May 5, 2007

Dear Colleagues and Guests:

Research advances knowledge through discovery and its application. At the University of California Riverside, we pride ourselves on offering opportunities for hands-on research and other forms of humanistic expression to our undergraduates. Our students are encouraged to pose fundamental questions, challenge current paradigms, and construct new approaches and innovative devices. Some of our students are driven by curiosity, some inspired by the natural world, and some by a passion to create or invent.

Within these pages are summaries of original research by students. Whatever their motivation, they have profited from the experience. They learn the rigor of the scientific method and the discipline of articulating their results. Their stories evidence the excitement of discovery, and encourage them to continue to explore our universe.

Sincerely,

France A. Córdova
Chancellor
May 5, 2007

I am delighted to welcome you to the First Annual Symposium for Undergraduate Research, Scholarship and Creative Activity. Involvement in faculty mentored undergraduate research, scholarship, and creative activities provides some of the best opportunities for students to round-out their academic program, gain practical experience, and to interact closely with a faculty mentor. These are experiences that just cannot be created in a classroom – being an integral part of a professor’s research or creative project, learning first hand about what is involved, understanding the lure of inquiry and inspiration. Undergraduate research, scholarship and creative activity form the essence of an undergraduate education at a large research university.

May this event energize you to continue in your endeavors!

With Best Regards,

Andrew Grosovsky

Andrew J. Grosovsky

Andrew Grosovsky
Vice Provost for Undergraduate Education
Professor of Cellular Biology
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Symposium Objective
To increase the visibility of undergraduate research and the commitment of faculty mentors at UCR by coordinating a professional conference setting in which undergraduate students present their research projects and creative activities.

Schedule of Events
May 5, 2007
Engineering Building II

8:30 - 9:15 am  Registration for Participants and Guests
Rooms 205 and 206  Continental Breakfast
ENGR II  Presentation set-up in Assigned Rooms

9:30 - 10:20 am  Welcome and Introductions
Rooms 205 and 206  Andrew J. Grosovsky
ENGR II  Vice Provost for Undergraduate Education
Keynote Address
France A. Córdova, Chancellor
"People of the Earth, Life among the Stars -- a Researcher's Perspective"

10:30 - 11:50 am  Oral Presentations
Assigned Rooms  See schedule on pages 5 - 7
ENGR II

11:50 am - 12:30 pm  Poster Presentations
Second Floor Courtyard  See schedule on page 8
ENGR II

12:30 - 1:30 pm  Luncheon and Awards
Second Floor Courtyard  Andrew J. Grosovsky
ENGR II

Oral Presentation Sessions
Each oral presentation is allocated 15 minutes and followed by a three to five minute question and answer period. The session is moderated by a UCR faculty member or graduate student. Student participants and guests are asked to adhere to general guidelines of conference etiquette and not enter or leave the room during a presentation.

### Oral Presentation Session A - Room 202, ENGR II

<table>
<thead>
<tr>
<th>Time</th>
<th>Presenter/Major</th>
<th>Project Title</th>
<th>Faculty Mentor(s)/Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30-10:50am</td>
<td>Lindsay Young, History</td>
<td>&quot;I was, I am, I will be.&quot; Rosa Luxemburg’s legacy in the German Democratic Republic.</td>
<td>Dana Simmons, Department of History</td>
</tr>
<tr>
<td>10:50-11:10am</td>
<td>Jin Hee Yoo, Music and Culture</td>
<td>Locating the Exotic and the Authentic in Javanes Gamelan Ensemble.</td>
<td>Rene Lysloff, Department of Music</td>
</tr>
<tr>
<td>11:10-11:30am</td>
<td>Brian Jew, Business Administration</td>
<td>A Successful Approach for Developing an Online Statistics Instruction Tool.</td>
<td>Daniel R. Jeske, Department of Statistics</td>
</tr>
<tr>
<td>11:30-11:50am</td>
<td>Kelly Wu, Art History and Studio Art</td>
<td>Forgotten Sites: Transforming Nature through the use of Art.</td>
<td>Jim Isermann, Jon Pestoni, Department of Studio Art</td>
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</tbody>
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### Oral Presentation Session B - Room 203, ENGR II

<table>
<thead>
<tr>
<th>Time</th>
<th>Presenter/Major</th>
<th>Project Title</th>
<th>Faculty Mentor(s)/Department</th>
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<tbody>
<tr>
<td>10:30-10:50am</td>
<td>Greg Goalwin, Political Science</td>
<td>Conflict, Consensus, and the Cross: Christianity and its Role in State Politics.</td>
<td>John C. Laursen, Department of Political Science, Michele R. Salzman, Department of History</td>
</tr>
<tr>
<td>10:50-11:10am</td>
<td>Adam Sanford, Sociology/Law and Society</td>
<td>The Role of Memetics in Evolutionary Social Processes.</td>
<td>Robert Hanneman, Augustine Kposowa, Department of Sociology</td>
</tr>
<tr>
<td>11:10-11:30am</td>
<td>Tiffany Abrego, Psychology</td>
<td>Children's Ability to Transfer from Fantasy to Reality through Media Presentation.</td>
<td>Reberkah Richert, Department of Psychology</td>
</tr>
<tr>
<td>11:30-11:50am</td>
<td>Natalie Medina, Psychology</td>
<td>The Influence of Semantic and Perceptual Features in Categorization Task with Autistic Children.</td>
<td>Curt Burgess, Department of Psychology</td>
</tr>
</tbody>
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Oral Presentation Session C - Room 205, ENGR II

<table>
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<th>Time</th>
<th>Presenter/ Major</th>
<th>Project Title</th>
<th>Faculty Mentor(s)/Department</th>
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<tbody>
<tr>
<td>10:30-10:50am</td>
<td>Daniel Hasegawa</td>
<td>Feeding Manduca sexta (Lepidoptera: Sphingidae) an Artificial Diet Containing Dyes to Mark Insect Parasitoid Eggs and Larvae of Cotesia congregata (Hymenoptera: Braconidae).</td>
<td>Nancy Beckage Department of Entomology</td>
</tr>
<tr>
<td></td>
<td>Joceline Lam</td>
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<tr>
<td>10:50-11:10am</td>
<td>Eric McDaniel</td>
<td>Double Knockout of E3 ligases in the Ubiquitin Proteasome System.</td>
<td>Karine LeRoc'h Department of Neuroscience</td>
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<td>Biochemistry and</td>
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<td></td>
<td>Biology</td>
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<tr>
<td>11:10-11:30am</td>
<td>Samantha Natvidad</td>
<td>Life histories of Fish in the Subgenus Limia.</td>
<td>David Reznick Department of Biology</td>
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<tr>
<td></td>
<td>Biochemistry</td>
<td></td>
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<tr>
<td>11:30-11:50am</td>
<td>Moni Bhattacharya</td>
<td>Genetic and Molecular Mechanism that Regulate Organ Boundaries during Reproductive Development in Arabidopsis Thaliana.</td>
<td>H.M.S Smith Department of Botany and Plant Sciences</td>
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<td>Botany and Plant</td>
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<td>Sciences</td>
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Oral Presentation Session D - Room 206, ENGR II

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<tr>
<th>Time</th>
<th>Presenter/ Major</th>
<th>Project Title</th>
<th>Faculty Mentor(s)/Department</th>
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<tbody>
<tr>
<td>10:30-10:50am</td>
<td>Joseph Olinga</td>
<td>Protein Purification.</td>
<td>Katie Defea Department of Biological Sciences</td>
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<tr>
<td></td>
<td>Biological Sciences</td>
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<tr>
<td>10:50-11:10am</td>
<td>Barbara Williams</td>
<td>The Cigarette Additives 3-Ethylpyridine and 4-Methylpyridine Increase Spreading Rate of Human Umbilical Vein Endothelial Cell In Vitro.</td>
<td>Prue Talbot Department of Cell Biology and Neuroscience</td>
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<td>Peter Kierstand</td>
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<td></td>
<td>Biology</td>
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<tr>
<td>11:10-11:30am</td>
<td>Natasha Harrell</td>
<td>“How to tie your shoe: a mathematical approach”.</td>
<td>Sam Nelson Department of Mathematics Whittier College</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
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<tr>
<td>11:30-11:50am</td>
<td>Oliver Losón</td>
<td>DsRed E5-Synaptobrevin 2 May Elucidate Temporal Dependence in Segregation and Trafficking of Astrocytic Neurotransmitter Vesicle Populations.</td>
<td>Changman Ha Vladimir Parpura Department of Cell Biology and Neuroscience</td>
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<td>Neuroscience</td>
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### Oral Presentation Session E - Room 215, ENGR II

<table>
<thead>
<tr>
<th>Time</th>
<th>Presenter</th>
<th>Title</th>
<th>Department and College</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30-10:50am</td>
<td>Matthew Hudgins Desalegne Teweldebrhan</td>
<td>Epitaxial growth of ultrathin graphite films on SiC(0001) by thermal desorption of Si.</td>
<td>Physics and Applied Mathematics</td>
</tr>
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<td></td>
<td>Roland Kawakami</td>
<td></td>
<td>Department of Physics and Astronomy</td>
</tr>
<tr>
<td>10:50-11:00am</td>
<td>Gregory Quiroz</td>
<td>Quantum Coherent Control of a Qubit System Coupled to an Oscillator.</td>
<td>Physics and Applied Mathematics</td>
</tr>
<tr>
<td></td>
<td>Leonid L. Pryadko</td>
<td></td>
<td>Department of Physics and Astronomy</td>
</tr>
<tr>
<td>11:00-11:30am</td>
<td>Billy Phan</td>
<td>High Temperature Sulfur Removal for Synthetic Diesel Production.</td>
<td>Chemical Engineering</td>
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<tr>
<td></td>
<td>Matthew Barth</td>
<td></td>
<td>Department of Electrical Engineering</td>
</tr>
<tr>
<td>11:30-11:50am</td>
<td>Evan Davis</td>
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<td>Environmental Engineering</td>
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</tbody>
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**Poster Presentation Sessions**

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First Annual UCR Symposium for Undergraduate Research, Scholarship and Creative Activity
During the 40-minute poster session, all student presenters stand by their poster displays and are available to discuss their projects and answer questions.

Time: 11:50 am – 12:30 pm
Second Floor Courtyard, ENGR II

<table>
<thead>
<tr>
<th>Poster #</th>
<th>Presenter/Major</th>
<th>Project Title</th>
<th>Faculty Mentor(s)</th>
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</thead>
<tbody>
<tr>
<td># 1</td>
<td>Ndeye Sesay, Political Science and International Affairs</td>
<td>Death by Diamonds: Breaking the link between Diamonds and War. Case studies of Sierra Leone and Angola.</td>
<td>Bronwyn Leebaw, Department of Political Science</td>
</tr>
<tr>
<td># 2</td>
<td>Diana De La Cruz, Anthropology</td>
<td>A case study: Reexamining the null hypothesis of Hypervitaminosis A in KNM-ER 1808 and other possible causes of Death.</td>
<td>Sang-Hee Lee, Department of Anthropology</td>
</tr>
<tr>
<td># 3</td>
<td>Allison Tackman, Psychology</td>
<td>The effect of trait visibility on the relationship between nonverbal sensitivity and judgmental accuracy.</td>
<td>David Funder, Department of Psychology</td>
</tr>
<tr>
<td># 4</td>
<td>Paula Kassouf, Medical Biology</td>
<td>Molecular approaches to understanding CNS Neurodegeneration.</td>
<td>Monica Carson, Benoit Melchoir, Jonathan Doose, Danielle Worrill, Department of Biomedical Sciences</td>
</tr>
<tr>
<td># 5</td>
<td>Alex Mamaril, Biology</td>
<td>Evolution of placentas in the fish family Poeciliidae: The Southern vs. Northern Clade of Poeciliopsis.</td>
<td>David Reznick, Department of Biology</td>
</tr>
<tr>
<td># 6</td>
<td>Linh Vuong, Biology</td>
<td>The Effect of Sperm Activating Peptides on Sea Urchin Sperm Motility.</td>
<td>Richard Cardullo, Department of Biology</td>
</tr>
<tr>
<td># 7</td>
<td>Priscilla Ebersole, Jeff Oleny, Doug Obana, Neuroscience</td>
<td>Feeding but not drinking is elicited by GABAa antagonist injected into the lateral hypothalamus.</td>
<td>Glenn Stanley, Department of Psychology</td>
</tr>
<tr>
<td># 8</td>
<td>Dorian Perkins, Computer Science</td>
<td>A Continuously Perfused 3-D Tissue Culture Microdevice to Improve Hepatocyte Drug Tolerance Testing.</td>
<td>Luke Lee, Department of Bioengineering, University of California, Berkeley</td>
</tr>
<tr>
<td># 9</td>
<td>Neil Zimmerman, Sally Pederson, Jason Grubbs, Mechanical Engineering</td>
<td>Measurement of Surface Fluxes Along Rural-Urban Transect.</td>
<td>Marko Princevac, Akula Venkatram, Department of Mechanical Engineering</td>
</tr>
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</table>
Children’s Ability to Transfer from Fantasy to Reality through Media Presentation.

Tiffany Abrego, Psychology  
**Mentor:** Rebekah Richert  
Department of Psychology

Educators tend to use fantasy characters and situations to facilitate the learning of young children to keep their interest. Thus far, research seems to support the idea that fantasy may be a useful tool for teaching children. However, little research has addressed whether there is a difference in a child’s ability to learn more information from a book, video or interactive video. The current study tests the ability of children to use socially relevant information from various forms of media. This project hypothesizes that children will be able to use the information in fantasy media to solve socially relevant issues presented in analogical problems, specifically with the video presentation of the story. This hypothesis will be tested using data (N=60) involving participant responses from three different experimental conditions: a video condition, a storybook condition, and an interactive video condition.

Genetic and molecular mechanisms that regulate organ boundaries during reproductive development in Arabidopsis thaliana.

Moni Bhattacharya, Botany and Plant Sciences  
**Mentor:** H.M.S. Smith  
Department of Botany and Plant Sciences

In flowering plants, the post-embryonic growth of the shoot system is regulated by the shoot apical meristem (SAM), which consists of a pool of stem cells. A key stage during development is the transition from vegetative to reproductive phase. During this the SAM undergoes morphological changes to become an inflorescence meristem (IM), which initiates reproductive phase-specific organs, including floral meristems (FMs). Studies have shown that two paralogous BELL homeodomain transcription factors, PENNYWISE (PNY)/POUNFOOLISH (PNF) are crucial for inflorescence development. Moreover, *pny* PNF/*pnf* mutants often display fused pedicels, indicating the role of PNY/PNF in maintaining boundaries between IMs and FMs. However, little is known about the mechanisms that regulate such boundaries. Therefore, the goal of this study was to understand how PNY/PNF might function with other known organ boundary genes during flowering. A recent study has elucidated the role of the GRAS transcription factor, LATERAL SUPPRESSOR (LAS), in maintaining lateral organ boundaries. Results from our genetic studies show the fusion phenotype of *pny* PNF/*pnf* is significantly enhanced in *las pny* PNF/*pnf* mutants. Additionally, yeast two-hybrid studies indicate that PNY/PNF and LAS interact with one another. These results collectively suggest that PNY/PNF and LAS are part of a complex to maintain boundaries between IMs and FMs. Future directions, include re-confirming the interaction between PNY/PNF and LAS by communoprecipitation and possible interaction of PNY/PNF with other known boundary genes (CUPSHAPED-COTYLEDON 1, 2, 3). Such studies will allow us to further elucidate the mechanisms by which lateral organ boundaries are maintained during flowering.

Real World Hybrid Electric Vehicle Energy Efficiency Analysis.

Evan Davis, Environmental Engineering  
**Mentor:** Matthew Barth  
Department of Electrical Engineering

Hybrid Electric Vehicles (HEVs) combine conventional and electrical energy storage systems to increase fuel economy over comparable conventional vehicles. HEVs can reduce the United States’ petroleum consumption and decrease greenhouse gas emissions by reducing the amount of petroleum the transportation sector uses. However, the actual benefits of HEVs are highly dependent on driving behavior. Prior to 2007, the achieved real-world fuel economy of many vehicles, especially HEVs, was lower than their rated quantity because vehicle fuel economies were determined using the EPA’s unrealistically passive Federal Test Procedure and Highway Fuel Economy Test. Although the EPA recently incorporated more aggressive elements into its tests to better represent contemporary driving patterns, vehicles’ rated fuel economies will likely still be unrepresentative of real-world values. To more accurately determine the real-world fuel economy of the Toyota Prius, a popular HEV, a large vehicle activity database for the Southern California region was used as input into a vehicle simulation model. The vehicle activity database contains over three million seconds worth of speed and position data and was carefully collected to be representative of Southern California driving patterns. The Advanced Vehicle Simulator (ADVISOR) was selected to perform the vehicle simulations because of the accuracy with which it can perform second-by-second simulation as well as its prevalent use in automobile research. Although this procedure was used to determine the real-world fuel economy of a
Toyota Prius driven in Southern California, a similar approach could produce accurate real-world fuel economy estimates for other vehicles, including plug-in hybrid electric vehicles.

**A case study: Reexamining the null hypothesis of hypervitaminosis A in KNM-ER 1808 and other possible causes of death.**

Diana De La Cruz, Anthropology  
*Mentor: Sang-Hee Lee*  
Department of Anthropology

KNM-ER 1808 is a Homo erectus that has been found as fragmentary skeletal remains with a form of pathology. She is first diagnosed by her discoverers with accidentally over-consuming hypervitaminosis A by large amounts of liver intake. In this paper I will look into possible causes of death for KNM-ER 1808 other than the known null hypothesis. The prospect of infectious disease will be examined along with modern day skeletal pathologies. Literature and observation of modern skeletal pathologies will be used as methods to thoroughly assess all possibilities. The implication of overdose in hypervitaminosis A in contrast to infection will be discussed and analyzed. The strong evidence of infection and its spread throughout the skeletal remains is a clear indication of osteomyelitis. This observation will clearly explain that KNM-ER 1808’s cause of death was of infection opposed to over consumption.

**Feeding but not drinking is elicited by GABAa antagonist injected into the lateral hypothalamus.**

Priscilla Ebersole, Neuroscience  
Jeff Olney, Neuroscience  
Dough Obana, Neuroscience  
*Mentor: Glenn Stanley*  
Department of Psychology

The hypothalamus has established roles in both food and water consumption. Previous studies from our lab have shown that the administration of the GABAa antagonists, Bicuculine or Picrotoxin, into the lateral hypothalamus (LH) of rats elicits feeding as well as competing behaviors such as hyperactivity and drinking. The present study was focused on determining the degree of specificity of the effect of Picrotoxin on feeding versus drinking. The first test, a food delay study, examined whether rats given LH injections of picrotoxin drink in the absence of food and the results showed that they did not drink when food was absent. This suggests that the previously observed drinking might have been consequent to the intake of solid food. The second study demonstrated that Picrotoxin injected rats would consume a liquid diet in preference to drinking water, even though the behavioral patterns required to consume the liquid diet and drink the water are virtually identical. These finding suggest that antagonizing GABAa Receptors in the LH disinhibits neuronal circuits that function specifically to control feeding behavior, with little or no direct role in the control of drinking behavior.

**Conflict, Consensus, and the Cross: Christianity and its Role in State Politics.**

Gregory Goalwin, Political Science  
*Mentors: John C. Laursen,*  
Department of Political Science  
Michele R. Salzman  
Department of History

Christianity has long been a powerful force that state and societal leaders from the first century onward have been able to use and maneuver to serve their own political purposes. Constantine I, the first Christian emperor, was able to use the rising power of the Christian movement to unify an empire fractured by the violence of civil war. Conversely, the power of Christianity has been harnessed to fracture and divide, leading, among other things, to the bloody violence in Northern Ireland. These disparate reactions to Christianity engender many questions: Why has Christianity been used politically by state powers throughout the ages? How has Christianity been used to affect political events? Finally and most important to this particular study, what determines whether Christianity will serve as a unifying or dividing power? I argue that the actions of the state leader and his political use of the religion have a powerful, though not exclusive, effect on the ways in which Christianity affects society. The cultural and religious tolerance of the respective states, and their place in the international system within which they operate both have an important influence on a state’s response to Christianity and the ways in which Christianity’s political power was used to either unite or divide the state. I use a historical analysis of two case studies: the Roman Empire during the reign of Constantine, and the situation of Northern Ireland in the late 19th and throughout the 20th century to illustrate and support this hypothesis.

“**How to tie your shoe: a mathematical approach**”.

Natasha Harrell, Mathematics  
*Mentor: Dr. Sam Nelson*  
Department of Mathematics, Whittier College
A classical knot can be thought of as a knotted string whose ends are joined to prevent the knot from unraveling. Virtual knot theory is a generalization of this idea of classical knots. Two knots are called equivalent if one can be made into the other by a sequence of Reidemeister moves. A virtual knot is classical if it is equivalent to a knot which can be drawn on a sheet of paper; otherwise it is called non-classical. Detecting the non-classicality of a virtual knot is not always simple. We use a mathematical construction called a quandle for detecting the non-classicality of some knots. Not all non-classical virtual knots have similar upper and lower quandles. We exploited this fact to define quandle difference invariants. These invariants compare the number of homomorphisms from a virtual knot's upper and lower quandles into a finite quandle. Our research involved defining these invariants and extending them to an invariant for classical two-component links.

Feeding *Manduca sexta* (Lepidoptera: Sphingidae) an Artificial Diet Containing Dyes to Mark Insect Parasitoid Eggs and Larvae of *Cotesia congregata* (Hymenoptera: Braconidae).

Daniel Hasegawa, Biochemistry
Joceline Lam, Biology
*Mentor*: Nancy E. Beckage
Department of Entomology

Marking techniques are important for tracking the dispersal of insect parasitoid species that are used as biological controls. Marking techniques include the use of tags, paint, dust, and pollen, but are often difficult to naturally sustain through multiple generations. Larvae of the tobacco hornworm, *Manduca sexta*, were fed on two different artificial diets to mark host tissues and those of the parasitoid wasp, *Cotesia congregata*, developing in the host. The first contained Oil Red EGN dye to stain internal lipophilic components of the host red, and the other diet contained Rhodamine B dye to mark hydrophilic components of the host pink. The weights of the host larvae that were reared on either diet were significantly lower than the control larvae that fed on normal diet; however unparasitized larvae that fed on treated diet did pupate and emerge as adults. In addition, parasitoids developing in the host body cavity took up the dyes. *Cotesia congregata* larvae were marked by the Oil Red EGN dye, which was evident in the silk incorporated in the production of their pupal cocoons, while the Rhodamine B dye marked the *C. congregata* larvae, but was not transferred to their silk. Both dyes were not obvious in the physical appearance of the adult *C. congregata*. Current studies are underway to determine if the dyes are transferred to the reproductive organs of the adult male and female parasitoids and ultimately transferred to the females' eggs.

Epitaxial growth of ultrathin graphite films on SiC(0001) by thermal desorption of Si.

Matt Hudgins, Physics
Desalegne Teweldebrhan, Physics
*Mentor*: Roland Kawakami
Department of Physics and Astronomy

Ultrathin graphite films show great promise for nano-electronic devices. The high mobility inherent in these carbon based films allow for low resistance transport of electrons, thereby reducing heat production. Moreover, graphite has been shown to be stable at sizes of a few nanometers. Other materials such as silicon will oxidize, decompose, and become unstable at sizes ten times larger. These properties make graphite and graphene (a single atomic layer of graphite) an important material for the development of future nano-electronic devices. In our work, we have annealed SiC substrates at high temperature in ultrahigh vacuum in order to desorb the Si atoms and produce layers of graphene at the surface. To accomplish this, we have designed and constructed an electron bombardment annealer that can heat the SiC substrate to temperatures as high as 1700° C. After annealing, the surface was characterized by low energy electron diffraction (LEED) and Auger electron spectroscopy (AES). Annealing at temperatures below ~900°C exhibit LEED patterns with SiC 1×1 reconstruction, indicating a clean SiC surface. After annealing at 1100° C for 15 minutes, the LEED pattern has a 1 reconstruction indicating the formation of a few atomic layers of graphene. After annealing at 1200° C for 1 hour, the LEED pattern has a graphite 1×1 reconstruction, which indicates a thick layer of graphite on the substrate (ie. thicker than the penetration depth of LEED, or several atomic layers). AES scans measure the presence of both Si and C at the surface. Electron transport measurements are also performed to characterize the resistance and mobility of this material.

A Successful Approach for Developing an Online Statistics Instruction Tool.

Brian Jew, Business Administration
*Contributor*: James Lin
CHASS Technology and Computing
Mentor: Daniel R. Jeske  
Department of Statistics

Last summer, I led a team of undergraduate and graduate students to create a statistical game for high school students. My objective was to manage the development of the project effectively and efficiently within a fixed deadline and resources. To achieve the objective, the project was organized to five different tasks sequentially. A sub-team was formed to complete each task. The first task was to determine which statistical concepts could be used to create an entertaining learning tool. During this phase of the project, I made sure that the team members had a clear understanding of the statistical concepts and premise of the game. The second task was for me to develop the storyboard to illustrate the basic game format. This process allowed me to communicate the structure of the game to the software development team. The next three tasks were the development of the game software, the integration of the statistical material into the game software, and the addition of our newly created game to the statistical suite website. For each task, effective communication was crucial for the team to work together efficiently and resulted in the completion of the project on time. I ensured that the project met the ten-week deadline by scheduling weekly team meetings and presenting progress reports to the faculty mentors. This project has taught me how to effectively manage a team, deliver a completed product within a fixed deadline, and provided me with the skills necessary for a career in business management.

Molecular approaches to understanding CNS neurodegeneration.

Paula Kassouf, Medical Biology  
Mentors: Monica Carson, Jonathan Doose, Benoit Melchior, Danielle Worrill  
Department of Biological Sciences

When studied in isolation, the central nervous system and the immune system are highly intricate processes that require constant regulation. In many neurodegenerative disorders such as Parkinson’s disease as well as Alzheimer’s these two systems intersect and begin to cross-regulate one another in an indistinct fashion. By understanding how the CNS and immune system communicate with one another to promote either an anti-inflammatory or a pro-inflammatory response, then we hope to realize how and which molecules are essential for these processes to occur. Specifically, one molecule that has drawn some attention in both the rat and mouse models is TORID and LR8, respectively. By studying the expression of this molecule on glial cells of the brain such as microglia, astrocytes, and oligodendrocytes we hope to come up with a precise conclusion to the nature of its activation and deactivation on diseased mice. By cloning the LR8 construct and creating an RNA probe that was used in an in situ hybridization, the localization of the LR-8 molecule is just one of many assay’s used to study its function.

DsRed E5-Synaptobrevin 2 May Elucidate Temporal Dependence in Segregation and Trafficking of Astrocytic Neurotransmitter Vesicle Populations.

Oliver Losón, Neuroscience  
Mentors: Changman Ha, Vladimir Parpura  
Department of Cell Biology and Neuroscience

Astrocytes have been shown to have much of the same exocytic protein machinery as do neurons, and to release neurotransmitter stored in secretory vesicles. An essential component of this exocytotic machinery is the soluble N-ethyl maleimide-sensitive fusion protein attachment protein receptor (SNARE) complex that is formed by SNAP-23, synaptobrevin 2 (also known as vesicle-associated membrane protein protein 2; VAMP2) and syntaxin 1. Because a significant proportion of vesicles in astrocytes house VAMP2 in their membranes for its exocytotic role, we created a fluorescent chimeric form of VAMP2 to monitor vesicular locations. In addition, the fluorescent tag we have chosen, ds-Red E5, is a mutant form of the red fluorescent protein drFP583, and its emission spectrum temporally changes from green to red fluorescence. Therefore, we will not only monitor the vesicles’ changing positions within astrocytes, but also determine if any segregation occurs amongst vesicles of different maturities. Of particular interest will be the effect, if any, that vesicular maturity has on vesicular mobility and localization. Supported by the NIH, MARC U* and the Vice Provost for Undergraduate Education Research, Scholarly Activity, and Creative Arts Grant.

Evolution of placentas in the fish family Poeciliidae: the southern vs. northern clade of Poeciliopsis.

Alex B. Mamaril, Biology  
Contributor: Sonya K. Auer, Ronald D. Bassar
Placental reproduction is a complex trait that has evolved in multiple different taxa. However, it is unknown why placentas have evolved and why they might be adaptive. Within the fish family Poeciliidae, a group of live bearing fish with broad inter-specific differences in degrees of placentation, there have been multiple, independent origins of the placenta. Documenting the life historical context in which the placenta evolved may be an important prerequisite to understanding its adaptive significance. The purpose of this study was first to identify the suite of life histories correlated with different degrees of placentation that evolved within a southern clade of the genus Poeciliopsis, and second, to compare these results with other clades in which placentation has evolved independently. High degrees of placentation in the southern clade of Poeciliopsis appear to be correlated with the production of few, large offspring in contrast to other clades within the family. This suggests that either placentation may have evolved for different reasons in different clades, or that the evolution of the placenta is independent of these features of the life history.

Double Knockout of E3 Ligases in the Ubiquitin Proteasome System.

Eric McDaniel, Biochemistry and Biology

Mentor: Karine LeRoch
Department of Biology

Malaria is one of the most ancient unsolved diseases in human history, killing up to 2.7 million people worldwide each year. The global dispersion of malaria is on the rise due in large part to the increasing number of drug resistant malaria parasites. This fact necessitates the need to develop new drugs in order to curb the trend of the increasing number of infections and deaths worldwide. Therefore it is essential for researchers to better understand the biology of the human malaria parasite; Plasmodium falciparum, in an attempt to regulate its life cycle progression and disrupt the pathogenic nature of this disease. The ubiquitin proteasome pathway is a key regulatory pathway involved in most cellular functions. The pathway has been largely investigated in mammalian cells due to the fact that disregulation of the proteins involved in the system are responsible for human diseases such as cancer, alzheimers and parkinson’s. However, this pathway has been largely overlooked in protozoa parasites and deserves an in-depth investigation. Indeed proteins of this pathway could be strong potential targets to the discovery of new antimalarials. In order to validate proteins of the UPS pathway as a new drug target, we are currently engaged in the development of a functional genomic approach. Selected component of the pathway, ubiquitin ligases, are genetically engineered to generate knockout cell lines to identify their role in the parasite life cycle. Once validated high throughput screening using chemical libraries, will be used to identify new inhibitors.

The Influence of Semantic and Perceptual Features in a Categorization Task with Autistic Children.

Natalie Medina, Psychology
Mentor: Curt Burgess
Department of Psychology

Previous research with autistic children has been equivocal with respect to a deficit in semantic categorization. The purpose of this study was to determine if autistic children have a deficit in semantic categorization and if perceptual features interfere with this process. In this study, two autistic children (ages 10 and 15), a developmentally delayed child (age 8), and a normal child (age 12), categorized 10 pairs of picture sets. The child’s task was to respond to a set of questions about the similarity of the images. Each set contained four pictures with one picture that did not belong. Results show that the autistic children were able to semantically categorize, however they were also influenced by the perceptual features more than the non-autistic children. These results are consistent with earlier results with the HAL model that showed that similarity was learnable from children’s autistic language input (Zachy & Burgess, 2004).

Life Histories of Fish in the Subgenus Limia.

Samantha Natividad, Biochemistry

Contributors: Tara Mastro, Yuridia Reynoso
Mentor: David Reznick
Department of Biology

The placenta is a complex organ that requires many different adaptations in order to function properly. The evolution of complexity is controversial because all of these adaptations seem necessary for normal functioning, so we wonder how all were brought together, seemingly at once. Livebearing fish in the family Poeciliidae display multiple, independent origins of the placenta. We often find close relatives with and without placentas. Studying the pattern of life histories of these fish will provide clues into the origins of the placenta. We report here on the life
history of species from the subgenus *Limia*, which is in the genus *Poecilia*. Some species in two other subgenera have placentas, so we are evaluating life histories throughout the genus to characterize conditions associated with placental evolution. Four species of *Limia* all produced large litters of small young and produced single litters about every 30 days, suggesting that they produce one litter at a time. Developing embryos lose 30-40% of their dry mass between fertilization and birth, which suggests that they lack placentas and instead allocate nutrients to yolked eggs prior to fertilization. This is in comparison to other *Poeciliid* fish, such as fish in the genus *Poeciliopsis* which have been found to have high degrees of placentation as well as superfetation (the ability to develop multiple litters at different times). From this comparative study, it can be noted that fish in the genus *Limia* may be a good representation of a common ancestor that lacked superfetation and placentation.

**Protein Purification.**

Joseph Olinga, Biological Sciences  
*Mentor*: Katie Defea  
Department of Biomedical Sciences

Eukaryotic cells are able to adopt a variety of shapes and to carry out coordinated and directed movements with the use of cytoskeleton, a complex network of proteins filaments that extend throughout the cytoplasm. Actin filament as part of that network beside microtubules and intermediate filaments are also involved in cell division. The activation of actin seems then to be so important that this work will focus on producing recombinant GST-tagged Wave/Scar, which is believed to play a key role in actin polymerization in response to extra cellular cues. [Method] The GST was tagged behind a lac promoter and the plasmid inserted into bacteria. Induction was optimized at 2h, 4h, 6h, and 24h. Uninduced controls were also paired. A possible difficulty in getting Wave- Scar is its stretches of pralines. After the lysates were centrifuged, soluble (supernatant) and insoluble (pellet) fractions were analyzed by SDS-PAGE. Western blots were later performed with anti-Wave and anti-GST. [Result] We found the optimal induction time to be after 2h. Also, the protein was found to be soluble.

**A Continuously Perfused 3D Tissue Culture Microdevice to Improve Hepatocyte Drug Tolerance Testing.**

Dorian J. Perkins, Computer Science  
*Contributor*: Mimi Y. Zhang

Liver diseases such as liver cancer, cirrhosis, hepatitis, and acute or chronic liver failure affect many patients globally. Liver transplantation, although a feasible method of treatment, is limited by a short supply of donors and expensive post-operation treatments, which has lead to the development of bio-artificial liver devices. In vitro drug tolerance testing of hepatocyte spheroids, or spherical multi-cellular aggregates, is essential to furthering the advancement of Bio-Artificial Liver (BAL) devices. Hepatocyte spheroids, because of their cell-cell interactions and in vivo-like physical formation, metabolize drugs in a more physiological relevant manner than sparse two-dimensional (monolayer) cultures. Our goal is to improve the functional maintainability of the primary source of cells used in these BAL devices by utilizing hepatic cell lines cultured in a spheroid configuration using a three-dimensional high-density hepatic spheroid trapping array microdevice with continuous perfusion to simulate physiological flow conditions. Our cytotoxicity assay uses the anti-inflammatory Diclofenac (sodium salt) with concentrations of 10 μM, 100 μM, and 1000 μM in media and a control with no drugs. HepG2/C3A (human hepatoma) cell proliferation will be characterized over a 4-day culture period using the spheroid array microdevice compared against static control cultures in a 12-well plate. Viability and proliferation is determined using Live/Dead and Hoescht stains in devices and Trypan Blue exclusion in the controls. Preliminary results have determined an exponential decrease in cell proliferation versus increasing drug concentrations while in 2D monolayer formation. Future results are predicted to show spheroid formation yields a stronger resistance amounting in increased proliferation versus the control.

**High Temperature Sulfur Removal for Synthetic Diesel Production.**

Billy Phan, Chemical Engineering  
*Mentors*: Chan Seung Park, Ki Seok Kim  
Department of Center of Environmental Research and Technology
To reduce the dependency of the fossil based transportation fuels, it is imperative to develop alternative fuel processes, such as a Fischer-Tropsch synthesis. The removal of sulfur in the feedstock of Fischer-Tropsch synthesis has been an important task. Sulfur impurity at a level of 2 ppm in the feed gas is usually regarded as the threshold of poison. It could lead to serious deactivation of F-T catalyst, and even at higher levels destroy the catalyst, whose replacement would be costly. The Fischer-Tropsch Process efficiency will be increased dramatically if the sulfur removal is performed at elevated temperature and with high moisture content. The experimental test of this research involves the flow of hydrogen sulfide mixed with varying quantities of steam passing through a fixed-bed reactor containing zinc oxide sorbent to find its sulfur capture capacity. There have been several tests in the past involving different sorbents. However, zinc oxide has still been considered to be the most competitive sorbent in removing hydrogen sulfide. In this investigation the performance of zinc oxide sorbent was evaluated for the operation parameters; such as temperature, sorbent particle size, space velocity, sulfur and steam contents of feed gas. The purpose of these experiments is to find the sulfur capture capacity of the commercial sorbent at these varying conditions and ultimately find the optimum design parameters of a high temperature, high moisture sulfur trap.

Quantum Coherent Control of a Qubit System Coupled to an Oscillator.

Gregory Quiroz, Physics and Applied Mathematics
*Mentor:* Leonid L. Pryadko
Department of Physics and Astronomy

Within an NMR-like approach to coherent control, we analyze the performance of “soft” refocusing pulses and pulse sequences in protecting the coherence of a qubit system coupled to a quantum oscillator. We focus on the effects of the oscillator excitation and heating, and associated deterioration of the qubits’ fidelity. These effects cannot be addressed in the conventional master equation formalism with the bath assumed in thermal equilibrium. Analytically, we construct the effective Hamiltonian of the controlled qubit plus oscillator system to quadratic order in powers of the couplings. The qubit error operators and the terms responsible for the oscillator excitation are thus identified explicitly. These terms dominate the oscillator evolution when it is close to resonance with the qubit(s). The corresponding single- and few-qubit simulations show continuously increasing average oscillator energy accompanied by deteriorating qubit fidelity. The magnitude of the oscillator frequency bias needed to arrest this run-away effect is smaller for second-order refocusing sequences, where the order of the sequence is the number of suppressed terms in the effective Hamiltonian of the qubit system.

The Role of Memetics in Evolutionary Social Process.

Adam Sanford, Sociology/Law and Society
*Mentor:* Robert Hanneman
Department of Sociology

This paper proposes a new approach to resolving the seemingly contradictory stances of micro- and macro-sociology, demonstrating the existence of a bridge between the two categories and also explaining a possible method of evolutionary social change, by introducing memetics into the processes of social theory. Macro-sociologists such as Durkheim and Parsons attempt to explain social change by positing that society shapes the individual social actor, while micro-sociologists such as Goffman and Garfinkel hold that individuals shape society. The proposed bridge is composed of the social facts held in common between society and the individual social actor, and explains how each shapes the other through the processes of memetic drift, resistance, consensus, and dissent, as theorized by Richard Dawkins and other memeticists. Social institutions, in order to create and maintain institutional control over the central society, exert influence on individual social actors and groups by way of memetic messages. Social actors and groups, working to make sense of these messages, create memetic reinforcement and drift, which feeds back into the maintenance of current social norms and mores as well as the creation of new ones. This paper is intended to describe the dynamic and necessary role of memetics in social evolution, and to lay groundwork for further theoretical research on these topics.

Death by Diamonds: Breaking the link between Diamonds and War. Case studies of Sierra Leone and Angola.

Ndeye Sesay, Political Science/International Affairs
*Mentor:* Bronwyn Leebaw
Department of Political Science
Why are gruesome conflicts started, and why do they last for such long periods of time with no real ideological victory on either side of the warring parties, have been the question surrounding the occurrence of civil wars in African states. It can be said with confidence that in African states such as Sierra Leone and Angola, civil wars were related to the conflict over power after colonial rule; mass illiteracy; poverty; immense corruption; and limited rule of law. But the question still remains as to what prolongs such violent conflicts? I believe this to be the abundance of natural resources in many African countries that fuel and finance wars because of an extremely lucrative market in the illegal trade of these resources. Research done thus far has answered this question of whether the illegal trade in resources prolongs civil wars. And research shows a positive correlation. The dynamic that has not been explored fully are the effects of policies put in place to fission the relationship between the duration of war and the trade of illegal natural resources, specifically diamonds. So the question at hand is -- how effective are measures that have been taken thus far in destroying the pernicious relationship between natural resources and war?

The effect of trait visibility on the relationship between nonverbal sensitivity and judgmental accuracy.

Allison Tackman, Psychology
Mentor: David Funder
Department of Psychology

The purpose of this study was to examine the relationship between sensitivity to nonverbal communication and the accuracy of personality judgments in light of trait visibility. This study hypothesized that individuals high in nonverbal sensitivity would be more accurate judges of personality in comparison to those low in nonverbal sensitivity when assessing personality traits that are more visible than less visible. Participants were 182 undergraduates who interacted in groups of three strangers. Using the California Adult Q-Set (CAQ; Bem & Funder, 1978), each participant provided a self-report of personality and made personality ratings on the two strangers within one’s group. On the basis of scores on the face and body short version of the Profile of Nonverbal Sensitivity (PONS; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979), participants were divided into three groups (i.e., low, medium, and high) for statistical analysis. Despite no differences in average self-stranger agreement across the three PONS groups, results revealed a significant effect of trait visibility for the low PONS group. Therefore, contrary to the current hypothesis, participants low in nonverbal sensitivity made more accurate personality judgments when rating interaction members on visible traits and less accurate judgments when rating members on less visible traits of the CAQ. In contrast, a failure to obtain a significant correlation between self-stranger agreement and trait visibility for participants high in nonverbal sensitivity suggests that these individuals may be consistent in judgmental ability independent of trait visibility.

The Effect of Sperm Activating Peptides on Sea Urchin Sperm Motility.

Linh Vuong, Biology
Mentor: Richard A. Cardullo
Department of Biology

Echinoderms spawn their gametes into the seawater. Sperm must find their complementary eggs. The role of egg-derived sperm-activating peptides (SAPs) is to increase the motility and metabolism of sperm. These peptides bind to complementary receptors on the sperm flagellum and activate signaling pathways in a species-specific manner. More than seventy SAPs identified including speract – a decapeptide found in species of sea urchins. The open reading frame (ORF) of speract in Strongylocentrotus purpuratus encodes four speract and seven additional decapeptides. The goal is to investigate the biological effects that these peptides exert on sperm. We tested the effects of both the decapeptides at 100pM in artificial seawater (ASW) at either pH 6.6 or 8.0 and the pH range (5.8-8.2) on motility. A spectrophotometer was used to measure changes in sperm concentration. We found that the addition of speract at pH 6.6 increases motility; pH8 increases and sustains motility. Alkaline conditions raise sperm motility while acidic does not. Future experiments quantifying respiration rate, cyclic nucleotide levels, and membrane potential will further address the effect on sperm motility.

The Cigarette Additives 3-Ethylpyridine and 4-Methylpyridine Increase Spreading Rate of Human Umbilical Vein Endothelial Cell In Vitro.

Barbara Williams, Biology
Peter Kierstead, Biological Sciences
Mentor: Prue Talbot
Department of Cell Biology and Neuroscience
Pyridine derivatives from cigarette smoke inhibit growth of chick chorioallantoic membranes at picomolar doses (Reprod. Biol. Endoc. 2005 3:52) and promote apoptosis in human umbilical vein endothelial cells (HUVEC) (Tox. Sci. 2006 93:82). The purpose of this experiment was to test the hypothesis that 3-ethylpyridine and 4-methylpyridine accelerate spreading rate of HUVEC in vitro. HUVEC were changed from proliferation to survival medium one day before the beginning of an experiment and treated with 3-ethylpyridine or 4-methylpyridine (0M, 10⁻¹⁰M, or 10⁻⁴M). Micrographs were taken between 0 min to 120 min, and the percentage of spreading cells was quantified using three randomly chosen images at each time and concentration. Unspread cells in suspension were surrounded by a halo, while spread cells lacked a halo. Data collection consisted of counting the number of spread cells and total number of cells, then calculating the percentage of spread cells. In two experiments, 3-Ethylpyridine increased HUVEC spreading rate. In both experiments more cells were spread in treated groups than the control eg. (22.5% ± 34.3% control vs. 44.7% ± 6.8% for 10⁻¹⁰M and 62.3% ± 25.6% for 10⁻⁴M). Similarly, in two experiments 4-methylpyridine significantly increased HUVEC spreading rate eg. (12.1% ± 2.5 control vs. 26.5% ± 1.5% for 10⁻¹⁰M and 37.1% ± 6.5% for 10⁻⁴ M). In both the 3-ethylpyridine and 4-methylpyridine experiments, cell spreading in controls caught up with treated groups by 60 minutes. These data demonstrate that 3-ethylpyridine and 4-methylpyridine accelerate HUVEC spreading rate on plastic.

Forgotten Sites: Transforming Nature through the use of Art.

Kelly Wu, Art History and Studio Art
Mentors: Jim Isermann, Jon Pestoni
Department of Studio Art

UC Riverside is a campus that is characterized by constant construction and change. Lost in the chaos are spaces that unsuccessfully integrate the student population with natural sites. Students are rarely found in these remote areas that offer an escape from the built landscape. In an attempt to rescue these spaces, I am constructing a site specific work that will bring attention to these overlooked places. My work will take place on the Engineering II Building lawn, a natural space that is hidden away from the main campus. In my piece, fabric will be used to connect and delineate the forms of the trees as a way of highlighting their majestic structure. The twigs and leaves found on the ground will also be covered in paper maché to encourage the viewer to take a closer look at these organic forms. Through the transformative use of art, I hope to change the perceptions of these sites, and thereby create an environment that builds interest in these forgotten places.

Locating the Exotic and the Authentic in the Javanese Gamelan Ensemble.

Jin Hee Yoo, Music and Culture
Mentor: Rene Lysloff
Department of Music

In this paper, I would like to interrogate two concepts, exoticism and authenticity, as they relate to my experiences in the UCR Javanese gamelan ensemble. My interests in these concepts arose when one year the ensemble was taught by a guest artist from Java, Sapto Raharjo. This was an exciting time because a real Javanese musician was here; because of him, something that once seemed so distant now felt closer to home. Indeed, students believed that his presence here created an authentic experience of Java. Thus, I would like to problematize such understandings. Exoticism and authenticity are bounded in an ideology of the traditional and the ancient, and fraught with vestiges of colonial history that implicate current power relationships. However, Sapto is unusual. He specializes in contemporary, not traditional, music. Nevertheless, in the Western imagination, he embodies our notions of traditional culture; he is the exotic Other, even if only because he is from a different country. Even among the Others (the Javanese) he is somewhat of an other. Thus, I argue that paradoxes like these complicate our understanding of the Exotic and the Authentic.

I was, I am, I will be”. Rosa Luxemburg’s legacy in the German Democratic Republic.

Lindsay Young, History
Mentor: Dana Simmons
Department of History

Rosa Luxemburg’s extraordinary Life and tragic death are hard to summarize into a simple
statement. Her complexity poses a distinctive obstacle to publicly memorializing her. In the German Democratic Republic, Rosa Luxemburg is not memorialized with all the fanfare and megalomania of most Soviet or communist leaders. The GDR used Luxemburg’s memory cautiously because her ideas were heretical to Marxism and Leninism and she did not reflect the state’s model of ideal socialist womanhood. Her martyrdom and socialist leanings were emphasized while muting her democratic ideals. The result of this is a large public interest and outpouring for a figure with modest state-sponsored and private memorials. The State reluctantly endorsed Luxemburg as a symbol of German communism in order to gain legitimacy by stressing the continuity of communism in Germany. It achieved these goals by continuing communist traditions already in place in Germany. The GDR did not significantly reinvent or add to her memory. Similarly, the FRG cautiously remembered Rosa Luxemburg because her values did not completely coincide with capitalist, democratic ideals. The public remembrances of Luxemburg are modest and emphasize less-controversial aspects of her legacy, such as her martyrdom. Overall, my project will explore how both governments chose to emphasize different aspects of her life and beliefs in order to project The GDR’s worldview.

**Measurement of Surface Fluxes along Rural-Urban Transect.**

Neil Zimmerman, Mechanical Engineering  
Jason Grubbs, Mechanical Engineering  
Sally Pederson, Mechanical Engineering  
*Mentors:* Marko Princevac, Akula Venkatram  
Department of Mechanical Engineering

Currently, there is a need for a more in-depth understanding of the effects of the transition of stable atmospheric conditions in rural areas to an unstable, convective, urban area. This relationship is necessary to properly model the continuing development of an inertial boundary layer. Shallow stable boundary layers are related to high levels of contaminants. Stable conditions occur in rural areas during cooler nighttime hours. As this stable air travels into urban areas, it encounters warmer and rougher surfaces that greatly affect the height of the boundary layer throughout the urban region. In the ongoing study, the data was gathered simultaneously at three urban and rural sites along an east-west transect through northwestern Riverside County, in Southern California. The three sites are located in urban Riverside (downtown), in rural Riverside (west of downtown, along the Santa Ana River), and rural Moreno Valley (east of Riverside). The locations were chosen along a path of nighttime easterly winds. At each location a 3 meter tower was set up with equipment to measure wind speed, wind direction, atmospheric and soil temperature gradients, and surface fluxes. Data was collected and analyzed for the trends in the surface friction velocity, sensible heat flux, and latent heat flux. The daytime heat and momentum fluxes were found to be higher at the rural sites than at the urban park site.
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