational design to test how 26-28 month old participants' comprehension of arbitrary pictures as symbols for objects relates to parental behaviors. A survey will be administered to parents to determine whether they engage their children in activities that might support the insight that printed symbols are meaningful.

---

## *Hong, Kenneth ChangYoon*

### **Emory's Korean Engagement**

Faculty Mentor: Dr. Candice Harrison, History Department and Dr. Jody Usher, Director of Transforming Community Project

#### **Abstract:**

For well over 100 years, Emory University has shared deep-rooted traditions and historical ties with the nation of Korea. This connection began with the matriculation of Emory's first ever international student in 1893, a Korean named Yun Ch'i-Ho. Yun went on to serve as an important diplomat in Korea, serving as an important agent of freedom, liberty and change. Emory has since benefited in its history and development, from the high achievements that Korea-affiliated alumnus have achieved post-Emory. While continuing to draw upon their experiences and education from our University, these remarkable individuals have all the while continued to strengthen the greater appreciation of Emory on an international level. The efforts of my academic research were not to simply recount Emory's historical ties with the students and people of Korea, the most of which have been well-documented up to date. Though worthy of mention, for my summer's research I was even more interested in seeking to discover how these historical connections worked and developed into creating a Korean identity here at Emory University as the number of Korean students have rapidly increased. Throughout all this, I hoped to discover whether a sense of a Korean community exists at the college and if Emory administrators, staff members and faculty are striving to create a community as the college becomes more diverse. In addition to this, I was also interested in evaluating the scope of modern Korean student experiences in the contemporary, amidst huge recent increases in matriculation rates. Throughout all my research efforts, I believe that the development of modernized Korea as we know it and the growth and maturing of Emory University as a whole, will have been characterized at least in part by these significant connections of relation between these two.

---

## *Locascio, Gillian*

### **Home Grown: The Evolving Traditions of Ngobe Home Gardens in a "Developing" Panama**

Faculty Mentor: Dr. Ellen Spears, Environmental Studies Department, Dr. Scott Lacy, Anthropology Department

#### **Abstract:**

Home gardens—highly diverse plots near the house in which plants are cultivated on a small scale, mainly for home consumption—are internationally recognized for their role in environmental conservation, culture, and food security. For the indigenous Ngöbe communities of western Panama, who are battling declining productivity of the land and suffer the highest levels of malnutrition in the entire country, home gardens provide a stable and invaluable source of nutrition. Parts of the indigenous state, however, are changing rapidly as government roads, schools, programs, and non-governmental organizations extend their influence throughout the area.

This study explores how Ngöbe communities are adjusting the structure and use of their home gardens to these changes in access to space, the national market, information, and basic services.

This study examines how distance from the nearest city impacts the limits and opportunities that Ngöbe families face in their home gardens with regards to access to the national market, basic services, information, and land.

Research was conducted in three communities. One town is situated on the edge of the highway, at the entrance to the indigenous state. As a main access point and provider of services to surrounding communities, this town ("Hub") can be considered a hub. The other two communities, "Distant1" and "Distant2", are an hour away from the nearest hub by foot. "Distant2," however, has been the focus of first international, then national, then local organizations for the last twenty years. Over the course of eight months I spent eight weeks living on site, conducting interviews with families and organizations, and examining the diversity and structure of home gardens. Contrary to trends in other parts of Latin America, increased access to the national market and less space have not led to a loss of diversity and structure in "Hub" as compared to the other communities. However, each community had distinct challenges based on its level of access to the market, basic services, information, and land. For example, residents in "Hub" found growing staple tubers in their gardens nearly impossible due to the density of houses and prevalence of marauding domestic animals, while their location on the main road allowed them to take advantage of the market to supplement their subsistence activities. "Distant1" was able to take advantage of this situation, sometimes selling tubers and other local produce in "Hub," but in general found buying food more costly and selling food less profitable. "Distant2," with high access to information, solved this by organizing to garner external resources and bolster the productivity of their farms instead of engaging in economic activity outside the community.

While home garden improvement programs have encountered difficulties getting their plant varieties and production techniques adopted into local gardens, Ngöbe gardeners themselves are not averse to change; locals often bring home new plant varieties or techniques that they encounter in their work outside of the indigenous state. What has limited the effectiveness of these programs has been limited human resources, limiting their ability to regularly transmit information to more distant communities and to adapt programs to the unique situation in each community. By assessing market access, land distribution, present information networks, and services available in each community these organizations can adapt to the unique gender, space, labor, and capital constraints of each community while playing more to their strengths.

---

*Sibley, Adams*

**Conceptualizing Cancer: A Symbolic-Interactionist Approach to Understanding Meaning Formation Among Family Members of Individuals with Cancer**

Faculty Mentor: Dr. Matthew Archibald, Sociology Department

**Abstract:**

Forming one's understanding of the world is based largely upon social interaction. Symbolic-Interactionists posit that learning involves interacting with other members of society, trying to figure out the underlying meanings of those interactions, and interpreting

the meanings in everyday life. From these meanings, individuals form their self-identities as well as their concepts of reality. For family members of individuals diagnosed with cancer, one of the many challenges is being forced to reconcile new norms with old behaviors with regard to the achieved statuses of "caregiver," "loved one," etc. What does it mean to be a spouse, child, parent, or sibling of a cancer patient? How are these meanings affected in daily interaction? And how do these individuals come to understand the cancer process based on the information they glean within different social settings such as the hospital, the home, and the workplace?

The study involved in-depth, qualitative interviews with direct family members of individuals currently diagnosed with cancer. The participants shared the experiences they had had with doctors, nurses, friends, co-workers, family members, and strangers. The process of conceptualizing cancer was largely based on the unique structure of interactions each participant had undergone, and in turn, the ways in which they chose to interact were largely based on their formative understanding of the cancer process.

---

## NATURAL SCIENCES

*Bui, Thinh*

### **Amyloid-Directed Catalysis – Opportunities for Peptides in the Origins of Life**

Faculty Mentor: Dr. David Lynn, Chemistry

Co-Authors: W. Seth Childers (Emory University)

#### **Abstract:**

Several leading theories for the origins of life suggest that life began from simple molecules that evolved to interact and form more complex and organized structures. The revolutionary discovery by Urey-Miller along with amino acid content from the Murchison meteorite suggest that these original building blocks may have been amino acids. We hypothesize that amyloid- $\beta$ , protein deposits exhibiting the cross- $\beta$  quaternary structure universal to all polypeptides (Dobson 2001), may be a bridge from simple amino acids to life formation. This cross- $\beta$  organization of the amyloid polypeptides presents an ordered array of active sites that could localize simple molecules for chemical catalysis. We have selected Amyloid- $\beta$ (16-22), a truncation of Amyloid- $\beta$ (1-42) associated with Alzheimer's Disease, to test this hypothesis. A $\beta$ (16-22) self-assembles to form organized nanotubes and fibers, which presents a possible catalytic surface populated with uniformly ordered lysine residues (Lu 2003). An important class of metabolic chemical reactions that utilizes lysine in chemical catalysis is the aldol reaction, via an imine-enamine mechanism (Wong 1994). Furthermore, we have evidence to suggest that the amyloid surface can also serve as a site of desolvation, which facilitate imine formation, a condensation reaction. Together, the aldol reaction and imine formation reaction are of evolutionary interest because they facilitate the building of more complex molecules through formation of carbon-carbon bonds and carbon-nitrogen bonds, respectively. With the aldol reaction and imine formation reaction, a potential role for amyloid as a catalyst in the origins of life is explored.

---

*Hammond, Tiffany*

### **IRES Program: Summer 2008**

Faculty Mentor: Drs. Preetha Ram, Joanne Brzinski, Leah Roesch, Pat Marsteller, Cathy Quinones, and Kenya Casey

Co-Authors: Ben Finck, James Eagan, Wenjie Xiao, Miguel Rovira, Tim Soo, Adriana Ramirez

#### **Abstract:**

The IRES (International Research Experience for Science Students) Program supports Emory students in a full-time, 10-week research experience in an international setting. The program is open to all students majoring in the sciences who have previous research experience. The students are placed in international research groups by Emory faculty collaborations, the Howard Hughes Medical Institute International Scholars Program, or by the German Academic Exchange Program (DAAD). Selected students participate in a 1-credit seminar during the preceding spring to plan research objectives, travel details, and prepare for the summer abroad. The participating students receive a travel award and a \$3500 stipend for their summer work. During the summer of 2008, the program funded seven students who worked in research communities in Japan, Romania, Italy, Thailand,

Australia and Germany. In this poster presentation, the 2008 IRES students share reflections on their academic, professional, social and cultural experiences during their summer of research abroad.

---

### *Hudson, Zachary*

#### **Synthesis and Characterization of Gold (III) Anti-Cancer Therapeutic Agents**

Faculty Mentor: Dr. Jack Eichler, Chemistry Department

Co-Authors: Chinar D. Sanghvi (Oxford College of Emory University); Dr. Mohammad R. Saadein (Oxford College of Emory University); Dr. Cora E. Macbeth (Emory University)

#### **Abstract:**

A series of 2,9-dialkyl-1,10-phenanthroline gold (III) coordination compounds have been prepared and characterized (alkyl = butyl, sec-butyl, and tert-butyl). Due to steric hindrance, such species do not form square-planar dichloroauric salts, as is the case with 1,10-phenanthroline, but form neutral, pseudo-square pyramidal trichloroauric species via a new synthetic route. Substitutions which are 1° or 2° at the alpha carbon allow for direct metal-ligand binding, while a 3° substitution inhibits chelation, yielding only an intermolecular interaction between the ligand and a NaAuCl<sub>4</sub> salt. In addition, similar ionic AuCl<sub>4</sub> species have been synthesized with 1° and 2° alkyl substituents by utilizing a protonated phenanthroline ligand. All compounds have been characterized by <sup>1</sup>H NMR, UV-Vis, and IR spectroscopy, as well as X-ray crystallography. These compounds may prove to possess anti-cancer therapeutic properties, which will be probed with DNA binding and thiodoxin reductase inhibition assays.

---

### *Moreines, Jared*

#### **Cognitive Effects of Deep Brain Stimulation of the Subcallosal Cingulate White Matter for Treatment-Resistant Depression**

Faculty Mentor: Dr. Paul E. Holtzheimer, School of Medicine

Co-Authors: Dr. Helen S. Mayberg (Emory University School of Medicine)

#### **Abstract:**

Deep brain stimulation (DBS) of the subcallosal cingulate white matter (SCCwm) offers a novel potential treatment for patients suffering from treatment-resistant depression (TRD). Previous invasive treatments for depression, and previous studies with DBS for other conditions, have identified potential cognitive side effects of these interventions. In a study of DBS for TRD at Emory, neuropsychological testing is performed repeatedly over time using a subset of the Cambridge Neuropsychological Test Automated Battery (CANTAB) and the standard and emotional Stroop tasks, administered before surgery (time point 1), after short term DBS (time point 2), and after long term DBS (time point 3) to assess for *any* changes in cognitive functioning associated with SCCwm DBS for TRD. Interim results from the first 8 subjects with data at all three time points are presented. Comparisons of scores between time points 1 and 2, 2 and 3, and 1 and 3 suggested no worsening on any measure of cognitive functioning except for very mild, transient increases in the interference effect in the traditional Stroop and in the positive interference effect in the

emotional Stroop after short term DBS. Small improvement was seen in Stockings of Cambridge (SOC) performance after long term DBS and subsequent thinking time after both short and long term DBS. Limitations include small sample size and no control for multiple comparisons, potential practice effects, potential placebo effects, or sources of the changes observed. Still, these preliminary results indicate that neither short nor long term SCCwm DBS is associated with any cognitive impairment.

---

### *Park, Michael*

#### **Do Rac1-mediated superoxide productions regulate epithelial sodium channel (ENaC) activity in the alveolar epithelium?**

Faculty Mentor: Dr. My N. Helms, School of Medicine

Co-Authors: Ms. Julie L. Self (Emory School of Medicine); Dr. Douglas C. Eaton (Emory School of Medicine)

##### **Abstract:**

Epithelial sodium channels (ENaC) play a key role in regulating lung fluid balance. ENaCs have been identified in both alveolar Type 1(AT1) and Type 2 (AT2) cells (which together make up the entire surface of the alveolar epithelium). Although AT2 cells are located at the junction of AT1 cells, several important differences between the two cell types have been identified. Our laboratory has shown that the redox states of AT1 and AT2 cells differ. AT1 cells generate significantly higher amounts of O<sub>2</sub><sup>-</sup> compared to AT2 cells. Therefore, it was not surprising that AT1 cells do not respond to nitric oxide (NO) treatment; whereas in AT2 cells NO significantly decrease ENaC activity. The likely reason for this observation is that elevated O<sub>2</sub><sup>-</sup> levels in AT1 cells bind to and limit NO's inhibitory effect on ENaC. In order to gain a better understanding of the mechanisms behind regulated O<sub>2</sub><sup>-</sup> production in the alveolar epithelium, I compared the level of NADPH oxidase (NOX) expression between type 1 and type 2 cells in culture, using western blots. NOX enzymes are made up of p22phox and gp91phox located at the cell membrane, and cytosolic regulatory units p40phox, p47phox, and p67phox activated by rac1. My data has shown that AT1 and AT2 cells express equal levels of gp91phox (the catalytic domain), however, AT1 cells express lower levels of p47phox and p67phox. I have also shown in A6 cells that rac1 inhibition decreases sodium transport from 8.25 μA/cm<sup>2</sup>+0.23 μA/cm<sup>2</sup> to 3.04 μA/cm<sup>2</sup>+0.16 μA/cm<sup>2</sup> after 1 hour. The implication is that rac1-mediated production of O<sub>2</sub><sup>-</sup> regulates normal ENaC function.

---

### *Pinto, Emily*

#### **Water from a Stone: Engineering *Colocasia esculenta* to Produce Beta-Carotene**

Faculty Mentor: Dr. David Lynn, Chemistry

Co-Authors: Chris Bozza (Cornell University), Yue Liu (Emory University)

##### **Abstract:**

According to the World Health Organization (WHO), Vitamin A deficiency is a global epidemic affecting roughly 10 million individuals worldwide. This is a tragedy for multiple reasons: not only is vitamin A deficiency a leading cause of blindness, but it is also important in the production of human growth hormone and the maintenance of a healthy

immune system, particularly in young children. It is estimated by the WHO that, in addition to quelling the epidemic of blindness, there could be a 25% reduction in infant mortality through improved vitamin A intake. A potential solution to this epidemic in South Asian countries is genetic transformation of taro (*Colocasia esculenta*), a starchy dietary staple in these cultures that, though rich in many minerals, is lacking the incredibly important beta-carotene, which is enzymatically transformed into vitamin A in the small intestine. Diets that rely on taro corms for a large portion of nutrients are, therefore, deficient in Vitamin A. Through transformations of multiple generations of taro using genes for five enzymes from plants like daffodil and maize and a common bacteria, it is proposed that taro will be able to not only produce beta-carotene from currently existing protein precursors native to taro, but self perpetuate this mutation, leading to future generations of "Vitamin A taro corms" that will provide the necessary nutrients to many different people groups.

---

*Raiser, Sara*

**An evaluation of vitamin D and its role in the reduction of blood pressure**

Faculty Mentor: Dr. Vin Tangpricha, School of Medicine

Co-Authors: Ms. Suzanne E. Judd (Emory School of Medicine) Dr. Meena Kumari (Emory School of Medicine)

**Abstract:**

Hypertension is quickly increasing in prevalence worldwide and is particularly common in African-Americans in the United States. Clinical studies suggest that vitamin D insufficiency contributes to the development of hypertension. We sought to evaluate the effect of vitamin D on blood pressure and proteinuria in a single-blinded study of five hypertensive African-American adult females. Subjects were randomized to either calcitriol (1,25-dihydroxycholecalciferol), which is the active form of vitamin D3, or placebo. Therapies were administered for a one week period. An ambulatory blood pressure (ABP) monitor was used to collect 24-hour blood pressure data. Blood samples and 24-hour urine samples were also collected. Mean systolic blood pressure (SBP), mean arterial pressure (MAP), percent dip, and heart rate decreased significantly in the calcitriol group as compared to the placebo group. No subjects showed signs or symptoms of hypercalcemia; therefore safety was also demonstrated in the use of calcitriol. Vitamin D shows potential for use as a safe and effective therapy for the reduction of blood pressure in hypertensive adults.

---

*Rovira, Miguel*

**Flavin Photooxidation**

Faculty Mentor: Dr. Cora MacBeth, Chemistry

Co-Authors: Robert Lechner (Universitaet Regensburg) and Dr. Burkhard Koenig (Universitaet Regensburg)

**Abstract:**

The objective of this experiment was to measure the oxidative ability of Flavin photocatalysts. These molecules are currently being explored as a more "organic" or

nonmetal alternative to other metallic and more heavily researched photo-oxidants that are currently being employed in solar cells. Starting from dinitrobenzene, a Flavin photocatalyst was synthesized through several steps. Then via the addition of an alkene group through Stille coupling, the Flavin photocatalyst was able to be polymerized and create an n-form Flavin photocatalyst polymer designated poly[3-methyl-7-ethyl-(3''-propyl)benzo[g]-pteridine-2,4-dione]. The reaction yielded approximately 4.92 mg of n-polymerized Flavin photocatalyst.  $2 \times 10^{-4}$  mmol of this product was then added to four solutions of differing pH (6.8, 8.8, HCl 1M and 10% Citric Acid). Upon addition of the reducing agent (paramethoxybenzalcohol), the reaction began and was ran under 440 nm light for 5 minutes. The results for the pH 6.8, 8.8, HCl 1 M and 10% Citric Acid are 75%, 42%, 38% and 50%, respectively.

---

### *Seitz, Scot*

#### **Norwalk virus-specific secretory IgA assay development**

Faculty Mentor: Dr. Juan Leon and Dr. Christine Moe (Rollins School of Public Health)

##### **Abstract:**

Noroviruses (NoV) are responsible for the majority of acute non-bacterial gastroenteritis worldwide. Previous research demonstrates that some individuals who are genetically susceptible to Norwalk virus, a specific type of NoV, do not become infected after they are challenged with the virus. This research suggests that there is a protective immune response to Norwalk virus infection. However, the particular components of this immune response are not known. Because Norwalk virus infection takes place in the gastrointestinal tract, it is likely that mucosal antibodies play an important role in protection from Norwalk virus infection. Secretory immunoglobulin A (SIgA) is the main type of antibody important to mucosal immunity. There is a need to detect and quantify levels of total and Norwalk virus-specific SIgA to determine the human SIgA response throughout the course of Norwalk virus infection. I am in the process of developing novel enzyme-linked immunosorbent assays (ELISAs) to quantify the amount of total and Norwalk virus-specific SIgA in saliva samples. Subsequent use of these assays will provide information on the human SIgA response to Norwalk virus infection, thereby providing insight into the pathology of NoV and guiding the development of NoV vaccines.

---

### *Spiegel, Lauren*

#### **The opiate system modulates pair bonding in female prairie voles**

Faculty Mentor: Dr. Larry Young, Neuroscience and Behavioral Biology  
Co-Authors: James Burkett (Emory University)

##### **Abstract:**

Prairie voles (*Microtus ochrogaster*) form highly selective pair bonds, which makes them an excellent model for investigating the neurobiology of social attachment. Opioids have been implicated in social attachment and are involved in mediating reward by acting on specific receptors in the nucleus accumbens. We hypothesize that endogenous opioids in the nucleus accumbens are also involved in pair bonding. To test this hypothesis, we administered the opioid antagonist naltrexone (IP, 7.5 mg/kg) to female prairie voles

during an 18-hour cohabitation period to two treatment groups: one receiving 3 injections of naltrexone 6 hours apart, and one receiving a single naltrexone injection followed by 2 injections of saline. These were compared to controls receiving saline only. Unexpectedly, the control females did not develop a statistically significant partner preference ( $p > 0.05$ ). However, the voles given 3 injections of naltrexone displayed stranger preferences ( $p < 0.05$ ). In our second experiment, the  $\mu$ -opioid antagonist CTAP was administered bilaterally to the nucleus accumbens (3  $\mu\text{g}/\text{side}$ ) twice during a 24 hr mating period. Control animals receiving artificial CSF in the nucleus accumbens displayed a significant partner preference, while voles receiving CTAP displayed no preference. These results suggest a role for opioids and their receptors in pair bonding.

---

### *Williams, Ramone*

#### **High Throughput Multiplex PCR to Enable a “Genes – to – Drugs” Approach**

Faculty Mentor: Dr. Shrikanta Chattopadhyay

Co-Authors: Dr. Stuart Schreiber (Broad Institute of Harvard and MIT)

#### **Abstract:**

Studies have shown that 75% to 80% of all existing proteins are considered “undruggable” by traditional biochemical means. This is because of their lack of membrane surface localization or suitable hydrophobic pockets. Metastasis from breast cancer, leading to more than 40,000 deaths a year in the US, is caused by many such proteins beyond the reach of directly inhibitory molecules. Chromatin modifying enzymes, amenable to modulation by small molecules, regulate the gene expression of a large fraction of the human genome. These small molecules have the potential to modulate the expression of genes of interest and to significantly widen the range of tractable drug targets. We aimed to develop a novel high throughput, multiplex, real time reverse transcriptase (RT-PCR) assay that uses therapeutic gene expression as a read out – serving as a method for developing novel drugs. Using a physiologically relevant metastasis model in which the cytokine CCL5 has been previously identified as a necessary and sufficient mechanism of this metastasis induction, we have successfully developed and optimized the RT-PCR assay and have determined a 38 fold increase in CCL5 gene expression in MSC – MDA coculture. The feasibility of multiplex readouts from the same well has been demonstrated. The technique has been optimized in 384 well plates using automated robotic plate processing machines to prepare for high throughput chemical screens. In addition, small pilot screens have been run in order to obtain positive controls for use as comparators in a high throughput chemical screen. The pilot screen revealed that trichostatin A induced a 4.3 fold increase in CCL5 levels, while dexamethasone showed small decrease that was not statistically significant. Lastly we have identified other putative targets using, cDNA microarrays. We conclude that this high throughput multiplex RT-PCR methodology will rapidly enable a “genes - to – drugs” approach applicable to a wide range of intractable targets.

---

### *Xiao, Wenjie*

#### **Oral Self-Administration of Cocaine in Genetically and Pharmacologically DBH-Inhibited Mice**

Faculty Mentor: Dr. David Weinshenker, School of Medicine

**Abstract:**

The noradrenergic system has been implicated in reward, especially reward obtained from psychostimulant drugs such as cocaine. One such evidence for the effects of the neurotransmitter norepinephrine (NE) is the drug disulfiram, which blocks NE production and is used therapeutically to treat cocaine addiction. While the exact mechanism of disulfiram's effects is unclear, it is known that disulfiram inhibits the activity of the enzyme dopamine- $\beta$ -hydroxylase (DBH), which converts dopamine (DA) to NE. Previous studies suggest that NE depletion may impede the reinstatement of drug-seeking behavior after extinction, which is a model for relapse in humans. Our study plans to investigate the role of NE depletion in cocaine self-administration. We will measure the difference in preference for cocaine between normal mice and mice that have low DBH activity and thus low NE. We will further measure any difference between normal mice that are pharmacologically depleted of NE by disulfiram and DBH knockout mice that have pharmacologically replete NE. Characterizing the role of NE in cocaine self-administration would augment our current understanding of reward and deepen our knowledge of drug abuse and addiction. The knowledge gained from this study could also be used to enhance disulfiram by finding a cleaner, less toxic therapy.

---