

# DAVIDSON



## 2017 DAVIDSON COLLEGE ALENDA LUX: SYMPOSIUM



Thursday, May 4, 2017

A Campus-Wide Celebration of Undergraduate  
Research and Creative Work

**Davidson College is grateful for the leadership of the  
Alenda Lux: Symposium Planning Committee:**

Verna M. Case, Associate Dean of Faculty and  
Director, Center for Teaching & Learning

Chris C. Alexander, Associate Dean for International Programs,  
McGee Director of Dean Rusk International Studies Program and  
Associate Professor of Political Science

Mario J. Belloni, Professor and Chair of Physics Department

Helen Cho, Professor of Anthropology

Ann Marie Costa, Samuel E. & Mary West Thatcher Professor of Theatre

Stephanie R. Glaser, Associate Vice President for Campus  
and Community Relations

Patricia Massey Hoke, Director of Corporate and Foundation Relations

Fuji P. Lozada, Jr., Professor of Anthropology and  
Chair Center for Interdisciplinary Studies

Sherry J. Nelson, Director Director of Davidson Arts and Creative Engagement

Stacey M. Riemer, Associate Dean of Students and Director of Civic Engagement

Mark Sample, Associate Professor and Chair of Digital Studies

Dave R. Wessner, Professor of Biology

## Art

1. Jean Paul Garcia
2. John Chavez and Berry Boeckman
3. Elizabeth Hunter
4. Isabel McLain and Nicole Kim

## **Civic Engagement and Community-Based Learning**

1. Dustin Atchley
2. Victoria Bonagura, Joe Jamison, and Julian Casey
3. Robert Brannen, John Chavez and Cordelia Wilks
4. Mackenzie Carey, Chase Davis and Hannah Sinks
5. Kelsey Carpenter, Anitta Machanickal and Emily Redler
6. Nile Chau Chau, Yiyao Xie, Nile Chau, Miller Page and Dr. Tim Chartier
7. Samantha Dhali and Dr. Stacey Riemer
8. Rachel Dickerman
9. Brian Fortier, Lukas Pracher and Connor Perkey
10. Shassata Fahim
11. Alexandra Galdi, Miriam Donner and Carolyn Raihala
12. Abbey Griffin, Eliza Crosby and Nate Kindig
13. Jacob Hege
14. Sarah Holmes, Savannah Williams and Nadia Glover
15. Daisy Jones
16. Claire Kane and Ashley Behnke
17. Laila King, Lisset Jarquin and Luke Gray
18. Bethany Kirkpatrick, Katie Marshall and Savannah Shivers
19. Kristen Koehler, Blair Nagell, Tanya Nair, Jada Wiggleton-Little and Dr. Lauren Stutts
20. Alexa Landsberger, Katie Im, Savannah Kennedy and Carolina Adams
21. Matthew LeBar, Kenny Xu and Colleen Callahan
22. Cullen MacDowell
23. Katherine Maultsby, Sarah Kopp and Karen Martinez Cabrera
24. Jaela McDonald
25. Rachel McKay, Andrew Ayala and Dusan Kovacevic
26. Isaac Mervis
27. Evelyn Morris, Ethan Faust and Isaac Mervis
28. Evelyn Morris, Noa Schork, Kianna Speight, Amelia Twiss and Dr. Lauren Stutts
29. Alexandra Moseley, Zari Press, and Sophie Johnson
30. Kiambra Griffin
31. Santiago Navia, Dylan Maghini, Santiago Navia, and Allyson Taylor
32. Lena Parker
33. Stephen Pacheco and Scotty Poston
34. Shauna Pointer
35. Samantha Gowing

## **Civic Engagement and Community-Based Learning (continued)**

36. Maya Packer, Gloria Nlewedim, Luke Boliek, Destiny Barnes, and Karaz Axam
37. Tiffany Ruan, Katharine Franz, Peter Haugen and Dr. Lauren Stutts
38. Annie Sadler, Brionna King and Claire Kane
39. Ryan Samuels
40. Kayla Seymour
41. Jonathan Sheperd-Smith
42. Henry Siebentritt, Ellie Irving, and Josh Sawyer
43. Katharine Tabachnick
44. Caitlin Smith, Xan Stoddard and Ricky Davidson
45. Westin Whitmire, Will Robertson and Dustin Atchley
46. William M. Worrilow and Naila M. Mamoon, PhD, Davidson College  
Stephen B. Riggs, MD, Levine Cancer Institute, McKay Department of Urology

## **Digital Studies**

1. Alec Custer
2. Violet Degnan
3. Dr. Michelle Kuchera
4. Jasmine McCarty
5. Diem Tien Le
6. Xirui Xu and Guanming Qiao

## **Humanities Projects**

1. Karaz Axam
2. Elizabeth Cowan
3. Erin Davenport
4. Ela Hefler
5. Arielle Korman
6. Dakota Morlan
7. Andres Ramos
8. Jackson Allen, Val Bruder, Beth Foote, Katie Hines, Matt St. Lawrence, Amanda Lee
9. Ben Corso, Alex Gould, Andrey Krachkov, Leah Mell, Elijah Midgette, Maurice Norman, Emma Rose Parker, Bean Rodriguez, Isabelle Sakelaris, Sana Alimohamed, Taylor Brendle, Chris Brooks, Grace Cain, Kaiya Carter, Lauren Crane, Sarah Cullen, Megan Cypcar, Olivia Daniels, Ethan Faust, Adam Ferraz, Eddie Garcia-Alamilla, Kaycee Gass, Charlie Goldberg, Alex Gould, Maeve Hammond, Crystal Ibarra, Ellie Irving, Mila Loneman, Annie Maisel, Daniel Martin, Lauren McFayden, Caroline Miller, Emi Moore, Sam Ortega, Nick Pearson, Isabelle Sakelaris, Amanda Scott, Hannah Sommerlad, Severine Stier, Darby Williams

## **Humanities Projects (continued)**

10. Sana Alimohamed, Taylor Brendle, Chris Brooks, Grace Cain, Kaiya Carter, Lauren Crane, Sarah Cullen, Megan Cypcar, Olivia Daniels, Ethan Faust, Adam Ferraz, Eddie Garcia Alamilla, Kaycee Gass, Charlie Goldberg, Alex Gould, Maeve Hammond, Crystal Ibarra, Ellie Irving, Mila Loneman, Annie Maisel, Daniel Martin, Lauren McFayden, Caroline Miller, Emi Moore, Sam Ortega, Nick Pearson, Isabelle Sakelaris, Amanda Scott, Hannah Sommerlad, Severine Stier, Darby Williams

## **International Experiences**

1. Kerry Honan, Austin Kistner, Arielle Korman, Andrew Rikard, and Sara Aziz
2. Natalie Skowlund
3. Rachel Ruback

## **Mathematics and Natural Science**

1. Josh Betts
2. Ryan Almeida and Dr. Kevin Smith
3. Dustin Atchley
4. Andy Baay
5. Nicholas Balanda, Dr. Laurie Heyer and Dr. A. Malcolm Campbell
6. Tiag Bhamber and Dr. Erland Stevens
7. Sarah Eisenach and Nika Fendler
8. Katherine Belanger, J.S. Isaac, and Dr. Julio Ramirez
9. Julian Bertini
10. Ella Brewer-Jensen
11. Henry Brooks
12. George Brown
13. David DeGrood
14. Ruiming Chen
15. Sarah Coats
16. Noah Constantine
17. Austin Crouse
18. Nicholas Elder
19. Sophia Emmons and Dr. Kevin Smith
20. Collin Epstein, Dr. Tim Gfroerer, Davidson College and Dr. Yong Zhang, UNCC
21. Vivienne Fang and Dr. Karen Hales
22. Andrew Fay
23. Samuel Frederick
24. Clifford Gilman
25. Chika Fujii
26. Kaycee Gass
27. Laura Knapp

<b>Mathematics and Natural Science (continued)</b>
--

28. Martha Gerdes
29. Adam Green
30. Greg Alspaugh
31. Anna Grumman
32. Kate Hardin
33. Allison Hunt
34. Emma Johnson
35. Tessa Jones
36. Alishah Lakhani
37. Joshua Messing
38. Esteban León
39. Jonathan Lim, Elizabeth Brunner, Eric M. Sawyer, Lindsay Regruto and Dr. Karen Hales
40. Ronnae Mailig
41. Stephen Mershon
42. Dr. Raghu Ramanujan
43. Papa Kwadwo Morgan-Asiedu, M. Ummer Qureshi and Dr. Karen Hales
44. Z.Nussbaum
45. Catie Morris, Dr. Brad Johnson and Dr. Chris Paradise
46. Nancy Pruett
47. Hayato Nakanishi
48. Caleb Warren
49. Allyson Pel and Dr. Barbara Lom
50. Andrew Peterson, Dr. Mark Smith, Andrea Robinson, Alex Casimir, and Michael Zhang
51. Caitlin Reilly
52. Jack Reynolds
53. Hannah Rieden
54. Brooke Riley
55. Judith Rosales Rivas
56. Taylor Simmons and Dr. Karen Hales
57. Rosalind Spell and Dr. Brad Johnson
58. Annalee Tutterow and Dr. Kevin Smith
59. Yufei Wang and Dr. Durwin Striplin
60. Erin Xu
61. Nick Pohl
62. Paul Brennan

## Social Science

1. Dorothea Allocca
2. Hayden Bates
3. Jennifer Belardo
4. Alyssa Bryan
5. Yijiao Chen, Dr. Greta Munger and Dr. Kristi Multhaup
6. Erica Clancy
7. Adelaide Cummings
8. Madeline Driscoll
9. Madeline Driscoll
10. Anna Catharine Feaster
11. Mary Frith, Kylie Leung and Dr. Julio Ramirez
12. Samantha Gowing
13. Mitchell Han
14. Allison Hancock and Dr. Lauren Stutts
15. Nate Harding
16. Remy Jennings
17. Shannon Hayes
18. Gillian Highet
19. Chris Johnson
20. Jonathan Lee
21. Drew Kromer
22. Anne Elizabeth Mason
23. Sara Muche
24. Gloria Nlewedim
25. Ryan Samuels, Ryan Leak, and Scott Jaris
26. Syed Sammy
27. Kayla Seymour
28. Michael Zhang, Andrea M. Robinson, and Dr. Mark Smith
29. Henry Siebentritt
30. Malaika Simmons
31. Davis Temple, Gregory Hunt, and Charley Oner
32. Patrick Spauster
33. Graham Steele
34. Yizhen Egn Zhu
35. Morgan Spivey

## Theatre

1. Andrew Lott and Gale Linares
2. Blaire Ebert and Eleanor Seaman

# Art

## **Annual Student Exhibition**

Belk Visual Arts Center, Van Every Gallery, 10am – 7pm

### **Senior Studio Art Major Exhibition: Jean Paul Garcia '17**

Belk Visual Arts Center, Smith Gallery, 10am – 7pm

The exhibition in the Smith Gallery is a solo exhibition by Jean Paul Garcia '17, and is part of an on-going series of Senior Studio Art Major exhibitions.

### **Student Curated Exhibition based on Middletown**

Curated by John Chavez '17 and Berry Boeckman '18, Cunningham Theater Building Hallway  
The works featured in the Cunningham hallway reflect the quiet awe that the audience finds as they pass through Middletown. These photographs reveal that it is through transactions across individuals that deepen our understanding of emotion and relation. Whether as residents or passersby, the baggage we carry, the words we use, and our gestures to one another can produce great meaning even in the most ordinary of towns.

### **Student Curated Exhibition: Portraits from the Permanent Art Collection**

Project of Elizabeth Hunter '17, E. H. Little Library

For many years, the library walls displayed the portraits of Davidson College's past presidents. In January of 2017, the portraits were reinstalled throughout campus in locations appropriate for each president's unique contribution to the college. By placing the portraits around campus, we can better understand who the presidents were, what they contributed to Davidson, and how their legacy shapes the college today. In place of the presidential portraits are works from Davidson's Permanent Art Collection. These pieces dig deeper into the idea of why portraits are made and who is typically depicted in a portrait. The works include portraits of seemingly ordinary people, representing a broad spectrum of identities. By elevating the subjects of these works to positions of permanence and distinction, the artists encourage viewers to question and overturn notions of who deserves to be remembered through art.

### **Student Curated Exhibition: International Women Artists from the Permanent Art Collection**

Curated by Isabel McLain '16 and Nicole Kim '18

Spencer-Weinstein Center for Community and Justice (Multicultural House)

The works on view in the Multicultural House are by international women artists from the Davidson College Permanent Art Collection. Artists include Pamela Phatsimo Sunstrum and Delia Cugat.

## **WDAV Student Curated Spaces**

# **Civic Engagement and Community-Based Learning**

## **Early English Education Engagement in Low Income Hispanic Communities**

Dustin Atchley

The continual immigration of diverse, multiethnic, multicultural populations has presented the U.S. with a variety of unique language opportunities and challenges. The lack of language proficiency and comfortability creates a distinct gap in opportunities and therefore social and socio economic mobility to the populations affected (Espenshade and Fu, 291). In some language minority populations, parental engagement in their child's early English education is lacking. This can be derived from a variety of factors, a prevalent one being the lack of formal training and accessible resources to aid them in better preparing their child, particularly in low-income communities. In this project, we discuss a method for developing and providing resources and training to better aid predominantly Spanish-speaking, low-income communities in engaging with preschooler's (ages 3-5) early English education.

## **Optimizing the ROTC Occupational Physical Assessment Test**

Victoria Bonagura, Joe Jamison, and Julian Casey

The US Army is transitioning to a new physical fitness test called the Occupational Physical Assessment Test (OPAT), which all new cadets must perform in order to join. Davidson's ROTC program, as a feeder program to the US Army, has to implement this test process. The OPAT test involves 4 stations of testing: standing long jump, seated power throw, strength deadlift, and an interval aerobic run. Each participant must complete all four of these events in a single setting and their results in each event must be recorded by a trained facilitator. The goal of this project is to mathematically model the entire testing process in order to find the most efficient process for optimizing "put-through" of the cadets within the system. "Put-through" refers to the ease of the process for both cadets and facilitators and a successful process would result in the smoothest possible flow of cadets through the system, seeing no bottlenecks at any station. A successful project would result in a more efficient testing process for Davidson's ROTC program that faces fewer bottlenecks and less time wasted while conducting the OPAT.

## **Disability in Social Media**

Robert Brannen, John Chavez and Cordelia Wilks

For this project, we will examine disability misrepresentation in the media--particularly social media and viral videos. Social media users share a multitude of feel-good videos that often sentimentalize the reality of disability and portray disabled people as objects of inspiration rather than full human beings. We aim to launch a digital video campaign that quantifies the variety and gauges the accuracy of disability representation as well as illustrates the range of effects of those portrayals. To accomplish this, we will perform research concerning the effects of misinformation, social media content and stereotypes on media audiences. Our poster will summarize our findings and give details about our digital video campaign.

## **Optimization of Community School of Davidson Afternoon Carpool System**

Mackenzie Carey, Chase Davis and Hannah Sinks

The Community School of Davidson (CSD) is interested in improving their afternoon carpool system to establish a more optimal process. We partnered with CSD's Director Connie Wessner, using mathematical modeling techniques in our efforts to observe the current carpool system and increase its efficiency. Queueing theory is used to model the carpool system, with each vehicle in the carpool lane representing a customer. Over multiple afternoons, the following data was collected: the arrival time of each vehicle in the carpool lane, the time when each student's name was called, the time each student entered their respective vehicles, and each vehicle's departure time. Subsequent modeling strategies utilize Monte Carlo simulation. These techniques allow us to make an assessment of the carpool system and determine what changes, if any, should be made to optimize afternoon carpool.

## **Commonalities in Teaching Methods for Second and Third Grade Students**

Kelsey Carpenter, Anitta Machanickal and Emily Redler

The variability in teaching methods leaves one to question the factors of effective teaching. In this poster, observations made at Community School of Davidson of second and third grade classrooms are summarized. Teaching methods in three different classrooms are compared in order to determine what the teachers are doing best and what the children adapt to readily. Each author was assigned to one classroom to observe teachers and children for one hour in the morning. Some factors were shared by all teachers. All three used metacognition by gaining feedback from the children in order to determine what they understood and used interleaving to review the lesson concepts after the activities. We have determined that these commonalities in teaching methods seemed to correlate with methods that have shown to be effective in previous studies.

### **Using Modeling to Create a Photomosaic**

Nile Chau Chau, Yiyao Xie, Nile Chau, Miller Page and Dr. Tim Chartier

A photomosaic is a large scale photo that is built by combining smaller photos together in a cohesive way. The team works with the Community School of Davidson to use student's artwork and activities photos to create a banner that spelling the word "spARTans". This poster exhibits the use of math modeling through binary integer linear programming (BILP) as a way to build this photomosaic. As we investigate in how to approximate images, we see how mathematical modeling could be utilized and applied to simple real world problem.

### **Earned-Income Model for the Ada Jenkins Center**

Samantha Dhali and Dr. Stacey Riemer

The Ada Jenkins Center, like many other non-profit organizations, primarily rely on philanthropy and government grants as their main sources of income. The Center's operation costs, however, continue to rise in recent years and often times, private donations and government grants alone are not sufficient enough to cover the costs. In order to generate a third main source of funding that is independent of outside support, therefore, we are designing an earned-income model that the Center can adopt and invest in. In addition to considering the sustainability of this model, we also aim to reach a break-even point within the first three years of startup. This earned-income model involves training the Center's client partners job-specific skills, which will then qualify them for employment in a revenue-generating business run by the Ada Jenkins Center. Job training will be directed towards the areas of food service and technology.

### **Florence Crittenton**

Rachel Dickerman

Our poster depicts the project we completed with the Florence Crittenton Center for our class, Contradictions in Motherhood. Florence Crittenton is a Charlotte nonprofit that works to empower women, with many of their services aimed at helping at risk mothers. In our project we were able to shadow different services within Florence Crittenton to see how they operate on a day to day basis. The three services we shadowed were Legacy Hall, a transitional living opportunity of young women to build independent living skills before aging out of the foster care system, a home for at risk pregnant women over the age of eighteen, and Sarah's House, a home for teen mothers. Shadowing these different programs and spending time with the clients allowed us to see motherhood in practice, illuminating some of the theories we learned, while complicating others.

## **A Faster Davidson Café**

Brian Fortier, Lukas Pracher and Connor Perkey

The workers at the Davis Café at Davidson College wish to evaluate their ordering and pick up process and see if there is a more efficient way for this to be run. We have many variables throughout our research but mainly focus on the amount of the time it takes to make each order, the time it takes for the customer to pick up their order, and the amount of time it takes for the customer to checkout. We have data on these times and we have information regarding the busiest times of the day and most popular food choices given to us by Mark Lewis, who is the Director of Cash Operations for Davidson College Dining. We used queueing theory with the actual data to model situations and predict the checkout lines and waiting times and compared them with the current numbers. This comparison allowed us to see a more efficient way for the Davis Café to be run.

## **Food Security on College Campuses**

Shassata Fahim

Across the country, colleges and universities have become more diverse. This diversity is not only limited to racial diversity but also other intersectional identifiers such as socioeconomic status. Students coming from low income backgrounds often do not have access to so many of the resources afforded to their peers by their parents or families and these students often have to fight not only to graduate from their institutions but work to eliminate the inequities that exist on their campuses. One of the most fundamental aspects of this is food security. My work will be related to looking at Davidson College as a microcosm of institutions around the country. According to the results of a DavidsonShares survey that went out to the student body, 53/1000 students had reported that they had gone hungry 5 or more nights a semester. In an institution that prides itself on its commitment to its students, a lack of access to a basic necessity is stark. My project will look at the rise of food pantries as a way to mitigate food insecurity on college campuses across the country. I will further examine financial aid and meal plans and how that relates to students' hunger. Lastly, I will look at access to local grocery stores for students and how that inevitably affects their food habits.

## **Pay Attention in School, Kids: Benefits of Transformative Learning in Elementary School**

Alexandra Galdi, Miriam Donner and Carolyn Raihala

Transformative learning is an application-based instructional method that integrates classroom knowledge into the everyday life experiences of the student. Existing literature studying post-elementary school students posits that this form of instruction yields increased student achievement and aids in long-term retention of learned material, compared to other teaching methods. In three different observational studies at the Elementary School of the Community School of Davidson, various applications of this method were observed for younger students. This poster examines the importance and benefit of introducing transformative instruction at a young age, thereby establishing the link between school and life skills from early-on. We hypothesize that this opportunity to learn with this form of instruction at such a young age will establish good learning habits, setting students up for success throughout their continued education. This longitudinal trajectory was not possible to observe for the purpose of this poster. However, because existing literature establishes the benefit of transformative learning for older students, we believe that exposure to this learning even earlier on can only increase these benefits.

## **Hierarchical Structures and Group Dynamics in Early Elementary Education**

Abbey Griffin, Eliza Crosby and Nate Kindig

Inspired by Chavajay's (2006) previous research investigating whether relationships between adults and children can differ based on culture and schooling, researchers looked at elementary school settings. In Chavajay's (2006) study of Mayan mothers and children, the amount of Western-style schooling mothers completed guided their problem-solving methods with their children. At the Community School of Davidson, a school in the United States, researchers observed numerous typically Western hierarchical structures in early elementary classrooms. Teachers in these elementary classrooms showed some egalitarian methods typical of non-schooled adults despite their personal past education with Western influences. Three different teachers and their assistants in three different grade levels, first, second, and third, were observed. In order to optimize learning, teachers shifted between egalitarian and hierarchical approaches depending on the desired learning outcome. Teachers utilized pairs and groups of children to accomplish their learning tasks such as math problems or story writing. Here researchers will analyze techniques teachers used in these three settings in conjunction with literature and data on studies in educational psychology. Interactions between children and teachers observed at the Community School of Davidson are investigated to determine their effectiveness in early elementary classrooms. Suggestions for optimal interactions include and expand upon observations.

## **The Consequences of Misogynistic Rhetoric in Public and Private Spaces**

Jacob Hege

The language we use in casual, everyday conversations has tangible consequences. Our words - whether we see it or not - have implications beyond the surface. With the current political climate in mind, we are creating a Public Service Announcement that highlights the negative consequences of so-called “locker room talk” and follows the what-if scenario of a white male identity traitor. Ultimately, his choices will affect greater social change at the Presidential level. Without identifying or vilifying any specific elected officials, our aim with this PSA is to demonstrate the consequences that our words can have. Based in the theories of Social Learning, Priming, Cultivation, Parasocial Relationships, and Social Identity, we believe the PSA will have an effect on the audience and that using a PSA as our medium will be successful.

## **Updated Learning through Student-Centered Teaching**

Sarah Holmes, Savannah Williams and Nadia Glover

Davidson Community Day School uses many educational psychology methods in their kindergarten and second-grade classes. They emphasize analogical reasoning through their writing exercises. Analogical reasoning tasks the children with making connections across separate and different concepts beyond the surface level (Vendetti et al. 2015). Media and classroom teaching such as the Cosmic Kids yoga videos to the Hungry Caterpillar story were combined for the children to learn in all learning styles. Exposure to all types of sensory information such visual, kinesthetic or auditory stimuli ensured that all students were taught to their hidden strengths. This inclusive practice is necessary because learning styles are a spectrum of skills with limited strict nominal categories (Gutiérrez and Rogoff 2003). Teachers asked more open-ended and wh-questions than yes-or-no questions to encourage the students to think for themselves. These types of questions are more common in hierarchical methods of problem-solving in Western society giving the children practical skills (Chavajay 2006). Separation of students through tracking allowed students in the same classroom to help each other, but also caused unintentional divisions among the class. Teachers encourage children to keep trying when they get an incorrect answer through gentle correction and support rather than strict dismissal.

## **Breastfeeding Advocacy in the Town of Davidson**

Daisy Jones

Our project focused on breastfeeding advocacy in the town of Davidson. The three of us went to multiple businesses in the town of Davidson to see if their managers and store owners were interested in becoming “Breastfeeding Friendly Businesses.” Outlined by the North Carolina Breastfeeding Coalition, a Breastfeeding Friendly Business is one that:

- Does not advertise infant formula or related products directly to consumers.
- Welcomes and respects breastfeeding mothers. They are never treated poorly, asked to stop breastfeeding, or asked to cover up or move.

Over the course of a couple weeks, we interviewed several businesses to see if they are interested in receiving this award, and documented their reactions to our request. This poster details the responses we heard and received. Creating safe and open environments for breastfeeding mothers should be a community value. We hope that this project will help normalize the natural and incredibly crucial practice of breastfeeding, so that mothers in the town of Davidson will feel more supported and welcome.

## **Community-Based Performance and the School-to-Prison Pipeline**

Claire Kane and Ashley Behnke

In our “Theatre for Social Justice” course, we have studied the ways in which community-based performance can serve as mechanism for social change and community empowerment by giving voice to marginalized identities. We have researched the work of Hidden Voices, a community-based performance collective in nearby Cedar Grove, North Carolina. They are a non-profit organization led by over 100 volunteers and various other contributing professionals who together work to develop two to three projects every year ([hiddenvoices.org](http://hiddenvoices.org)). Hidden voices collaborates “with underrepresented communities to create award-winning works that combine narrative, mapping, performance, music, digital media, animation, and interactive exhibits to engage audiences and participants in explorations of difficult issues” ([hiddenvoices.org](http://hiddenvoices.org)). Recently, Hidden Voices has created a project designed to expose the School-to-Prison Pipeline phenomenon wherein children, a majority of which are African American, are increasingly “funneled out of public schools and into the juvenile and criminal justice systems” ([aclu.org](http://aclu.org)). The project includes a performative component centered around the reading of monologues that have been written by stakeholders in the School-to-Prison Pipeline system. As a part of our final project for our “Theatre for Social Justice” course, we prepared a poster presentation on the work of Hidden Voices and how their methods can be used to tell the stories of those most affected by the School-to-Prison Pipeline. In addition to our poster presentation, we are also planning a performance piece during which various members of the Davidson College Community will present the monologues on the “School-to-Prison Pipeline” that have been collected and organized by Hidden Voices. This monologue reading will then be followed by an interactive discussion. All students, faculty, staff, and community members are invited to attend the monologue reading and discussion that will take place after the symposium.

**Styles of Learning and Teaching**  
Laila King, Lisset Jarquin and Luke Gray

Elementary school teachers (particularly kindergarten through second grade) are cognisant of incorporating multiple learning styles into their teaching as much as possible. Almost every learning objective was taught using multiple styles (primarily: visual, auditory, and kinesthetic). This observation spans over all of the classrooms we observed, even though the material being studied and the grade level varied. An example of this was demonstrated in Ms. Webb's kindergarten class through the reading excerpt with George Washington. She passed out a copy of the reading to each individual child and she read the book out loud (audio) while the children read along with her (visual). After the paragraph was read, the children proceeded to color in a picture that tied the paragraph they just read (kinesthetic). We found this to be an interesting observation considering the body of literature questioning the validity of the learning styles approach.

**Schooling the Citizen: The Effect of Classroom Management  
on Student Socialization in Grades 1-3**  
Bethany Kirkpatrick, Katie Marshall and Savannah Shivers

We observed three separate classrooms that ranged from grades 1-3 for an hour each at the Community School of Davidson, a public charter school. Each class studied a different subject, math, social studies, and language arts respectively. Commonalities arose between all three grades related to classroom management. For example, teachers used positive criticism, behavioral reminders, structured routines, and emphases on both collaboration and individual learning to introduce lessons to their students. Students had a clear understanding of different authorities, structures, and acceptable behaviors, and used these understandings to complete their work and to interact with other students. Teachers emphasized student responsibility more critically in older grades, while choosing positive reinforcement in younger grades. There were also differences across classrooms between the goals of collaborative activities and individual work. We observed a relationship between the three steps of teacher action, student response, and student action. We conclude that the classroom management style of the teacher sought not only to teach a lesson, but also to introduce students to dynamics of peer-to-peer interactions, responses to authority, routine behaviors, and other "real life" skills. Therefore, we believe citizenship skills must be considered a goal of classroom learning at the elementary school level.

**A Community-Based Project for Davidson International Students  
To Increase Access to International Cuisine**

Kristen Koehler, Blair Nagell, Tanya Nair, Jada Wiggleton-Little and Dr. Lauren Stutts

Diverse Diets at Davidson: Davidson College has an increasingly diverse population, particularly among international students. This population of students often experiences difficulties assimilating into American food culture due to a lack of access to native foods, being required to be on a meal plan, and having to adjust to new eating habits and social spaces. Davidson College has implemented a pre-college orientation specific to international students, but this orientation fails to include any information regarding nutrition. Our community-based intervention aimed to address this void in nutritional support offered to international students by launching [deliciousdavidson.weebly.com](http://deliciousdavidson.weebly.com). This website provides access to resources, advice, and guidance on healthy eating habits that will benefit the community of international students who attend Davidson College. We partnered with the Dean Rusk office for this project. Our website integrates resources and information from various other sites regarding food and nutrition in Americanized food compared to staple foods found in the numerous cultures represented by Davidson international students. In addition, it includes information about nutritional facts, local American produce, how to shop at grocery stores, a list of international restaurants located nearby, recipes, and healthier food options available on campus. We also hope that our website will increase international students' access to a more diverse array of food options.

**Minority Women in the Media**

Alexa Landsberger, Katie Im, Savannah Kennedy and Carolina Adams

There is existing research regarding minority and female representations in current media. Our poster aims to intersect these ideas, looking specifically at how women from minority groups are underrepresented overall. As well as, when they are represented are often portrayed in stereotypical ways. We will conduct a literature review of studies within this scope and then connect that research to existing communication theories. The aim of this project is to discuss the application of how media portrayal of these groups have real world impact on how society views women of color. This in turn has negative effects on how these women view themselves and how they limit their ability to functions outside the stereotypes presented to them. This project will examine television shows and look at how women of color are underrepresented or misportrayed in media. This project aims to heighten awareness regarding misrepresentations of colored women in the media and how that can impact these women in their daily lives. The hope is that women of color and other members of society are able to recognize these discrepancies in media and work to increase their media literacy about stereotyping.

## **LEARNWorks Schedule Optimization**

Matthew LeBar, Kenny Xu and Colleen Callahan

We worked with Ada Jenkins' LEARN Works program, which connects middle and elementary school students with tutors enrolled at Davidson College. They needed to organize tutor hours so that all tutors got enough hours and children had the opportunity to work one-on-one with tutors. We used mathematical modeling techniques to help them achieve these goals with an improved scheduling system.

## **Shaping Campus Drinking Habits: Social Fraternities and Beyond**

Cullen MacDowell

College students' indulgent relationship with alcohol is by no means a recent development. There is a notable increase in the amount of and frequency at which alcohol is consumed when students enter college. These increases are even greater for students who join Greek organizations. (Wechsler et al. 2009). Davidson has a unique social scene however, with social fraternities, but no social sororities. While Eating Houses, the Black Student Coalition, Union Board and other student-run organizations have their own respective agency over the matter, this research investigates the degree to which social fraternities dictate students' alcohol consumption habits on campus. It also investigates the other policies and actors that intentionally attempt to reshape these habits. Lastly, it applies national models aimed at reducing risky drinking in tandem with theories on community and change in a proposal for Davidson College collaboration to promote healthy alcohol consumption among students.

## **Structured Interactions in Elementary School Classrooms**

Katherine Maulsby, Sarah Kopp and Karen Martinez Cabrera

Western schooling is predominately characterized by dyadic exchanges between teacher and student (Chavajay, 2006). The Community School of Davidson's (CSD) kindergarten and first grade classes utilized Western schooling techniques such as turn-taking, asking known answer questions, and the teacher's adoption of a managerial role. This poster examines the teacher-student interactions in three of CSD's elementary school classrooms, and the future implications of such interactions. The activities observed include how the teacher engaged the child, who oversaw the discussion, and types of activities students performed. In this way, the classroom setting is structured according to a hierarchy, where the teacher dictates schedule and discipline. Elementary school education is crucial in teaching students social and behavioral skills needed to be successful. These observations have greater implications; they model interactions between adult and child that the student may continue to apply in his or her future life.

## **Consent and Communication: A Workshop for College Couples**

Jaela McDonald

With conversations surrounding consent becoming more prevalent across the nation, particularly throughout college campuses, there is a need to understand and advocate for healthy sexual encounters. The increasing energy surrounding the push toward combating rape culture highlights a desire for a cultural shift in how the Davidson College's campus views sexual encounters. By focusing on the specific population of college students in relationships, the proposed workshop aims to educate participants on effective communication styles, discuss what a healthy relationship looks like, and engage with the topic of consent. The workshop will strive to provide an environment for couples to explore their preferred communication styles, decision-making as a couple, how they express and abide by boundaries in intimate encounters, and what consent looks like in their relationship. The design of the workshop is built upon existing models with a similar purpose that has been modified to a Davidson-specific context. The ultimate goals of the workshop are to equip participants with skills to be able to have each person advocate for themselves in intimate encounters, learn about the definition that the College uses for consent, know how to maintain healthy conversation in a relationship, and have a complete understanding of how consent is gauged. Improving communication in relationships has the potential to lead to a better grasp on what consent is, as well as the ability to ensure that it is implemented in all sexual encounters.

## **Advertising, Targeting, and Identity in Colleges and Universities**

Rachel McKay, Andrew Ayala and Dusan Kovacevic

Our project focuses on advertising, targeting, and social identity. We will be looking at how institutions use advertising to target certain populations and how consumer vulnerability relates to the effectiveness of these advertising campaigns. This theoretical framework examination will be accompanied by a case study portion of our project. Specifically, we will be examining how colleges target and advertise to students in efforts to obtain a certain demographic. We will be observing college advertising through websites, pamphlets, television, and representatives, alongside interviewing college students themselves about their experiences with college advertising.

## **Patterson Court Sustainability**

Isaac Mervis

Patterson Court sustainability has made great strides towards increasing the sustainable practices of their organizations in the last several years. However, despite these improvements, there is substantial room for growth. To learn about the current state of Patterson Court sustainability, I engaged in conversations with the head of Patterson Court, Erica Urban, the head of the Sustainability Office at Davidson College, Yancey Fouche, and Patterson Court Sustainability Chairs, as well as read through the Patterson Court Executive Committee Bylaws. I supplemented my understanding of Patterson Court sustainability with additional research about best practices of different colleges and universities throughout the United States, and theories of leadership and organizational change. This poster reflects the knowledge I have gained, and proposes several concrete steps to take to improve Patterson Court sustainability. These steps include: educating members on the importance of sustainability through mandatory educational events, creating a cohesive and collaborative sustainability community through regular meetings and frequent communication, and establishing accountability measures to ensure that events and meetings are well attended and that concrete sustainability initiatives are pursued each semester.

## **Structured Schooling: Content Organization and Teaching Techniques in Elementary School**

Evelyn Morris, Ethan Faust and Isaac Mervis

Our class, Educational Psychology PSY 242, has been identifying best practices in modern education throughout the semester. This project synthesizes classroom observations from Kindergarten and First Grade classrooms at Community School of Davidson (CSD) from February 2017, and relates these observations to concepts covered within the course. Quantitative and qualitative data demonstrate differences in the structure and content of these two classrooms, but similarities in how the teachers elicit answers and give feedback. Structurally, Kindergarten students participated in a blocked lesson structure, whereas the First Grade students participated in an interleaved lesson structure. However, despite the differences in structure, both teachers used similar managerial techniques to command and maintain the focus of their students with a combination of known-answer questions and prompting, characteristic of Western educational practice. Based on these observations, we recommend that teachers follow similar lesson structures for Kindergarten and First Grade students, keeping in mind the varying cultural and contextual factors that led to success in these classrooms at CSD.

## **Keep it Moving! A Community-Based Intervention to Increase Physical Activity in Elementary School Students**

Evelyn Morris, Noa Schork, Kianna Speight, Amelia Twiss and Dr. Lauren Stutts

Based on studies by the CDC and Fairclough and Stratton (2005), students in a majority of PE classes are only engaged in moderate to vigorous activity (MVPA) for 50% of the class or less and therefore rarely meet the recommended goal of 60 minutes of exercise daily. Our community-based intervention aimed to increase the time that students are engaged in MVPA during their allotted physical activity time by adapting games students currently play to make sure there is minimal standing or sedentary time. We employed our intervention for 3rd graders at Davidson Elementary School. We hoped that children would stay moving even during explanation periods and throughout all games while having an engaging experience. In addition, we created an accompanying handout to disseminate to teachers and parents containing 5-minute "Brain Blasts." This handout includes modified physical activities for children in class or at home to assist in making progress towards their daily physical activity goals. The handout also contains links to various programs that exist currently as resources for teachers and parents to encourage their students to stay active. Ultimately, we hope this intervention increases the amount of time children spend active in P.E. class and can serve as a model for other schools in the greater Charlotte area.

## **Around the Room in Many Ways: Using Stations to Maximize Opportunities to Learn**

Alexandrea Moseley, Zari Press, and Sophie Johnson

In classroom observations at the Community School of Davidson, researchers found that teachers use learning stations instead of lecturing in first and third grade classrooms. Individual classwork in a “learning station” teaching environment exposes students to material in different formats and difficulty in a way that fosters problem based learning. When presented material in different ways and given the opportunity to practice in different ways, children are more likely to remember key concepts to use as a foundation for future learning. The technique of having students work independently promotes self-regulation and improved engagement with material for the students. By critically engaging with material, students are more involved and therefore have more opportunities to learn than in a lecture style class. Additionally, they receive feedback from their teachers which improves student performance on subsequent attempts at similar work. By combining these different techniques, teachers maximize students’ opportunities to learn, which has been demonstrated to improve academic performance.

## **The Work of the Divine Nine**

Kiambra Griffin

The National Pan-Hellenic Council, otherwise known as the “Divine Nine”, has a rich history rooted in the fight for social justice among African-Americans. Its mission, created in 1930, is “unanimity of thought and action as far as possible in the conduct of Greek Letter collegiate fraternities and sororities, and to consider problems of mutual interest to its member organizations”. The organizations on the campus of Davidson College (Alpha Phi Alpha Fraternity, Inc., Alpha Kappa Alpha Sorority, Inc., Kappa Alpha Psi Fraternity, Inc., and Delta Sigma Theta Sorority, Inc.) aim to address local and international issues that highlight social, political and racial justice matters. This poster examines the development of a permanent framework for the cohesive and collective functioning among individual organizations apart of the National Pan-Hellenic Council at Davidson College. The project was inspired by initial conversations between the NPHC members held during the NPHC retreat as it addressed the topic of support for programs and events between the organizations. As a result, strategies for accountability linked to the values and tenets of the governing body of the NPHC were created.

**Optimizing the Layout of the Town of Davidson Farmers' Market**  
Santiago Navia, Dylan Maghini, Santiago Navia, and Allyson Taylor

The aim of this project is to optimize the layout of vendor booths at the Davidson Farmers' Market to reduce congestion of pedestrian traffic and increase connectedness between the two parking lots of vendor booths. The Davidson Farmers' Market, open Saturday mornings in the spring and summer months and every other week in colder weather, offers a wide variety of local goods and produce to the Davidson community. Unfortunately, the market has high amounts of pedestrian congestion that can negatively impact visitors' experiences, and the market can feel fractionated to vendors in either lot. To address this problem, we first collected data on pedestrian traffic through the market to calculate distributions of visit times and queue lengths at booths. We then used these data to inform various models of the market, which employed techniques such as Monte Carlo simulations, queueing theory, and agent-based modeling. We evaluated the pedestrian congestion levels resulting from different booth layouts and modeling techniques, and drew final conclusions based on which market layouts fit the necessary space constraints. While our modeling process made a number of simplifying assumptions, we intentionally designed our models such that they would not obscure important traffic factors.

**Adjusting Attendance Boundaries to Increase Diversity in CMS Schools**  
Lena Parker

Though Charlotte-Mecklenburg Schools (CMS) was once at the forefront of school desegregation in the south, CMS schools have become increasingly racially and socioeconomically segregated. As CMS undergoes a review of student assignment for the 2018-2019 school year, I recommend a method of rezoning student assignment boundaries in a manner that maximizes socioeconomic diversity in schools. A type of mathematical modeling called linear programming is a promising avenue to systematic student assignment that upholds constraints of student assignment and maximizes socioeconomic diversity and shorter commute times. My model uses geographic data from CMS and Mecklenburg County, as well as demographic data from the census. I find that this model significantly increases socioeconomic diversity within the catchment areas of student assignment boundaries for CMS.

## **An Analysis of Kendrick Lamar's Album Release as a Media Event**

Stephen Pacheco and Scotty Poston

For our final project, we have decided to take an all-encompassing view of media literacy and media effects and apply it to a singular media event in order to clarify, elucidate, and analyze the various aspects of that event capable of seeping into and affecting the viewers' subconscious--whether that be framing, cultivation, reception modes, perceived co-viewing, bias and prejudice, racial/ethnic stereotyping, social movement mobilization, and DIY content and online communities. The media event we have chosen is the forthcoming release of Kendrick Lamar's new album, due out by the end of this week. We have chosen Kendrick Lamar because of his cultural, social, and political relevancy and impact - both within his content as well as embedded in the reception and discussion sparked by the album. His last album, *To Pimp a Butterfly*, proved to be more than an album--it was an historical moment in time, which shifted the landscape of not only music but society and popular culture as a whole. It sparked discussion and forced viewers to reflect on the effects of their individual identities in relation to their consumption--what it meant for perceived outsiders (in this case, the white majority) to enjoy a work of art made by a member of a minority group, for that minority group (the insider). We expect his next album to be just as culturally relevant and controversial, and even more widely discussed and intimately and closely considered--all the things an ideal media event strives to do. We hope to analyze the various media effects and elements embedded within the album itself as well as the subsequent reception and critical reviews of the work, which we will compile, analyze, and write about ourselves. We will attempt to set up various social media platforms--Instagram, Facebook, Twitter, and a personal blog/website--to compile and disseminate the critical reviews of as well as our own writing about the album and its reception, in order to test the relative effectiveness of the various platforms in relation to one another. We hope to test which platform is best suited for the distribution, consumption, and analysis of our work at the same time we are analyzing the album itself--therefore analyzing not only the consequences of the media event but also the social media platform best fit for its viewing and discussion. We will create, curate, and run these sites over the course of three to four weeks surrounding the media event in order to capture the full scope of its effects. We believe that this project will not only be analytical, exploratory, and explanatory, but also interactive and dynamic, shifting and maneuvering to adapt to the variety of ways the album itself and its perception and impact may change and grow.

## **Community Relations & Social Change Within the NPHC Community**

Shauna Pointer

The National Pan-Hellenic Council is composed of 9 Black Greek-Letter Organizations who have a large focus on Brotherhood or Sisterhood and Service. Delta Sigma Theta Sorority, Incorporated, founded in 1913, takes pride in the first act of service being the Women's Suffrage March in DC. From that point on Deltas have built schools, hospitals and programs to support boys and girls through middle school and high school. On campus, at Davidson College, the Upsilon Mu Chapter of Delta Sigma Theta Sorority, Inc. has been engaged with the community by hosting a Delta GEMS event, building homes with Habitat for Humanity and packaging meals for Stop Hunger Now. But like our Founders, we are seeking more. Using a three step program that marks the progression of inputs, outputs and outcomes, we can reshape the way in which we think about service, enact our service projects and keep attune to the impact we are making.

## **Student Debt as a Barrier to Millennial's Access to Homeownership**

Samantha Gowing

With a system of affordable housing based primarily on income levels, the qualifications for access to affordable housing exclude groups who cannot access housing due to variables other than income, such as student debt. Policies and programs that promote millennial homeownership aim to address these gaps in current affordable housing regulations. Through an analysis of statistical data and qualitative surveys of millennials leaving college and entering the housing market, my project identifies areas of need and sources through which to provide assistance. In partnership with the Davidson Housing Coalition, my work explores the potential for financial literacy support from local community organizations to serve as a resource for millennials to overcome the existing challenges working against them in today's economy.

## **American Pit Bull Foundation**

Maya Packer, Gloria Nlewedim, Luke Boliek, Destiny Barnes, and Karaz Axam

Veterans and pit bulls are two of the most neglected populations in this country. Everyday 22 veterans commit suicide as a result of PTSD while nearly 3,000 pit bulls are euthanized in shelters daily. The American Pit Bull Foundation (APBF) has taken on the challenge of preventing both through their newest program Operation Sidekick. Through the application of communication theories, our team consulted with APBF and provided communication proposals to help better spread the word of their mission as a preventative care non-profit. Our main goals were specifically to focus on improving storytelling and increasing fundraising through a social media presence, connecting with social and service organizations on college campuses, and developing interactive programs that educate and entertain donors.

## **Create Your Own Customized Workout Plan: A Community-Based Intervention to Increase Physical Activity in Young Adults**

Tiffany Ruan, Katharine Franz, Peter Haugen and Dr. Lauren Stutts

Since the 1980s, the rates of people who are overweight or obese have been growing exponentially, especially among the adolescent and young adult populations. This has become a problem of concern, because being overweight or obese early in life may significantly increase the risk of becoming obese as an adult. Additionally, our nation's young adults are beginning to display diseases connected to obesity that have historically been limited to adults, including cardiovascular disease and Type 2 diabetes. This community-based intervention aims to create a workout plan for college students and young adults who are struggling with reducing or maintaining their weight. We created a website that provides an easily accessible workout plan for individuals who enjoy going to the gym or those who prefer to work out at home. Furthermore, we designed workouts that will help individuals strengthen their lower body, core, and upper body. We hope that our project will ultimately help young adults become more active and reduce the risk for health problems connected to obesity within our communities.

## **Community Baby Shower with Queen City Cocoa B.E.A.N.S.**

Annie Sadler, Brionna King and Claire Kane

As a part of the Contradictions in Contemporary Motherhood course, we volunteered with Queen City Cocoa B.E.A.N.S. to put on their It's Only Natural community baby shower. Queen City Cocoa B.E.A.N.S. (Breastfeeding, Education, Advocacy, Normalcy, Support) is a nonprofit sponsored by the North Carolina Breastfeeding Coalition based in Charlotte, NC. QC Cocoa B.E.A.N.S. works specifically with the African American community in the area to educate and empower families and their community to support breastfeeding as a cultural and social norm. The baby shower, co-sponsored with the Mecklenburg County Health Department and the WIC program, is an educational event on the benefits of breastfeeding for new and expecting families in the Charlotte area. The shower will consist of a 90-minute presentation of the It's Only Natural materials listed on [womenshealth.gov](http://womenshealth.gov), which are designed to help African American women and their families understand the health benefits of breastfeeding ([womenshealth.gov](http://womenshealth.gov)). The shower includes food, donated giveaway items, along with games and prizes. Participants are also invited to attend QC Cocoa B.E.A.N.S.'s monthly cafes to meet with other new moms and their families.

QC Cocoa B.E.A.N.S, comprised entirely of volunteers, uses a holistic approach to promoting breastfeeding reflecting the diversity of their volunteers as doulas, dietitians, health educators, lactation consultants and peer counselors. QC Cocoa B.E.A.N.S. hosts monthly cafes bringing together expecting and current mothers as a support network to share personal stories about breastfeeding and motherhood which serves to share personalized knowledge of breastfeeding amongst the members.

**Youth Enrichment, Empowerment, and Training Freedom Schools Project**  
Ryan Samuels

The Youth Enrichment, Empowerment, and Training Freedom Schools Project aims to supplement the established Freedom Schools program with a proposal to make it year-long. The Freedom Schools program is a national summer program funded by the Children's Defense funds that empowers young students and inspires them to make a difference in themselves, their family, community, country, and world through hope, education, and action. One of the Freedom Schools sites currently resides in Davidson, North Carolina at the Ada Jenkins Center over the summer. I am offering a supplemental proposal of change to the program to make it year-long that would occur once a week. This change would involve providing weekly tutoring and empowerment activities by former summer interns or students from Davidson College. Similar to the summer program, it would also provide informational, training sessions to the parents and guardians of the students. These sessions would be led by the director of the Freedom Schools Program and former summer interns who will discuss different ways to better their families such as tips for financial management, the need for civic engagement, and ways to better their child's future. Overall, the Youth Enrichment, Empowerment, and Training Freedom Schools Project looks to attack the achievement gap found in public schools and offer additional help to foster young, prosperous students to become the leaders of the next generation.

**Gen-One Charlotte**  
Kayla Seymour

GenOne Charlotte is a non-profit that works with first generation college students in Charlotte Mecklenburg Schools to give talented low-income students a roadmap to and through college. Based on our coursework in COM 495, we have created communication proposals for this organization in 3 key areas: social media, donor relations, and human capital. We propose an increase in social media usage, particularly involving students as social media contributors to share testimonies and events. Additionally, we suggest a microgiving campaign incorporated to their social media platforms and website to increase the donor base. Finally, to attract more volunteer mentors, we suggest targeting both retired teachers and current college students in the Charlotte area. Our case study has implications for non-profit organizations in the startup phase.

**DuBoisian World Scholars Society: Educational Empowerment amongst CMS Students**  
Jonathan Sheperd-Smith

The Duboisian World Scholars Society (DWSS) is a student service organizational with a focus educational empowerment and social innovation implemented in the Project LIFT Learning Corridor in CMS Schools. The organization targets low-income minority students with various levels of academic achievement. The pedagogy utilized is based on best-practices utilized by Project LIFT, as well as models developed by Geoffrey Canada's Harlem School Zone. The organization is composed of a network of support for West Charlotte Students, most comprised of Davidson College Students. Students are divided into 5 separate committees working to provide a cohesive curriculum allowing students agency in their own educational experiences: A Mentorship committee that works directly with students, drawing connections between traditional education and real world issues; a Data analytics committee that collects and analyzes qualitative and quantitative data to measure outcomes; a Community Relations committee, that facilitates communication between DWSS and community partners; a Development committee that secures funding for the organization; and an Alumni engagement committee that garners support from Davidson College alum. Ultimately, the goal of the organization is to utilize the resources of the Institution in a way that stimulates individual interest in CMS students that eventually leads to social innovation.

**Individuality in the Classroom**

Henry Siebentritt, Ellie Irving and Josh Sawyer

Across three different elementary school classrooms, the teaching styles and classroom structures indicated high value placed on individuality. Though wide variability existed in the specific activities employed in class, they each promoted individual achievement as opposed to community-based problem-solving. This theme reflects a general approach seen in typical Euro-American education (Chavajay, 2006). Based on our findings from our classroom observations, we suggest teachers implement more group work where not only intellectual, but also interpersonal skills may be developed. Not only would group-work practice valuable life skills, but would also allow students to interact with diverse perspectives in the classroom.

**Davidson Lifeline 101**

Katharine Tabachnick

Davidson Lifeline 101 is a program that is a collaboration between Davidson Lifeline and Davidson College. During every Davidson College freshman's first year they must complete five Davidson 101 courses in order to graduate. These range in topics from diversity to sexual assault and campus police. My proposal for change is that Davidson Lifeline and Davidson College partner to create another Davidson 101 course about suicide prevention. This would be a way to help reduce the stigma surrounding mental health and to inform freshmen about suicide prevention. This course could also then be expanded to create a group similar to the student health advisors, but this group would be a group of students who focused on suicide prevention.

## **Cutting the Queue**

Caitlin Smith, Xan Stoddard and Ricky Davidson

The phenomenon to be modeled is that high school students wait for their food in one long, disorganized line/clump. We are modeling the amount of time that each student takes to receive her food. The goal of this is to minimize the number of students in line at any given time. We will assume that each student takes up roughly an equal amount of space. To this effect, a side goal is to minimize the space that students take up as they wait for food. We can model how long it takes to receive each food group (i.e. a main course, then a side item, then a dessert, then a drink, etc.) We will also presume that the number of students does not change, even though increased efficiency in the process might motivate more students to buy hot lunch because they will not have to wait as long for it. One of our constraints is that all students eat at roughly 11:27am; we cannot divide the lunch period into two different times. Another constraint is the number of students who have to be fed; we cannot notably reduce the number of students in each grade who are ordering hot lunch. Another constraint is that we are limited in the amount of technology we can ask the district to purchase. We will code a simulation that will use Monte Carlo processes to model student time in the queue. This will require us to feed parameters to the method, including the number of total students ordering hot lunch. It is important to note that we will need to be collecting data by ourselves. The impact on the community is clear - high school students will be able to more conveniently obtain their food, which might improve their emotional states during a long school day.

## **A Demographical Analysis of Computer Needs For CMS Students**

Westin Whitmire, Will Robertson and Dustin Atchley

We attempt to use school demographic information to create an algorithm that estimates how many students need computers at any given CMS school. To do so, we will work closely with the nonprofit organization E2D - Eliminate the Digital Divide. Their goal is to provide all students in Charlotte-Mecklenburg schools with access to the technology and digital literacy necessary to succeed in today's environment. They have grown considerably in recent years, but they still face constraints in who they are able to help. Therefore, a major part of their service is to determine which schools and students could benefit the most from access to their resources. Our algorithm will help them understand and assess the needs of every CMS school. We use demographic information provided by E2D to perform a regression analysis that predicts computer need. From there, we use simulation to fine tune the results and understand the real-world effects of our algorithm.

## **Evaluation of Treatment Outcomes in Patients with Testicular Cancer**

William M. Worrilow and Naila M. Mamoon, PhD, Davidson College  
Stephen B. Riggs, MD, Levine Cancer Institute, McKay Department of Urology

Testicular cancer is the second leading cause of death and most common malignancy in young men 20 to 40 years of age with an estimated value of 9000 men diagnosed with this cancer in 2015. Current treatment options include radical orchiectomy, Retroperitoneal Lymph node dissection (RPLND), chemotherapy, radiation, active surveillance and expectant management that involve measuring three serum tumor markers. The educational purpose of my year-long independent study is to gain an in-depth understanding of cancer pathology and molecular aberrations associated with testis cancer while simultaneously obtaining significant knowledge in the clinical aspects and treatment paradigms associated with testis cancer. Through collaboration with a urologic oncologist, Dr. Stephen Riggs, at the Levine Cancer Institute, a local and regional destination for testicular cancer treatment, I have the opportunity to examine outcomes and to follow patients with this rare disease through the creation of a testicular cancer database. Creation of this database using Research Electronic Data Capture software ultimately allows us to assess the efficacy of different treatment modalities, to better inform patients of treatment options, to tailor individual treatment interventions and to guide future improvements in patient care and treatment research.

## Digital Studies

### **“add / drop / swap”: Developing Privacy and Trust in a Web Application for Trading Courses at Davidson College**

Alec Custer

A number of recently popular online platforms, such as Uber, Airbnb, and Tinder facilitate complex and potentially dangerous interactions between users. For users to feel confident entering these communications, software developers must carefully engineer trust both in other users and in the platform itself. This thesis in Digital Studies introduces Swaptime, an open-source web application that helps Davidson students secure seats in high-demand courses by organizing trades with their peers. Swaptime also asks its users to navigate potentially risky transactions, but unlike Uber and similar platforms that coordinate non-repeating interactions between complete strangers, Swaptime targets a student body that prizes accountability and trust between its members. This distinction enables Swaptime as a lens for exploring the challenges involved in preserving an offline community’s values and cohesion in a new online space. By applying prior research on security, trust, and identity online to the advent of single sign-on services (SSOs), this project theorizes that developers can utilize SSO logins to “embed” trust into community technologies.

### **Tingle Producers: Femme, Informal Workers in ASMR**

Violet Degan

Millions of people are watching YouTube videos where beautiful women caress the camera, crinkle make-up bags, scratch hairbrush bristles, and whisper in soft, breathy voices, among a plethora of other activities. The goal? To elicit a tingly and relaxed feeling in the viewer, otherwise known as the physical sensation “ASMR.” ASMR is a relatively new online community, with videos first gaining mainstream popularity on YouTube around 2013. Several research studies question why viewers consume ASMR content, with viewers reporting the videos primarily function as a relaxation tool and sleep aid. This project delves into the other side of the camera, in an attempt to understand how video producers are situated in an informal, digital labor market. Besides generating tingles, they are generating money -- trading on their performances of femininity and parasocial relationships with their audience to monetize their content. Through email interviews with YouTube producers and analysis of ASMR content, this project examines the role of femininity, work, and construction of self in the YouTube ASMR community.

## **Davidson College Hackathon 2017**

Dr. Michelle Kuchera

The inaugural Davidson College Hackathon was held on Saturday, February 4, 2017. Approximately 40 Davidson College students competed in the 9-hour event. The challenge was to create a digital submission that could be used to communicate science to non-scientists. No prior experience was required to participate. Groups of up to four students started from scratch to create their challenge submission over the course of the day. The event ended with product presentations and awards in three categories: Overall, Coding, and Communication. This poster highlights the impressive work of the participants, whose products included games, websites, and more. Event information and feedback data will also be presented.

### **Videogames as an Art Form: How Video Games Allow Us to Express Ourselves**

Jasmine McCarty

<http://nabidancemystory.nabidance.net/start.html>

As a disclaimer, I feel extremely grateful for my life. I grew up with a loving family who did everything they could to support me. I wouldn't be the person I am today without them. This game was challenging to make, because I don't tell my story to people. This was the first time I've outlined the events that took place over the past several years. I had to edit it down for the sake of clarity and time- otherwise we'd be swimming in a pool of senseless memories- but the story remains. Piecing it together helped me understand why I am the way I am a little better. Nevertheless, this story wasn't made just for me, even though it's all about me. Really, this story was made for anyone else who has ever felt misunderstood or alone (cue angsty teen music). I don't think my experience is that unique, and the negative thoughts and feelings I kept inside are definitely not unique. Like my Dad always says, everyone has a sob story if you listen long enough. Ultimately, everyone, even the happiest person you know, has a story - and it's important that these stories be told. It's important to know that you're not alone.

## **The Misalignment of Computers and Curriculum: An Ethnographic Case Study of Computer-Aided Instruction in a Flipped Chemistry Classroom**

Diem Tien Le

Historically, technology in education has been designed to increase efficiency, a philosophy that tends to prioritize the needs of teachers over those of the learners. Because most studies that research CAI use achievement scores as an indicator of success, they fail to account for the complex interactions users have with both computer hardware and software. The research explored the following question: How does CAI facilitate and hinder learning and communication in a flipped chemistry classroom? I chose to conduct an ethnography in the high school where I graduated, which implemented a one-laptop-per-child policy six months prior to the research. Data was collected from in-class observations, semi-structured interviews, and document analysis. My ethnography suggests a transition from computer-aided instruction to computer-dependent instruction that facilitates the test-based pedagogy, which consists of constant monitoring and immediate feedback. Future research should consider ways to better align the changes and use of technology with more authentic forms of assessment.

## **Participatory Guarantee Systems and the Sustainability of Small Organic Farms (shengtai nongzhuang) in China**

Xirui Xu and Guanming Qiao

Despite China's tremendous economic growth, there remains one salient area that Chinese people do not perceive as having improved: the quality and safety of food. Chinese consumers struggle with the question "is it safe" in their everyday food purchasing decisions. This is the context behind the organic/local food movement in China, one that greatly impacts the small farms that struggle to survive economically, faced with competition from Chinese industrial agriculture. Large agro-industrial organic farms benefit from state certifications of food safety, while small organic farms seek to find ways to build trust among Chinese urbanites. Based on fieldwork conducted between 2014-2016 in Shanghai and Beijing, we will explore the myriad, disparate (and often imported) structures and ideologies that food activists in Shanghai use to better connect urban consumers with rural farmers, such as IFOAM-Organics International's Participatory Guarantee Systems. Using social network analysis (SNA), however, we have found that the social context is crucial in determining the success (in terms of sustainability) of the implementation of trust-building mechanisms. We will explore how differences revealed through SNA in the social context of the food movement (which includes food activists, farmers markets, cooperatives, and small farmers) helps to explain different levels of sustainability between farms in Beijing and Shanghai, which can help food activists choose localized approaches that will help make small organic farms more economically sustainable.

# Humanities

## **Mass Communication in Higher Education**

Karaz Axam

My thesis consist of two major components. The first is a literature review of collaborative media communities and the effects on college communities and organizations. The second is an analysis of Davidson College media platforms from surveys which collected data using qualtrics and how students utilize these avenues of communication. This information will inform my research. I hope to refine my understanding of the role mass media communication plays in college academic culture and cultivating community. Focusing on how social network theory effects a higher education model of learning and community.

## **"A Shamrock Could Arise": The Southern Cross and the Creation of Irish Identity in Argentina, 1875-1889**

Elizabeth Cowan

Immigrants from Ireland began settling in Argentina as early as 1806, but the Irish community experienced the most dynamic changes during the 1870s and 1880s as economic prosperity and number of immigrants peaked. The Irish immigrants were part of a broader English-speaking immigrant community in the new Argentine Republic, but they created their own distinct community, most evident in Irish Chaplain Patrick Dillon's founding and publishing of the Southern Cross, a newspaper specifically for the Irish Catholics of Argentina. Because of the relatively small numbers of Irish in Argentina, especially in comparison to immigrants who left Ireland for North America and Australia, few scholars have studied this community, and fewer still have investigated questions of identity and assimilation that are regularly asked of other parts of the Irish diaspora, instead focusing on the economic contributions of the Irish to the growing Argentine Republic. It is my goal to begin to fill this gap in the historiography, and bring the Irish immigrants of Argentina into the larger conversation of the Irish diaspora.

Though viewed as a single cohesive community, the Irish immigrants were socioeconomically and geographically divided between laborers and small sheep farmers living the rural pampas and urban estancieros (large ranch owners) and merchants living in the city of Buenos Aires. The Southern Cross served as an intermediary between the two groups, with its editors emphasizing their shared interests in Argentina and Ireland and a common "Irish" identity to unify the Irish immigrant community. My project investigates the creation and negotiation of a communal "Irish" identity by these different parts of this immigrant group, namely between the urban editors of the Southern Cross and their rurally-based audience. Looking primarily at the Southern Cross, I argue that an attempt to create an Irish identity was based on Irish Catholicism, growing diasporic Irish nationalism and cultural pride that characterized other parts of the Irish diaspora, and an engagement with both Argentine and Irish politics to serve the Irish-Argentine community's specific interests in both countries.

## **Rainclamation**

Erin Davenport

Rainclamation is a collaborative installation art project that is displayed next to the elevators in Duke and Belk dorms. The art is used to reclaim the space around an elevator from an area of stress and stigma to one of calm and beauty. Thus, while the primary audience of this project is members of the disabled community, it can also serve to remind others of the humanity in disabled experiences by bringing an artistic element into a space otherwise thought of as merely functional. The medium of Rainclamation is wooden panels with melted wax. The abstract wax designs are inspired by the question of “what would rain (or water) look like running through color?”. Thus the design incorporates another level of reclamation, taking rain from a source of significant stress for people with physical disabilities and transforming it into the source of beauty. Also painted on each panel is erasure poetry derived from physical education manuals from the 1950s. The original manuals included letters emphasizing physical fitness as an essential attribute. Our project takes those documents, the false universality of which erases disabled bodies, and erases them, resulting in poignant poetry.

I hope to further explicate the creative process behind this work, as well as review linkages to queer theory. I want to discuss the positionality of the viewer and explore how viewers may bring multiple perspectives to bear in their interaction with this art. I will explain how this project is derivative of my personal experience with, and concerns regarding, disability disclosure in public spaces, and invite others to think about ways they can transform their personal experiences into public art and activism. I want to highlight partnerships at the college, such as my collaboration with fellow student Sarah Gompper, and our work with the College Archives, English department, and RLO.

## **“We Want Able Blacks”: The Role of African Slavery in the East India Company, 1658-1757**

Ela Hefler

This project examines the East India Company’s relationship to African slave labor prior to the Battle of Plassey (1757), arguing that the EIC’s trade and state-building efforts were inextricably linked by the Company’s dependence on African slave labor. Examining the slave trade, I argue that the Company’s comparatively-small trade volume was not indicative of slaves’ significance to the Company, rather the trade’s volume was a direct consequence of the specific and vital role African slaves played within the Company-State structure. Unlike the tea, cloth and pepper trades, which were driven by external demand, the Company’s trade in slaves was a direct response to their own internal demand for labor. By being highly selective in their slave cargos, and by grafting the slave trade into their established shipping network, the EIC managed to sustain an otherwise economically inviable trade volume. Without African slave labor the East India Company would not have had the military force, infrastructure or population necessary to establish itself as a Company-State sites like St. Helena and Bencoolen. It is only through the labor of thousands of African slaves that the East India Company had the structural foundation necessary to become a colonial power in the nineteenth-century.

**The First Ember and a Mind's Plight: Translated Stories by Ya'aqub Bilbul (Yaakov Lev)**  
Arielle Korman

The exodus of the Jewish population from Iraq to Israel in the 1950's signified the end of an era, one that had lasted over two thousand years. Jews had long been part of Iraq and Babylonia. They had contributed to politics, culture, and specifically Arabic literature. Decades later, the average Western reader does not associate Jews and Iraq. Iraqi-Jewish literature written in Arabic is scarcely known or found, as most Iraqi Jews began to write in Hebrew upon immigration to Israel. The stories and poems translated in this collection come from one Iraqi-Jewish writer, Ya'aqub Bilbul, who wrote them at the age of seventeen. Bilbul represents one of the last generations of Iraqi Jews who grew up feeling their place was within Iraqi society. He writes in elegant formal Arabic. His stories pay homage to Baghdad and to the diversity of Iraqi culture. They represent a time and place in which the labels "Arab" and "Jewish" were not in conflict and could more easily exist within the same person.

**Study Abroad: My Travels through Tribalism and Terror**  
Dakota Morlan

We all live within our own bubbles. On college campuses and in small towns, it is difficult to connect with that which we are not a part of - no matter how many times it may grace our Facebook feed or favorite news source. Yet, sometimes, circumstance thrusts us into an entirely new reality, and we are faced with hard, human truths which we may never have wished to know. How do we reconcile these truths? When we are suddenly awakened to some of the darkest horrors the world has to offer, how do we find and maintain hope? This book aims to honestly capture this struggle, exploring the ugliest fears that reside within us, as well as the joys and triumphs through which we, humanity, find redemption.

## **Los Desterrados: How Cuban Exiles in New York City Led the Revolutionary Movement Against Spain, 1889-1898**

Andres Ramos

Cuban separatism was a revolutionary movement that removed Spanish colonial rule from the island. It was born in the 1840s in the form of annexationism, annexation to the United States. In the second half of the nineteenth century, separatism became an independence movement. Separatism was not only propagated and molded by Cubans on the island, but by those in exile as well. The United States hosted most of those exiles and the political groups they formed to foment public sympathy and solicit donations. These Cuban juntas were active during the period of the three Cuban wars for independence, 1868-1898. Furthermore, the final War of Cuban Independence (1895-1898) was organized and paid for by the exiles. While Floridian exile communities have seen insightful publications in recent decades, the New York one has not. New York was home to the greatest concentration of leaders and political groups, so I contend it was the most important city outside of Cuba for the separatist movement. This project studies the Cuban exile community in New York City during the 1890s and their separatist activities; it also hones in on the black Cuban intellectuals in the city who were also prominent leaders in the movement and have not yet received the scholarly study they deserve. The ways the exiles raised money, formed societies, created support in the American public and Congress, and lobbied the federal government undermines the traditional understanding of immigrant groups, diplomacy, and sovereignty. These were transnational actors who had a disproportionate effect on American foreign policy, which is evident in the American intervention in the final war of Cuban Independence in 1898.

### **Poetry BroadSides: A Collaboration between the Poets of English 303 and the Printers of English 345**

Ben Corso, Alex Gould, Andrey Krachkov, Leah Mell, Elijah Midgette, Maurice Norman, Emma Rose Parker, Bean Rodriguez, Isabelle Sakelaris, Sana Alimohamed, Taylor Brendle, Chris Brooks, Grace Cain, Kaiya Carter, Lauren Crane, Sarah Cullen, Megan Cypcar, Olivia Daniels, Ethan Faust, Adam Ferraz, Eddie Garcia-Alamilla, Kaycee Gass, Charlie Goldberg, Alex Gould, Maeve Hammond, Crystal Ibarra, Ellie Irving, Mila Loneman, Annie Maisel, Daniel Martin, Lauren McFayden, Caroline Miller, Emi Moore, Sam Ortega, Nick Pearson, Isabelle Sakelaris, Amanda Scott, Hannah Sommerlad, Severine Stier, Darby Williams

These broadsides are the products of collaborations between students in two English courses, "English 303: Advanced Poetry Writing" and "English 345: Book Culture." Trading drafts and prints, the printers (in groups) and the individual poets were charged with responding to opinions and ideas and instructions with every new step—that is, having to make changes in their medium based on the work of others, from printers to poets and back again, and then making more changes to accommodate new results. It was a thrilling, discomfiting process, and truly collaborative, as everyone's work was transformed.

## **History, Memory and Identity in the Works and Biographies of Thomas Medicus and Jagoda Marinić: was is Deutsch in Deutschland Now.**

Jackson Allen, Val Bruder, Beth Foote, Katie Hines, Matt St. Lawrence, Amanda Lee  
(German Studies 260: Introduction to German Cultural Studies, Fall 2016, Dr. Scott Denham)

German cultural studies is crucial to understanding German identity and politics. In December of 2016, Davidson College sent us to two German cities, Gunzenhausen and Heidelberg, to learn more about how immigration can define a nation, how history and memory inform modern identity, and about the role of culture in politics. During the semester we read cultural studies theory and works by authors Thomas Medicus and Jagoda Marinić. During the study trip we interviewed Medicus in Gunzenhausen and Marinić in Heidelberg. Our endeavors and research cultivated in us a spirit of not only scholarship and learning, but also of the importance of the universal push towards belonging and self-identity. Through our discussions with Medicus and Marinić, we delved into the the German experience with these ideals.

Thomas Medicus explores the topics of history and collective memory in his works *Heimat: Eine Suche* and *Verhaengnisvoller Wandel*. Medicus was born in 1953 in the small Franconian town of Gunzenhausen. His book *Heimat* deals with his childhood and adolescence in Gunzenhausen and his attempts to reconcile his memories with his later discoveries of his town's past as a pioneer of Nazi support. We met with and interviewed Medicus after reading *Heimat* to learn more about how the town has worked through its past and how history informs modern democratic citizenry.

Jagoda Marinić's parents immigrated from Croatia to Germany in the 1970s as guest workers. Though Marinić was born and raised in Germany, she was not considered to be a German citizen while growing up due to Germany's complex citizenship laws. Marinić later became a novelist, and evolved into a political activist and author, dealing with questions of modern German identity, immigration, and politics. Her views and works are influenced heavily by her status as a *Bildungsinlaenderin*, someone who lives in Germany and is neither a citizen nor ethnic German, yet had an entirely German education. Jagoda's writings express her view that nationality and cultural identity are determined not by ethnicity and heritage, but by participation in the national discourse and society.

### **Hand-bound Letterpress Miscellany Books**

Sana Alimohamed, Taylor Brendle, Chris Brooks, Grace Cain, Kaiya Carter, Lauren Crane, Sarah Cullen, Megan Cypcar, Olivia Daniels, Ethan Faust, Adam Ferraz, Eddie Garcia-Alamilla, Kaycee Gass, Charlie Goldberg, Alex Gould, Maeve Hammond, Crystal Ibarra, Ellie Irving, Mila Loneman, Annie Maisel, Daniel Martin, Lauren McFayden, Caroline Miller, Emi Moore, Sam Ortega, Nick Pearson, Isabelle Sakelaris, Amanda Scott, Hannah Sommerlad, Severine Stier, Darby Williams

This series of traditionally printed and bound books was designed, handset, and relief printed according to the traditional techniques of the first centuries of print culture. The students of ENG 345 "Creating Book Culture" created this series as a reflection on the technologies and structures that preserve information before the rise of digital technologies of design and replication. The pages of these books reflect the students' semester-long study of the history of the book and of the technical processes required to create and preserve them.

## **International Experiences**

### **Rock, Wall, Tomb**

Kerry Honan, Austin Kistner, Arielle Korman, Andrew Rikard, and Sara Aziz

We are a group of students representing different academic disciplines and religious/spiritual traditions, and we have met weekly over the course of the semester to explore Jerusalem as an epicenter of religious pilgrimage. In particular, we chose to focus our study on three Old City sites that are central to the Abrahamic traditions: the Church of the Holy Sepulcher, the Kotel (Wailing Wall), and Haram al Sharif (al-Aqsa Mosque and Dome of the Rock). The course culminated in a spring break trip to Jerusalem (including five students and three faculty) during which we visited and revisited each of these sites, together and individually. The opportunity to make firsthand observations, interact with diverse locals and visitors, and experience “sacred” spaces through sight, sound, smell, and touch, transfigured our perspective on the Jerusalem we had constructed academically. Through physically engaging with the sites, and exploring their complex histories and politics, we gained a more nuanced and personal understanding of what it means to be a pilgrim. Since returning to campus, we have been collaborating to create a multimedia website that captures our personal and academic reflections. In addition, we are currently producing a syllabus to be used for a future Davidson course on these topics.

### **"Bailamos en Desamor" ("We Dance in a Lack of Love")**

Natalie Skowlund

I began this study with the intention of exploring the question, how do female Bolivian writers interact with social justice themes through their writing, especially related to issues that women confront living in a patriarchal society? By the end of my study, however, I realized that in interviewing a literary community as diverse as that of female writers in Bolivia, to focus specifically on themes of social justice was difficult. Therefore, instead of only emphasizing the theme of social justice in my interviews, I tried to leave room so that the writers could speak about the concerns, ideas and beliefs that they found to be the most pertinent to their writing today. My study is, ultimately, more an exploration of the most relevant current topics for female writers in Bolivia, including the impact of globalization in their writing, the influence of female identity in their written works and the role of literature in modern social change efforts. I try to give voice to the variety of perspectives of female Bolivian writers, and I also include information obtained from interviews with figures who are related to the Bolivian literary community, and/or are involved in activism surrounding women’s rights in Bolivia, in order to encounter opinions beyond the boundaries of the female literary community in Bolivia. More than provide “results” of my study, I would like to recognize this study as a path to enter into discourse with this community little-known in Bolivia, and even lesser known outside of the country. The information I obtained from these authors represents a diversity of opinions, hopes, worries and beliefs that reach towards new questions and thoughts about what it is like, and what it means, to be a female author in Bolivia today. My expectation is that this study will not give definitive facts about this literary community, but rather influence others to think about the ideas that these writers present, and perhaps search for and read their written works with a new appreciation for their manipulation of the written word.

**Factors Influencing Efficacy of Provision of Maternal and Reproductive Health Care:  
A Qualitative Analysis of Extra-Governmental Organizations in Nairobi, Kenya**

Rachel Ruback

Background: Maternal mortality is a global health epidemic with crippling economic and social consequences. It impacts women, their families and communities alike. The death of a mother increases the risk of child mortality, decreases the likelihood that surviving children will finish school, and creates a financial burden, as the family must somehow make up the income brought in by the mother and the hours of housework she completes. Many factors, such as overburdened health care systems and government corruption, prevent governments from giving the issue the attention it deserves, especially in the low-income world. As a result, extra-governmental organizations often play a key role in the reduction of maternal mortality. Kenya came nowhere near meeting the target reduction set by the United Nations Millennium Development Goals, which aimed for a three-quarter reduction in maternal mortality in all countries. Extra-governmental organizations play a vital role in filling in gaps in access to care. However, there are inefficiencies in the implementation of global health services. Objective: This research aims to identify key aspects within the economics, infrastructure, and social relations of the organization which allow for or hinder the efficacy of extra-governmental organizations working on issues of maternal and reproductive health, which could be used to improve implementation of services. Methods: In this study, a combination of semi-structure interviews and participant observations were used to complete qualitative analyses of five extra-governmental clinics which offer maternal and reproductive health services. These analyses were then compared to identify their successes and failures, and what contributed to those results. Results: Six key sub-themes of successful organizations were identified within the three major thematic areas. Economics included the funding and price of services. Infrastructure included evaluation and client evaluation and identification of client needs. Social relations included education and social interventions.

# Mathematics and Natural Science

## Visualization of the Double Slit Experiment

Josh Betts

The goal of the project is to create a 3D visualization of the double slit experiment built in vPython. The double slit experiment is incredibly significant to the understanding of the field of quantum physics, but can be difficult for people unfamiliar with the field to understand. A full 3D visualization of the experiment would greatly improve understanding to people new to the field. The most-recently completed version uses a pseudo-random number generator and dynamically calculated probability curves to create a 2D plot of the final position of simulated particles, built in Python. Values such as the width between the slits, the distance between the slits and the wall, and the wavelength of the particle are all manipulatable as the probability curves are dynamically calculated. The final project will essentially be a rewrite of the code in vPython, with the probability curve visually represented as waves.

## The Importance of Abundance to Local Extinction Caused by a Disturbance in Freshwater Communities

Ryan Almeida and Dr. Kevin Smith

Understanding the mechanisms that contribute to local and regional extinction of species is an essential goal of conservation biology and ecology. In particular, a critical question is whether extinction processes are primarily selective and based on species traits, or are primarily stochastic and therefore based strictly on species abundance. To determine the importance of abundance and stochastic processes in species' extinction risk, we used a null model approach to analyze local macroinvertebrate extinctions from a mesocosm experiment in which predatory green sunfish (*Lepomis cyanellus*) were added. Mesocosms were surveyed for macroinvertebrate richness and abundance prior to and after the addition of sunfish. Our null model follows a rarefaction approach that assumes species loss is determined by the random removal of individuals following a disturbance.

Our preliminary results provide evidence for both mechanisms of extinction. We compared the expected number of extinctions based on our rarefaction simulation to the observed number of extinctions after both time periods. Plots of observed extinctions vs. expected extinctions demonstrate that in general, more extinctions occurred in treatment tanks than expected by the null model. However, linear regression analysis indicates that null-expected stochastic extinction is a significant predictor of observed extinctions in the first post-treatment survey ( $p = 0.039$ ,  $r^2 = 0.27$ ). This result suggests that abundance is a primary determinant of species' extinction risk and that local extinctions following a disturbance may be driven by stochastic processes that are masked by additional selective extinctions that would not be predicted based on abundance alone. Although the importance of abundance to extinction risk has long been recognized, we suggest that it is essential to explicitly account for stochastic extinction processes prior to inferring selective or deterministic extinction processes.

## **RNA-Seq-N-Find: A Web-Based RNA-Seq Training Tool**

Dustin Atchley

Since the completion of the Human Genome Project and the beginning of the “-omics” era, biological technology and biological computing have seen an acceleration of advancement to help collect and interpret the massive new datasets that are now available. Here we work with one type of “-omics” data, produced by a Next Generation Sequencing (NGS) technology called RNA-Seq. RNA-Seq analyzes a cell’s transcriptome, which is the portion of the genome that is transcribed at a given instant for a particular cell type in an organism. RNA-Seq-N-Find is a combination of a bioinformatics pipeline and accompanying online modules designed to train the researcher to manipulate a raw RNA sequence file and extract genes and gene pathways of interest based on differential expression. The pipeline will be accessible within the Galaxy interface, which was designed to allow users with no computational skills to do bioinformatics analyses. The online modules include tutorials detailing the choices one might face throughout the process of differential expression analysis using RNA-Seq data. Researchers using the Galaxy interface and our modules will be empowered to use the same techniques with data unique to their research.

## **Using Tree-to-Tree Comparisons to Rank Glycan Structures**

Andy Baay

Glycans (carbohydrates) are one of the four major building blocks of biology and are critical contributors of diversity through post-translational protein modifications. The branched primary structure of glycans differentiates them from linear molecules in biology such as nucleic acids or proteins. Bioinformatics tools developed for analyzing linear molecules are not applicable to the analysis of glycans, so new tools that accommodate branching structures must be produced. Here we present a structure comparison algorithm as a contribution to the growing collection of bioinformatics analysis tools available specifically for glycans. This analytical tool represents glycans as mathematical trees and applies a tree-to-tree comparison algorithm to produce measures of structure similarity. There are many applications where comparing glycan structures can prove useful; we evaluated two: ranking glycan search engine results and lectin binding affinity prediction. This algorithm was able to rank glycan search engine results in a logical way where structures with the highest similarity appear earliest in the results but achieved only partial success in predicting lectin binding affinity. In the future, altering parameters within the algorithm may produce better results for binding affinity predictions.

## **Differential Expression Analysis of Postprandial Python Bivittatus Reveals Highly Controlled Mechanism of Cell Proliferation and Tissue Restructuring**

Nicholas Balanda, Dr. Laurie Heyer and Dr. A. Malcolm Campbell

The Burmese python demonstrates an extreme physiological response to feeding. Understood to be a mechanism to optimize metabolism of a large meal after prolonged period of fasting, the Python bivittatus experiences rapid postprandial organ enlargement (as much as twice internal organ wet mass). This experiment aimed to uncover genes involved in organ growth response using RNA sequencing differential expression analysis between fed and fasting snakes. Previous research examined 6 hours postfeeding, but we looked at the more immediate response ‘upon constriction, before swallowing prey’ and ‘immediately after swallowing prey’. Our results demonstrate the very rapid and highly controlled nature of the postprandial response, enabling regulated cell proliferation, adaptive hypoxic cell survival, and improved tissue restructuring after mass apoptosis. The quick transcriptional response indicates that food reaching the stomach is not the trigger and we propose hormonal and/or neurological stimuli initiate the transcription cascade that leads to organ growth.

## **Predicting Key Drug Properties from Chemical Structure**

Tiag Bhamber and Dr. Erland Stevens

Volume of distribution and clearance are both pharmacokinetic properties that determine the half-life of molecules. Currently, these properties cannot be accurately predicted without collecting experimental data. New methods for predicting these properties could facilitate the development of promising molecules for advancement into clinical trials. Therefore, we have performed correlations between known structural features of molecules (e.g. charge, polarity, surface area) and experimental values for volume of distribution and clearance. These correlations have allowed us to develop a model for predicting the half-life of a molecule based solely on its chemical structure.

## **Synthesis of multivalent glycooligomers for studying carbohydrate-protein binding**

Sarah Eisenach and Nika Fendler

One major limitation in studying carbohydrate-protein interactions is the low binding affinity of individual carbohydrate subunits. Molecular scaffolds that display carbohydrates in a multivalent fashion are useful for studying these processes. However, the lack of methods for the preparation of well-defined molecular scaffolds remains a major limitation. In this poster, we describe how our research aims to overcome this limitation through the synthesis and characterization of a series of well-defined and tunable glycooligomers that can be systematically designed to probe carbohydrate-protein interactions.

## **The Effects of Cholinergic Loss in the Septodentate Pathway on Long-Term Potentiation Induction in the Perforant Path of Sprague-Dawley Rats: A Case Study**

Katherine Belanger, J.S. Isaac, and Dr. Julio Ramirez

Long-term potentiation (LTP) is considered a neurophysiological correlate of learning and memory characterized by strengthening of connections between neurons and increased synaptic efficiency. LTP has been demonstrated to occur in the hippocampus, which has an established role in learning and memory. The dentate gyrus (DG) of the hippocampus receives innervation from the medial septum/nucleus of the diagonal band of Broca through the septodentate pathway (SD). In addition, the entorhinal cortex (EC) innervates the DG via the perforant path (PP). The role of the SD, particularly the cholinergic division, is considered essential in memory function. Glutamatergic and GABAergic neurons are also located in the SD, thus to examine the role of cholinergic SD neurons we performed extracellular electrophysiological recordings in rats that had received an injection of a selective cholinergic neurotoxin, 192-IgG saporin, in the septum of male, Sprague-Dawley rats. After a three-week recovery period recordings were obtained from the DG following paired-pulse, heterosynaptic stimulation of the septum (preliminary, conditioning pulse) and EC (test pulse). Population spikes in the DG in response to PP stimulation were measured at stimulation intensities of 25%, 50%, 90%, and 100% as determined by an input-output curve. The impact of the septal stimulation on the DG response after PP stimulation was explored from 40 min before and up to 130 minutes after LTP was induced by a high-frequency-stimulation tetanization protocol. Four different interpulse intervals of 30, 60, 100, and 500 ms were used to characterize the effect of septal stimulation on the PP response. The cholinergic neuronal marker acetylcholinesterase (AChE) was labeled in DG to determine the extent of loss caused by IgG-saporin. The degree of AChE labeling in the DG (quantified using optical densitometry) indicated there was one successful case, 1758, of cholinergic SD neuronal deafferentation of the DG. Interestingly, electrophysiological analysis indicated a depression of the PP after a high-frequency tetanization protocol in this one case. This indicates that the cholinergic neurons of the SD pathway are involved in LTP induction ability within this neuronal system.

## **Interactive Optics Simulations Using Python**

Julian Bertini

This project will be comprised of a collection of interactive optics simulations. More specifically, there will be two simulations that model the reflection of light at a spherical surface and two simulations that will model light propagation through converging and diverging lenses. An object in optics is a source of light. Realistically, such an object would extend in three dimensions, but in these simulations I will only consider idealized point objects that have some amount of height and negligible width. In addition, for these simulations I will use idealized thin lenses, where the refraction significance of the thickness of the lens can be ignored.

## **Simulating Shepherd Moons**

Ella Brewer-Jensen

I will write a program in Python involving the orbit of two moons around a planet. Many planets in our solar system have moons. Sometimes, when there is excess dust and icy or rocky debris orbiting the planet as well, the moons can help herd this dust into defined rings. For example, two of Saturn's moons, Prometheus and Pandora, define Saturn's F ring. They do so by orbiting on either side of the dust ring. Any dust that tries to escape is either absorbed by the moons' gravitational pulls, or is pushed back into the ring by the different speeds of the moons. The outer moon travels at a relatively fast speed, thus speeding up any stray particles of dust that try to escape the ring, swirling them back towards the ring. Similarly, the inner moon travels slower, slowing down any dust that tries to escape the ring by traveling in towards the planet.

For my project, I will model the shepherd moons Prometheus and Pandora orbiting Saturn and herding dust particles between them into a ring. I will use vpython to create a 3D simulation of the planet and moon system. The moons orbit at slightly different speeds and different distances from the planet. In my model the orbits will be circular, since that is a sufficient approximation of a realistic elliptical orbit for this exercise. I will then model small particles between the moons' orbits to show the dust ring they help contain. The dust will look like a cloud or ring-shaped plane made up of dots. I will animate them so that they move in or out towards the moons and stick to the moons if they collide due to the moons' gravitational pulls. I will also attempt to animate the particles so that they can be pushed back into the ring by the moons velocities and motion trajectories. I will include a graph of the moons' and a dust particle's motion to show more clearly how they interact with each other.

This simulation and accompanying graphs will illustrate how the motion of shepherd moons help create rings around planets.

## **Launch Simulation of a Saturn V Rocket**

Henry Brooks

The first step of almost any space mission is to place a satellite or capsule into high Earth orbit, a task that can only reasonably be accomplished with a multi-stage rocket. The mathematical concepts necessary for achieving a circular orbit of the desired altitude at the desired time are quite complex, so the goal of this simulation is to reduce such complexities down to a visual representation of the launch and orbital insertion of the rocket. Specifically, the motion of a Saturn V rocket, of the type that sent astronauts to the moon, will be examined. This visualization should allow viewers to grasp the nature of some of the maneuvers necessary to reach the moon, while additionally giving a sense of the altitudes and speeds that these rockets reached.

## **A Novel Role for Notch in Neuronal Connectivity in *C. Elegans***

George Brown

Notch receptors are conserved transmembrane proteins that regulate key developmental processes and promote stem cell proliferation and renewal. Defects in the Notch pathway are especially evident in neurons, where Notch signaling remains active in the nervous system from birth to adulthood. These receptors are highly conserved across many species, including humans, and have been highly described in the model organism *Caenorhabditis elegans*. In our research, we documented the development of light touch sensing mechanosensory neurons at the nerve ring in *C. elegans*. We first observed that *sup-17/ADAM10* animals, a Notch pathway mutant, had significantly higher rates of ALM-AVM nerve ring breakage than wild type animals. This observation led us to test other Notch mutants to determine if the pathway was involved. Multiple different Notch pathway mutants were crossed with animals with an integrated transgene that expresses GFP in mechanosensory neurons (*zDIIs5*) to visualize their nerve rings. Significantly higher rates of breakage were found in all Notch mutant animals when compared to wild type, which suggests that the Notch pathway is involved in ALM-AVM nerve ring development. Genetically identical Notch mutants did not exhibit different break rates across life stages. Therefore, the defect is likely to be developmental rather than degeneration or a developmental delay as would have been indicated by increases or decreases in break rates across time respectively. We next need to identify which cells Notch works through to promote ALM-AVM nerve ring development. To do so, we are currently performing tissue specific rescue experiments for both the mechanosensory neurons and the surrounding glia. We are also in the process of determining if the defect affects the normal behavior of the worm using a light activated protein called channelrhodopsin. By expressing this protein in the animals' light touch sensing mechanosensory neurons, we can use blue light to control the activation of ALM and AVM neurons and make powerful conclusions about any behavioral differences in Notch mutant animals.

## **Characterizing Head Content Contributions to the Particulate Matter of Hookah Smoke**

David DeGroot

The use of waterpipe in the United States is increasing in a largely unregulated market. Little is known about the particulate matter size distributions of waterpipe smoke, though much of this particulate matter is able to penetrate into the lungs. Particulate matter distributions were characterized for trials in which the head contained various components of hookah shisha to determine their contribution to the size and concentration of hookah smoke. Data suggest that glycerol particles peak between 200 and 300 nm in diameter, while flavorants contribute particles peaking between 100 and 200 nm in diameter. Tobacco leaves appear to produce particulate matter in a bimodal distribution peaking below 5 nm in diameter and at about 225 nm in diameter. Further research needs to be conducted to determine the concentration of particles produced below 5.6 nm and above 560 nm in diameter.

## **Simulation of a Pendulum**

Ruiming Chen

This project simulates the movement of a simple gravity pendulum and allows the user to explore the factors that influence the frequency of the pendulum. The program allows the users to input several factors that may or may not influence the frequency of the pendulum: the length of the string, the initial angle of the mass, the planets (with different gravitational constants) and mass of the object. The program will then generate an animation of the pendulum and the trace of the mass under the chosen conditions.

To make the animations more educational, the program will also offer comparisons between the default pendulum and the user-selected pendulum to show whether the user-selected variable contributes to the (proportional, anti-proportional) change of frequency. What's more, the program will provide graphic analysis of the trajectory of the mass and calculations of the angular frequency, the frequency and the period of the pendulum.

If possible, this program will also incorporate the possibilities of air resistance to make the simulation more realistic. This addition involves another user input variable to generate one more force that influences the movement.

The program will be created using Python programming. The 3D animations will be designed by using VPython module, the graphic analysis and plotting will be generated by pylab module and the other sample calculations by built-in functions in Python.

## **The Physical Properties of the Particulate Matter of Waterpipe Tobacco Smoke**

Sarah Coats

Waterpipe smoking has increased in popularity over the last several decades especially among college students. Contrary to popular belief, waterpipe tobacco smoke (WTS) causes a significant health risk to users because of the toxicant content and physical properties of the smoke. Three hundred toxicant compounds have been found and the particles produced are so small that they penetrate deep into the lungs causing adverse health effects. However, there is minimal data examining the physical properties of WTS and the data that has been collected does not provide consistent results.

This project aims to consistently characterize the size and concentration of particles produced in a typical waterpipe smoking session. Charcoal, glycerol, flavorant, and shisha will all be examined individually to determine how each of these components contributes to the particulate matter produced. Preliminary data suggest that charcoal produces extremely small particles with an average diameter around 34 nm, while glycerol, flavorant, and shisha all produce slightly larger, which have an average size of 165 nm.

## **The Relationship Between White-Tailed Deer (*Odocoileus virginianus*) Population Size and Red Maple Seedling Survival Rate**

Noah Constantine

Investigations of many large forest ecosystems have documented that white tailed deer (*Odocoileus virginianus*) populations have reached densities that threaten the regeneration of forest canopy trees throughout much of North America. The Davidson College Ecological Preserve (DCEP) represents a set of small, fragmented forest habitats, and many of these fragments have high edge to area ratios that may foster extremely high deer densities. We conducted an experiment to determine if white tailed deer adversely affected seedling survival of a hardwood canopy species, red maple (*Acer rubrum*), in one DCEP mixed pine hardwood forest. We randomly selected 3 spatial blocks within a 0.5 ha area and established 3 plots in each block. One plot used metal caging to exclude all potential mammalian herbivores, another excluded large herbivores, but allowed entrance by small mammals, and the third was a completely exposed control. We transplanted 50 first year red maple seedling into each plot and then monitored them for survival from June to November, 2016. Red maple seedlings in the exposed plots in all three blocks showed approximately 50% less survival than either of the two caged treatments. The two caged treatments showed similar survival in all blocks. These results suggest that mammalian herbivory has the potential to reduce red maple regeneration in the forest studied. However, the similar survival rates in the two caged treatments could result from a cage effect that discouraged small mammals from entering the enclosures or reflect low levels of small mammal herbivory on red maple seedlings. Results of a follow up experiment suggest that small mammals visit control plots and plots with cages that exclude deer but provide entrances large enough for small mammals at similar rates. Our results indicate that deer may be the main animal source of red maple seedling mortality in the forest studied.

## **Characterization of Waterpipe Tobacco Smoke (WTS) by Attenuated Total Reflectance (ATR) and On-Line Fourier Transform Infrared Spectroscopy (FTIR)**

Austin Crouse

Waterpipe smoking is becoming an increasingly popular social activity in the US, especially among college-age students. Unlike cigarette smoke, waterpipe tobacco smoke (WTS) is passed through a bowl of “filtration” liquid prior to inhalation and is thus often misperceived as a safer alternative to cigarette smoking. However, little is known about the chemical composition of WTS and its potential toxicity. In this work the gas and particle phases of WTS, its condensate, and shisha tobacco coating are examined using Fourier Transform Infrared Spectroscopy (FTIR) under charcoal and electronic heating conditions. Identified organic aerosols found include: glycerol, carbon monoxide, solvated carbon dioxide, and an unidentified hydroxyl or amine stretch. This work serves as a proof of concept, demonstrating FTIR’s potential for use in WTS analysis, but calls for the development of more specific methods with sensitivities capable of identifying the unknown compound observed and further organic components in WTS.

## **Methods Development for Expression of Luminopsin 3 in the Neurons of *C. elegans***

Nicholas Elder

Optogenetics has emerged as a novel method for investigating neural circuits. This method uses light activated or light emitting molecules that have been integrated in neurons to either stimulate neuron firing or to report neural activity. In this project, I am using an optogenetic protein called luminopsin 3 to stimulate a subset of neurons in the model organism *C. elegans*. The crux of luminopsin 3 (LMO3) is a light-activated ion channel called channelrhodopsin. When channelrhodopsin is stimulated with blue light, it propagates action potentials in neurons, making it a valuable optogenetic tool. The LMO3 protein can also act in the absence of external light when a chemical cofactor, called coelanthrazine (CTZ), is present. This makes LMO3 a chemical genetic tool as well. While channelrhodopsin has been integrated into *C. elegans* neurons before, to the best of our knowledge, a dual optogenetic and chemical genetic approach in these animals has not yet been described. Furthermore, no literature exists for the application or introduction of CTZ in *C. elegans*. Therefore, we are developing a method for the expression of LMO3 in the GABAergic neurons of the model organism *C. elegans*. Here, we report a transgenic strain of *C. elegans* containing the construct, preliminary data for the characterization of the construct, and a novel approach for the use of CTZ in a *C. elegans* system. We hope this tool will open up new pathways for research on effects of short term, chronic, and temporal effects of neuron activation on axon regeneration and neuroplasticity.

## **Marine Protected Areas' Effectiveness on Preserving Coral Reef Health**

Sophia Emmons and Dr. Kevin Smith

The coral reef ecosystem sustains some of the highest biodiversity in the world. However, many coral reefs around the world are in decline due to a multitude of factors. In particular, the Caribbean reefs face a variety of other threats, including coral bleaching associated with global warming, habitat destruction, overfishing, disease, invasive species, and microalgae overgrowth. This study aims to analyze if and how one type of marine reserve, marine protected areas (MPAs), affect the overall coral reef health in the Admiral Cockburn Land and Sea National Park located to the south of South Caicos, Turks and Caicos Islands. Researchers used the AGRRA method to sample multiple sites inside and outside of the MPA to determine overall site dissimilarities as well as differences in coral, fish, and benthic species, diversity, and abundance. Reef sites located around the outside of MPAs were significantly different from MPA sites in multiple measure of reef biodiversity. Specifically, there was significantly higher species richness and diversity of coral inside the MPA and a higher abundance and species richness of macroalgae outside the MPA. Overall, these results suggest that the MPA is effective in protecting coral reef health, but it still remains threatened. Threats like global warming cannot be protected against using reserves, they require global action to protect the corals from bleaching.

### **Modeling Charge Carrier Diffusion in Blue LEDs**

Collin Epstein, Dr. Tim Gfroerer, Davidson College and Dr. Yong Zhang, UNCC

Blue light emitting diodes (LEDs) remain subject to widespread research because they exhibit detrimental behavior that LEDs of other colors do not. While most LEDs become more efficient at converting electrical power to light as the drive current increases, blue LEDs only increase in efficiency up to a certain current threshold, at which point they become progressively less efficient. The decrease in efficiency is called droop. Previous research in the Gfroerer lab has shown that when a laser excites a blue LED device, the device emits light from regions that are not directly excited. We investigate this phenomenon by comparing operational conditions under optical and electrical excitation, and constructing a computational model of electron-hole diffusion in the device.

### **Characterization of a *Drosophila* ortholog of SLC25A46 which is required for mitochondrial shaping during spermatogenesis**

Vivienne Fang and Dr. Karen Hales

Mitochondria undergo various shape changes during *Drosophila* spermatogenesis, making this process useful for studying mitochondrial morphology. Abnormal mitochondrial clumping in late-stage spermatid elongation occurs in male flies with two mutant copies of CG5755. A unique stop codon mutation was identified in CG5755 after deficiency mapping of the Z2-3738 strain, tissue expression analysis, and sequencing of the only testis-specific gene within the candidate region. The nonsense mutation was absent from CG5755 in a different strain with the same background chromosome, confirming our gene. Crosses to trigger RNAi knockdown of CG5755 in testes produced males with wild type mitochondrial shaping, but since insufficient knockdown was a possibility, subsequent experiments are incorporating UAS-Dicer for an enhanced effect. We tested for genetic interactions between CG5755 and its broadly expressed paralog, CG8931. Male CG5755 heterozygotes that are hemizygous for a non-lethal insertion in CG8931 (X linked) are fertile, though the insertion may enhance the CG5755 homozygous phenotype. The human ortholog, SLC25A46, was found by other research groups to localize to the mitochondrial outer membrane, to interact with mitofilin, and to be associated with fusion/fission dynamics; SLC25A46 is associated with optic atrophy spectrum disorder and pontocerebellar hypoplasia.

## **Plotting the Flight Path of a Knuckleball**

Andrew Fay

A knuckleball, or a pitch in baseball that has minimal spin, experiences a small lateral force that depends on its orientation. In this situation, were the ball to be rotating slowly, the lateral force would vary sinusoidally, with period equal to one quarter of the period of spin. Because of this phenomenon, a knuckleball tends to change the direction in which it curves during flight. Any baseball fan knows this, and they also know that even some of the best professional hitters have trouble hitting a knuckleball. This project will use python 3 to code simultaneous differential equations for a knuckleball's position in three dimensions with respect to time and plot the flight path of the ball from the catcher's perspective, the third baseman's perspective, and the overhead perspective, with the goal of visually representing how unorthodox the ball's flight path is relative to other baseball pitches.

## **Analysis of Particle Trajectories Around Schwarzschild Black Holes**

Samuel Frederick

Einstein's theory of general relativity is one of the most critically tested and verified modern theories of physical phenomena. General relativity has successfully described and quantified space-time surrounding massive objects, including black holes, which are among the most enigmatic features of the universe. For black holes with no angular momentum, the Schwarzschild metric can be used to describe the curved space-time surrounding the black hole. A Lagrangian can be constructed from the Schwarzschild metric to provide a system of first-order differential equations for describing the motion of a particle surrounding the black hole. Utilizing the computational accuracy of the Runge-Kutta method for differential equation iteration, trajectories were determined for a variety of initial radii and energies. From the Schwarzschild metric, other useful quantities including proper time and coordinate (wristwatch) time were calculated to provide clarification of gravitational time dilation in highly curved space-time regions.

## **3-D Modeling Fireworks**

Clifford Gilman

The purpose of this project is to 3-D model different types of fireworks in order to examine the typical physical properties of fireworks. In completing this goal, visual python coding is used in addition to trigonometric functions in order to examine the way fireworks expand and progress through their explosions. While there are hundreds of types of fireworks, this project examines and models three types, specifically areal star shells, standard fountains, and spinning disk fountains. The project sheds light on the physical properties behind the celebratory phenomenon of fireworks so familiar to us.

## **Modeling CD4 Expression with Short Lived EGFP**

Chika Fujii

The surface glycoprotein CD4 plays an important role in regulating the CD4 T cell development. While previous research has identified the promoter, the proximal enhancer, and the silencer, these elements still do not fully describe the mechanism governing the dynamics of Cd4 expression in developing thymocytes. The Sarafova Lab has identified a regulatory element, termed the Novel Cis Element (NCE). Results of in vitro experiments show that the NCE is most active at the intermediate stage of CD4 T cell development. To better understand the kinetics of Cd4 expression over time, we developed a transgenic mouse model that expresses an enhanced GFP that acts as a CD4 reporter. The EGFP also has a shortened half-life of two hours, which allows for detection of small differences in the EGFP expression at different developmental stages. Through comparing the expression levels of the EGFP between mice with or without the NCE, we expect to see a lowered EGFP intensity in the delNCE mouse strain. The levels of EGFP were measured by flow cytometry analysis and directly visualizing the GFP protein through immunohistochemistry analysis.

## **Investigation of the C-C Bond Coupling of N,O-Ligands in the Presence of Gallium**

Kaycee Gass

A recent result in the Anstey research group noted the coupling of two ligand moieties when brought together by a gallium metal center. This only occurs when the acenaphthene quinone ligand is of the mono-imine variety. This results is in stark contrast to the data that has been collected about related complexes of gallium, but it has precedent in transition metal chemistry. The reversibility, utility, and generality of this chemistry is of interest and will be investigated.

## **Optimizing Your Speed to Win the Race!**

Laura Knapp

This poster codes the physics model of a runner who is competing in a race against last year's state running champion in North Carolina. The program is modeled for a runner of a specific mass competing in a 1600m race. This code accounts for the fact that the runner starts the race from rest, and it calculates for the small period of time it takes for the runner to accelerate from standing to their desired pace. This small portion of time that the runner is not running at her planned speed slightly alters the speed the runner needs to maintain to win the race. Finally, the program shows how changing the final speed affects the power equation of the runner trying to win the race. The user of this code is able to manipulate the final speed of the runner to see how it effects the other kinds of energy the runner will need to exert to still win the race.

## **Modeling the Dynamics of Two-Dimensional Flight**

Martha Gerdes

In this project, we will investigate the dynamics of flight in two dimensions (involving changes in altitude but not direction). For steady-state flight, where there is no change in speed or altitude, the aircraft is subject to the forces of thrust (T) and drag (D) in the horizontal direction, and lift (L) and weight (W) in the vertical direction. These forces must balance so that  $T = D$  and  $L = W$ . For a jet airplane, thrust is primarily a function of altitude, and so it will be considered to be constant for a given altitude below 36,000 feet. It can be found that for a specific altitude, there are two speeds at which T and D are equal; they can be seen as equilibria. We want to find whether these speeds generate stable equilibria or not. For one of the speeds, termed V1, an increase in speed also results in an increase in drag, so the aircraft slows down. If the speed decreases, the drag decreases, so the aircraft speeds up. A displacement from equilibrium, so this speed is statistically stable. For the other speed, termed V2, the opposite is true. Increased speed results in decreased drag, so the aircraft continues to speed up, but decreased speed results in increased drag, slowing the aircraft down even further. This speed is statistically unstable. My project involves confirming the stability and instability of the speeds of 950 ft/sec and 170 ft/sec at an altitude of 20,000 ft. I will also find the lift coefficient for a specific initial altitude and speed. Flight in two dimensions at a certain starting speed (dx/dt) and starting altitude (y) will be modeled using the dimensions specified in the introduction, and the computer will follow the subsequent flight history.

## **Determination of Pyrazines in WTS, Bowl Water and Heated Shisha**

Adam Green

My research aims to provide a compartmental analysis of pyrazines contained in and generated by waterpipe tobacco smoking. This includes added flavorants, pyrazines generated by heating tobacco, pyrazines produced by Maillard reactions, and those filtered out by bowl water. I have worked on developing methods for extracting and concentrating pyrazines from these “compartments,” and I have analyzed these samples using gas chromatography/mass spectrometry (GC/MS).

Previous research suggests that the presence of pyrazines positively reinforces the consumption of tobacco, both by masking the harsh flavor of the tobacco stems and through chemical processes that force more nicotine into the gas phase. This allows nicotine to cross the blood-brain barrier more readily, thusly increasing the addictiveness of tobacco products. Pyrazines are both added to shisha and produced in a typical waterpipe tobacco smoking session, and they can have these effects even in small concentrations. Developing a method that can analyze for pyrazines in small concentrations is therefore of vital importance in studying the health risks of waterpipe tobacco smoking.

## **Choral Music**

Greg Alspaugh

Choral music is an art form that involves multiple individuals singing together to create a collective sound. In this type of music, more emphasis is placed on fundamental tones, non-resonant choral tones, and frequent intensity changes when performing pieces. Though more research has been conducted for solo singing acoustics, the mathematics of Fourier transforms can be used to analyze any sound for frequency and intensity. Fast-Fourier Transforms (FFT) require sound input, and output detailed plots of the sound with intensity on the y-axis and frequency on the x-axis. Combined with Linear Prediction Coefficient (LPC) analysis, which attempts to predict the resonances of the inputted sound by separating resonant sounds from the source characteristics of that sound, FFTs can provide glimpses of a sound spectrum at a given point in time. Spectrographs are computer algorithms that perform a series of FFTs at different times, then displays the results of these FFTs on a three-dimensional graph of time, frequency, and amplitude. Through spectrographs, longer duration sounds can be quantified and analyzed. The overall purpose of this project will be to analyze a piece by the Davidson College Chorale via Fourier transforms, linear prediction analysis, spectrograms, and two-dimensional frequency and intensity spectra.

## **3D-Printed Models for Explaining Organic Chemistry Concepts**

Anna Grumman

3D printed models have long been used to teach difficult chemistry concepts. This project explored the use of 3D printing to create new 3D models to explain molecular symmetry and the reactivity of a steric alkyl halide in a SN2 reaction. Molecular modeling software (Spartan '16) and various 3D computer-aided design programs were used to design the molecule, convert the model to a stereolithography (.stl) file that the 3D printer can understand, and alter the model to show a specific aspect of the molecule. The model was then printed using a Makerbot Replicator 2 printer and post-processed, with sanding tools and paint, to prepare it for classroom use. The models that explained an internal plane of symmetry were designed, printed, painted, and attached to magnets and a mirror to show how the molecule is not chiral. Space-filling models of the SN2 molecules were printed and painted to simulate how the molecules actually interact and show why a sterically hindered alkyl halide will not work in the reaction. This project provided an understanding of how 3D printing works, how to design and print a 3D object from scratch, and how to develop new solutions to problems faced during the process. The 3D models printed could be useful teaching tools in organic chemistry education.

## **Application of SeeDB Clearing Method to *Xenopus laevis* Tadpoles**

Kate Hardin

There are several clearing techniques that have been developed over the past decade that differ in their method of action but the common aim of all methods is to reduce light scatter and increase transparency of tissue samples. Light scatter occurs when there are differences between the refractive indices of the lipid membranes and aqueous intracellular and extracellular fluids. All techniques seek to homogenize the refractive indices of the sample by replacing the aqueous intra- and extracellular fluids with a solution with a refractive index closer to that of the lipid membrane. SeeDB utilizes fructose, which when dissolved in water has a refractive index of 1.490 at 25°C, while the refractive index of lipid membranes is estimated to be between 1.42 and 1.45. This method has previously been applied to brain tissue samples from mice, rats, and songbirds but not to *Xenopus* brains. For this experiment, brains were dissected from 3 to 4 day old tadpoles and underwent the SeeDB protocol. After the three days of the protocol, the brains were visualized under both a dissecting and confocal microscope. Initial comparisons of SeeDB brains to untreated brains show an increase in transparency of SeeDB brains. The goal of developing a protocol for clearing *Xenopus* brains is to allow for the 3-D imaging of structures like dopamine clusters that are currently imaged in 2-D. The initial results of clearing trials are promising and the next step is testing the efficacy of the protocol when combined with immunostaining. One of the advantages of using fructose rather than high index solvents is that it does not extinguish fluorescent proteins which bodes well for its use in combination with immunostaining.

## **Aluminium Bis(imino)acenaphthene Quinone Complexes**

Allison Hunt

A recent result in the Anstey research group noted the peculiar structural motif of a “butterflied” ligand when reduced to the di-anionic catecholate oxidation state. This was noted with gallium as the metal center, and, in an effort to understand how general this motif is, I synthesized analogous aluminum complexes using the same ligand: bis(imino)acenaphthene quinone (BIAN). The various motifs of the aluminum complexes have different properties. Determining exactly what these properties are is important for various purification techniques of the Aluminum complexes, and future complexes synthesized. Crystallization data confirmed that I've isolated the desired tris complex. Separate data from other experiments also indicates that I've made the potassium salt of my ligand, something that didn't happen when the gallium complexes were synthesized. The characteristics of the salt will be of use to future research so researchers can know when this is synthesized and how to avoid it. I am also investigating the electron carrying capacities of the various motifs. I expect them to be similar to that of the gallium complexes, but the electrochemistry data thus far has presented some confounding graphs, which I will address during the next few weeks. Overall, my work with aluminum will lay down the foundation for future research with other metal compounds used as metal centers for the BIAN ligand.

**Relationship between private land use and frog diversity  
on Colón Island, Bocas del Toro, Panama**

Emma Johnson

Tropical islands are globally threatened ecological systems that are exposed to a multitude of different pressures from both anthropogenic and natural sources. Throughout tropical ecosystems, frogs are often one of the most threatened vertebrate groups due to their sensitive physiological characteristics and inability to migrate from a disturbed habitat. Frog populations on Colón Island, the main island in the Bocas del Toro archipelago in Panama, are vulnerable to threats from expanding development and increased forest habitat fragmentation. Through examining frog populations and habitat compositions at five sites with three different land management strategies, I found increased diversity in low disturbance forest sites and a greater similarity in the frog communities between the two recently disturbed sites, suggesting that the pattern of forest succession on Colón is limiting the diversity of frog species that can live in those sites. Variations in diversity between management strategies are highlighted in three frog species, *Oophaga pumilio*, *Phyllobates lugubris*, and *Allobates talamancae*, which can depend on specialized habitat characteristics within sites. Although there is currently more forest habitat that could promote improved frog habitats in future years if the forest continues to mature, the increase in population on Colón Island is continuing to fragment habitats, which could have negative long-term implications for local frog populations.

**Development of a locomotor assay for the measurement of hyperactivity in zebrafish  
after early developmental BPA exposure**

Tessa Jones

The purpose of this experiment was to measure the effects of low dose bisphenol A (BPA) exposure on zebrafish hyperactivity. BPA is a common component in durable plastics but its estrogen mimicking structure has raised concerns that early developmental exposure results in increased rates of anxiety, depression, hyperactivity, and aggression. This type of exposure was replicated using zebrafish, an important model organism in biology. Embryos were raised in a low dose solution of BPA (0.01, 0.1, 1 uM) from 24 to 36 hours post fertilization (hpf). This window was selected because it includes the period of primary hypothalamic neurogenesis. During this period stem cells and progenitor cells are used to build neuron in the hypothalamus which controls the autonomic nervous system and homeostatic systems. To assess hyperactivity a locomotor assay was performed at 3 and 5 days post fertilization (dpf) to determine speed and distance traveled in response to a tactile stimulus. The locomotor assay was specifically developed for the needs of the lab and included development of: a videoing procedure using a microscope camera, a video processing and data extraction procedure using a physics motion applet and a data analysis procedure using new functions built in R. We will use these methods to identify significant differences in speed or distance between control and BPA exposed embryos, between BPA concentrations, and between development stages. These data will give us the ability to determine if BPA influences rates of hyperactivity in zebrafish exposed during development.

## **Elucidating the Role of Slitrk1 in the Morphology of Mechanosensory Neurons in the Developing Zebrafish Spinal Cord**

Alishah Lakhani

The Slitrks are a novel gene family associated with neurite outgrowth, neuronal survival, and synapse formation. Mutations in Slitrks have been associated with neuropsychiatric disorders, such as Tourette's syndrome, OCD spectrum disorders, and trichotillomania. Slitrk1's expression pattern in the developing zebrafish nervous system suggests potential involvement in the development and function of Rohon-Beard (RB) neurons. The RB neurons are transient mechanosensory neurons that innervate the trunk skin and some of the first neurons to sense information from the environment. We are examining potential roles of Slitrk1 on RB neurons in the developing zebrafish spinal cord. To investigate Slitrk1 function, antisense morpholino oligonucleotides (AMOs) are used to knock down the Slitrk1 gene and study the effects. These AMOs are delivered by microinjection at the 1-4 cell stage of zebrafish embryos. Chordin AMO serves as the positive control. Embryos that lack the chordin protein produced a distinct phenotype (deformed tail), demonstrating the success of microinjections. The chordin phenotype has been effective through many trials. In addition, the process of microinjecting embryos at the early stages did not cause morphological abnormalities or differences in survival rates. To visualize RB neurons, immunostaining was performed at 48 hours post fertilization (hpf) with a mouse anti-acetylated  $\alpha$ -tubulin primary antibody, which stains the RB neurons. Confocal microscopy revealed RB neurons in immunostained zebrafish embryos. The number and location of the RB neurons will be recorded and analyzed using appropriate statistical analyses. In order to examine potential behavioral consequences of knocking down Slitrk1 protein, a locomotor assay will be conducted at 48 and 72 hpf to assay. This study will provide some insight into potential roles of Slitrk1.

## **Utilizing a Model of Oral Drugs to Explore Correlations Between Fraction Unbound and Structural Parameters**

Joshua Messing

Using structural parameters to predict drug pharmacokinetic properties provides a potential alternative to collecting extensive experimental data that could allow for the selection of viable drugs for further analysis in clinical trials. Binding to human serum albumin (HSA) and  $\alpha$ 1-acid glycoprotein (AAG) in the plasma is an important property that cannot be accurately predicted. Thus, I have performed correlations between the experimental values of plasma fraction unbound for approved drugs and chemical properties such as logP, molecular weight, and pKa. These correlations have allowed for the derivation of a formula to predict plasma fraction unbound based only on chemical structure.

## **Utilizing Supersymmetry to Calculate Partner Potential Eigenfunctions of the Infinite Square Well**

Esteban León

As a final project for my Computational Physics class, I will create a poster containing the results of the algorithm related to the field of quantum mechanics that I will have created as a final product. The project consists in creating a Python algorithm that calculates and plots various "eigenfunctions" of a potential function known as the "infinite square well" utilizing the concept of supersymmetry. Supersymmetry (SUSY) is a physical theory that relates mass and energy and has served to make advancements towards a unified theory of the universe. In the field of quantum mechanics, SUSY has been utilized to factorize the Schrodinger equation with the purpose of solving basic quantum mechanical models, such as the harmonic oscillator. With the infinite square well, SUSY has served to obtain new solvable partner potentials with their corresponding eigenenergies and eigenfunctions using raising and lowering operators. The goal of my final algorithm is to numerically calculate several partner potential wells of the infinite square well with their corresponding eigenfunctions and eigenenergies. The output of the final code will contain a plot of all the partner potentials with the first three or four eigenfunctions corresponding to each potential well (even though the code will be able to calculate much more eigenfunctions for each well). The poster will include the theoretical framework of how SUSY works on the infinite square well, the details of how the code calculates new potential wells with plots of the various eigenfunctions, and the output of the algorithm.

## **Testis-specific ATP Synthase Subunits Associated with Shaping Mitochondrial Membranes in the Nebenkern**

Jonathan Lim, Elizabeth Brunner, Eric M. Sawyer, Lindsay Regruto and Dr. Karen Hales

During fruit fly sperm formation, the mitochondria fuse into a spherical nebenkern with mitochondrial membranes forming concentric layers that enclose two topologically distinct compartments. Previously we identified Knon as a gene required for nebenkern shaping and sperm motility. Knon encodes a testis-specific large paralog of the D subunit of F1Fo-ATP synthase, a protein complex that shapes cristae by forming dimers on the inner mitochondrial membrane. Since nebenkern lack cristae, we hypothesize that Knon can replace subunit D on the peripheral stalk of ATP synthase, where it sterically hinders dimerization, enabling ATP synthase-harboring membranes to curve more freely in the nebenkern. I tried to demonstrate Knon's inhibition of testis ATP synthase dimerization by resolving ATP synthase complexes on a blue-native protein gel, but without positive results. We believe three other testis-specific paralogs of ATP synthase subunits play a role in nebenkern shaping, but previously we had a limited set of genetic tools for characterizing them. When we used the CRISPR/Cas system to mutate two of the respective genes, ATPsynCF6L and ATPsynGL, we found that the mutants exhibited defective sperm. Further experiments are needed to show that the roles of Knon, the CF6-like, and the G-like subunits in mediating mitochondrial dynamics is through inhibition of ATP synthase dimerization.

## **Physical Properties of Waterpipe Tobacco Smoke Particles Larger than 500 nm**

Ronnae Mailig

The purpose of the study was to characterize the physical properties of waterpipe tobacco smoke (WTS) larger than 500 nm. Studies on particulate matter (PM) has shown that exposure to finer particles, increases its toxicity even if the particles have the same chemical composition. The size distribution of WTS PM over time was determined using the Optical Particle Sizer (OPS) and the mass distribution was determined using the DustTrak. The effects of different heating methods and different head contents on the WTS PM properties was also examined and compared to the baseline, charcoal and shisha.

## **Soil Infiltration as a Factor in Stream Flashiness, North Carolina Piedmont**

Stephen Mershon

Due to increased soil erosion and changes in land use in recent years, stream flashiness has become an issue of concern in the Piedmont Region of North Carolina. The region has experienced considerable population growth over the past several decades, leading to large-scale changes in land cover and management. This study sought to determine if soil infiltration rate is an important factor in connecting changes in land use to increased stream flashiness in the North Carolina Piedmont. To accomplish this objective, a miniature disk infiltrometer was used to calculate soil infiltration rates at four experimental study sites: "Previously Cultivated Farmland," "Cultivated Farmland," "Urban Grassland," and "Forest." Each site had a different land use history, and the "Urban Grassland" site was from within a watershed with a particularly flashy stream. Each study area was located within the town of Davidson, North Carolina, a small college town of about 12,000 people located in Mecklenburg County, North Carolina. The results suggested that land use history especially as it applies to soil compaction plays a role in determining soil infiltration rate. However, soil infiltration rate was not found to affect stream flashiness. Therefore, stream flashiness in the Piedmont Region of North Carolina is likely affected by other factors such as topography, stream morphology, vegetative cover, or watershed shape and size rather than by soil infiltration. These factors are more likely the primary factors responsible for flash flooding in the Piedmont Region.

## **Artificial Intelligence (CSC 370) Final Project Posters**

Dr. Raghu Ramanujan

These are final project presentations from students enrolled in CSC 370: Artificial Intelligence. The posters will describe student projects in speech-to-text transcription, reinforcement learning, game-playing, and automated theorem proving.

## **Defective Drosophila Spermatogenesis in CG4701 and nmd Mutants Possibly Connected to Faulty Protein Transport and Peroxisome Biogenesis**

Papa Kwadwo Morgan-Asiedu, M. Ummer Qureshi and Dr. Karen Hales

Mitochondria are shape-changing, energy harnessing organelles. Their morphogenesis can be studied in *D. melanogaster* spermatogenesis. The male sterile strains nmdP[ry4], nmdN162I, and CG4701 exhibit aberrant mitochondrial phenotypes. nmdP[ry4] mutants display aggregation failure, nmdN162I and CG4701 mutants show failed meiotic cytokinesis, and CG4701 mutants show vacuolated nebenkerns. Msp1, the *S. cerevisiae* ortholog of CG4701 and Nmd, traffics Peroxin proteins (PEX) from mitochondria to peroxisomes, and we suspect that CG4701 and Nmd may have related roles. Pex proteins regulate biogenesis of peroxisomes which metabolize very-long-chain-fatty-acids (VLCFA). We visualized peroxisomal organization at each stage of spermatogenesis in WT and CG4701-/-flies. We observed that peroxisomes normally demonstrate stage-specific patterns of organization, including being positioned near mitochondria and microtubule organizing centers (MTOCs), sites associated with Nmd localization. Co-visualization of MTOCs and peroxisomes confirmed co-localization. CG4701 males sometimes demonstrated reduced stage-specific peroxisomal clustering and smaller peroxisomes at the basal body from onion to elongation stage. In line with our hypothesis that defective peroxisome biogenesis is associated with defects in the nmd and CG4701 mutants, pex2 and pex13 mutants phenocopy the cytokinesis failure of nmd and CG4701 mutants. To test for a peroxisomal function of nmd and CG4701, we developed protocols for overloading peroxisomes via VLCFA food supplementation; preliminary results show shriveled testes and significant defects in the onion stage in pex13 mutants as compared to LCFA controls. Finally, to test whether pex mutations compromise nmd and CG4701 functions, we are comparing localization of Nmd-GFP and CG4701-RFP in pex mutants to their localization in WT. Our results thus far support the protein transport hypothesis.

## **Trajectory of a Baseball Based on Batted Ball Exit Velocity and Launch Angle**

Z. Nussbaum

Baseball's most exciting result is the homerun. The game pays its stars millions of dollars to hit balls far out of the stadium at high velocities, some even reaching above 100 miles per hour. This simulation will aim to try and find the parameters for the homeruns based on batted ball exit velocity and launch angle. The trajectory of a batted ball varies heavily based on the exit velocity and the launch angle of the batted ball.[1] The trajectory of a batted ball can be simulated using Newton's 2nd law and three forces: the force of gravity, the magnus force (or lift force), and the drag force. [2].This project will aim to simulate the trajectory of a batted ball based on a user input of exit velocity and launch angle. Since the trajectory is influenced by both factors [2], this simulation will aim to explore the parameters needed for a batter to hit a homerun through different launch angles as well as different exit velocities. The first code submission will aim to accurately calculate the trajectories by a batted ball and plot them on a graph vs time. The second submission will try to integrate these trajectories and animate them.

## **The Effect of Flashiness on Macroinvertebrate Populations in 1st Order Streams in Davidson, NC**

Catie Morris, Dr. Brad Johnson and Dr. Chris Paradise

We examined 17 headwater streams in the North Carolina Piedmont to explore if there is a relationship between a stream's flashiness and biotic index of the macroinvertebrate community. We hypothesized that flashier streams would show macroinvertebrate communities with higher tolerance toward sedimentation and organic pollution, and that land use in a drainage basin would affect the stream's flashiness. Stream gauges were installed on 17 headwater streams in the Davidson, NC area using HOBO sensors to determine water depth and temperature every 15 minutes. Depth was converted to discharge using ratings curves developed for each site. To measure flashiness, we calculated the Richards Baker Index for each gauge site by season and for the whole data collection period. At each site we collected two kick net samples seven times between May and July and calculated the Hilsenhoff Biotic Index for the macroinvertebrates based on the per site per date data. We found no correlation between macroinvertebrate biotic tolerance index and flashiness but we did find a relationship between land use and flashiness. From this study, we conclude that streams located in residential areas tend to be flashier than streams located in mixed use or forested areas. However, flashiness does not seem to impact summer macroinvertebrates as measured by the Hilsenhoff Biotic Index. Further work is needed to determine if flashiness impacts invertebrates in other seasons and more detailed analysis is necessary to determine the impact on individual species and biodiversity during the summer.

## **Planetary Motion with General Relativity**

Nancy Pruett

The object of this project is to model the motion of planetary bodies in our solar system accounting for general relativity. The greatest difference exhibited between the equations of planetary motion developed under the general theory of relativity and the Newtonian theory is that the elliptical orbit of the planet rotates in its own plane at a greater speed than in Newtonian Mechanics. The fraction of a revolution which the planet rotates during one revolution about the sun is given by the formula:  $12\pi^2 a^2 / c^2 T^2 (1-e^2)$  where  $a$  is  $1/2$  the major axis of revolution,  $c$  is the speed of light,  $T$  is the period of revolution and  $e$  is the eccentricity of the orbit. I use the vpython package to model the planetary orbits of our solar system as relativistic ellipses rotating over time.

## **Progress on Synthesis of High Mannose Glycan Mimetics Using the Staudinger Ligation**

Hayato Nakanishi

The purpose of this thesis is to synthesize high mannose glycan mimetics on the solid oligoproline scaffold using the Staudinger ligation for the development of antimicrobial agent. Mannose is believed to have a strong adhesive property on the cell surface, and microbes exploit this property to bind to host cells. Synthesis of high mannose glycan mimetics on the peptide scaffold is critical to present those highly functionalized mannoses, and proline was adapted in this research for having a rigid alpha-helical structure. In this research, we decided to focus on a Staudinger ligation approach to directly append the highly functionalized mannose with a carboxyl group and the oligoproline scaffold with an azido group. Despite the successful amidation linkage between a functionalized alpha-linked mannose residue and oligoproline scaffold, we faced a serious challenge purifying the product and yielding in a high quantity. Thus, we investigated the Staudinger ligation using model compounds, non-carbohydrate and carbohydrate based compounds, that contain the carboxyl linker. We successfully appended the model compounds with the oligoproline scaffold, and we observed that non-carbohydrate compounds generated significantly greater amount of target compounds than carbohydrate compounds. We also observed that appending two carboxylic linkers simultaneously at two different sites on the scaffold would yield significantly less amount of target compounds than that of one site. We successfully optimized the yield of the sugar compounds by repeating the Staudinger ligation for the second time. An attempt was made to append a functionalized mannose and oligoproline scaffold with an alternative synthetic route that involves both click reaction and Staudinger ligation. We successfully linked the functionalized mannose and the oligoproline scaffold with one binding site.

## **Predicting Parent Elements in Radioactive Decay**

Caleb Warren

Research with radioactive samples often requires taking its spectrum and determining what elements are within a sample. This project aims to ease that process by creating a program to read data from a spectrum and present an ordered list of likely radioactive elements in this spectrum. This is done by comparing NNDC's database of elemental data to intensity peaks in this sample and reporting those intensities who are most common between the two systems.

## **Ethanol and RoundUp Compromises *Xenopus laevis* Development**

Allyson Pel and Dr. Barbara Lom

Teratogens such as ethanol and herbicides are factors that can cause malformations in embryos. The widespread consumption of alcohol has been the focus of many studies attempting/aiming to understand its effects on embryonic development. Alcohol consumption during pregnancy has been linked to cognitive deficiencies, behavioral problems, and other functional impairments. In humans, ethanol exposure causes smaller head sizes, below average heights/weights, smaller eye sizes, and narrower eye distances. This distinctive developmental phenotype and associated neurological damage has been termed fetal alcohol syndrome (FAS). Another teratogen, the glyphosate-based herbicides Roundup is used commercially to kill weeds. Contamination of aquatic and terrestrial amphibian habitats due to over-spraying, wind drift, and drainage are known to cause declines in amphibian populations, physical malformations, and delayed development. Model organisms such as the frog *Xenopus laevis* are sensitive to ethanol and herbicides during development. My experiments investigated the effects of ethanol and RoundUp on tadpole embryogenesis. Tadpoles were reared in 0 - 2.5% (v/v) of ethanol for two or six days or 0-0.004% (v/v) of RoundUp for four days. Body lengths and inter eye distances were measured using ImageJ for the ethanol and RoundUp experiments with the addition of quantifying stage of development for the RoundUp experiment. I observed a negative correlation between ethanol concentration and both body length and eye distance. Additional observations included bloated abdomens, curled body shapes, and reduced eye sizes. Taken together, these results suggest that ethanol can induce FAS-like gross morphological differences in a developing aquatic vertebrate, a potentially useful model for elucidating mechanisms by which ethanol compromises CNS development. Preliminary results for Roundup experiments suggest gross morphological and pigmentation changes.

## **Testosterone Positively Modulates Heroin Self-Administration**

Andrew Peterson, Dr. Mark Smith, Andrea Robinson, Alex Casimir, and Michael Zhang

Males and females differ significantly in their rates, patterns, and trajectories of drug use and abuse. Significant amounts of research has shown the influence of ovarian hormones on drug self-administration, but very few research studies have examined the effects of testicular hormones on heroin self-administration—even though epidemiological studies show that men are more likely than women to use heroin and other drugs. This study investigates the effects of androgen hormones on heroin self-administration in male rats. To this end, sexually mature male rats received either a bilateral orchietomy (GDX) or a sham (SHAM) surgery and were implanted with intravenous catheters for heroin self-administration. Rats were trained to self-administer heroin. In daily test sessions, and heroin self-administration was examined over a 30-fold dose range. We found that GDX rats self-administered significantly less heroin than SHAM rats at all doses tested. These data suggest that testosterone positively modulates heroin self-administration and that androgenic hormones may increase heroin intake in males.

## **Land Development, Stream Morphology, and Human-Nature Relationships in the North Carolina Piedmont**

Caitlin Reilly

This study addresses changes in the morphology of headwater streams and human-nature relationships in several communities north of Charlotte, North Carolina within the context of recent increases in land development in the region. Morphological changes were measured via water temperature and stream flashiness. Human-nature relationships were considered through ethnographic interviews focusing on place attachment and place identity. Results demonstrate initial changes in stream morphology in response to development. Interviews did not reflect decreased place attachment but did demonstrate important shifts in place identity and mode of interaction with local streams and natural areas. There were also notable differences in experiences of residents based on race and socioeconomic status. The changes observed here call for a preservation of community access to local streams and highlight the importance of vegetative buffers and the management of the introduction of impermeable surfaces. Furthermore, these results indicate a need for additional inquiry into the impacts of development in the area, both human and ecological, especially in terms of issues relating to environmental justice.

## **The Art of the Shot: Modeling and Analysis of Free Kicks in Soccer Based on Initial Conditions**

Jack Reynolds

Soccer is a sport with a relatively simple goal- put the ball in the back of the other team's net. However, it can be difficult to actually achieve that goal, so when players are afforded opportunities like free kicks (a spot-kick to restart or resume play with opponents 10 yards from the ball) close to goal, they need to be prepared to make the most of the chances they get. The most skilled strikers spend hours every week practicing their shots, varying initial conditions of the ball's motion in order to make their shots almost impossible to stop. My project involves calculating trajectories of shots with varying initial conditions, including angular velocity, launch angle, and initial velocity that will affect the forces acting on them, most notably the Magnus Force. By using vector functions for forces acting on the ball as it travels through time and space in combination with kinematic equations of motion, I will map the trajectories of the shots through three-dimensional space and time. I will use these models, as well as data drawn from them, to determine things about soccer shots in general, including but not limited to what set of initial conditions puts the ball into the goal fastest or slowest and what set lets the ball fly the farthest or shortest, in both space and time.

## **Incision in North Carolina Piedmont Streams: A Mill Dam Case Study**

Hannah Rieden

Throughout the Piedmont of North Carolina low-energy streams have incised, or eroded vertically, into their banks. We explored the hypothesis that historic mill dams impounded sediment upstream, increasing potential for incision when dams were breached and the base level lowered and the flow velocity increased. Sites were found in the counties of Mecklenburg, Iredell, Rowan, and Cabarrus using historic maps and ArcGIS. We measured bank heights 100m upstream and downstream of the estimated dam location and observed remains when visible. We examined the bank wall for fluvial sediments or mill pond sediments, to determine if they'd been deposited by flowing water or during the time the stream was dammed. 18 sites were visited, and 13 of those stream reaches were incised. Only one incised site had mill sediments, and the other 12 had fluvial sediments (that continued downstream of dam). Local research, opposed to findings in the mid-Atlantic, suggested that North Carolina dams post-dated the stream incision, as stream reaches were consistent in both sediment and magnitude of incision upstream and downstream of dams. Additionally, remains were found that did not extend onto the banks, suggesting they were built into preexisting incised channels. These factors indicate that mill dams were not the cause of incision in the North Carolina Piedmont, and other hypotheses, including the effects of poor agrarian practices and stream straightening, need to be examined.

## **The Dynamics of Flight**

Brooke Riley

Before the Wright brothers' first airplane flight in 1903, and even after the fact, the concept of flying would have baffled many who took the time to think about it. How could such a large object be lifted into the sky and travel without falling back down? The dynamics of an airplane are complex, with many different factors affecting the airplane's design and thus its flight. When looking at the forces on an airplane during flight, there are three different ways to view them, each one more complex than the last. These three ways are steady-state, two dimensional, and three dimensional flight. The four main forces that affect airplanes are thrust and drag, which are horizontal forces, and lift and weight, which are vertical forces. However, there are numerous variables that affect these forces so that they are rarely the same between two flights. These variables include, but are not limited to, altitude, wind speed, velocity, temperature, pressure, weight of the aircraft, area of the wings, and ratio of atmospheric density. In my project I am creating a Python code that explores the dynamics of airplanes in all three forms of flight using Newton's second law and the equations for the four main forces. For each equation I will allow the user of my code to input different variables to find the thrust, drag, lift, and weight. After finding these forces with the input variables, they will be able to calculate the total forces for each of the three types of flight using equations from Newton's second law. The user can then graph the forces to see how they relate with different velocities.

## **BPA and BPS Do Not Affect Tyrosine Hydroxylase or Swimming Activity in *Xenopus laevis* Tadpoles**

Judith Rosales Rivas

Bisphenol-A (BPA) is a synthetic compound commonly used to make plastics. As an endocrine disruptor (specifically an estrogen antagonist), BPA has been linked to health problems including obesity, diabetes, schizophrenia, hyperactivity, and cancer. As a result, some manufacturers produce “BPA free” products, which frequently contain the BPA analog bisphenol-S (BPS). BPS’s strong structural similarities to BPA allow it to be an effective plasticizer though not necessarily a healthier alternative. Previous experiments in our lab and others have revealed that developing dopaminergic neurons can be compromised by BPA exposure. This experiment compared the influence of BPA and BPS on dopaminergic neurons of *Xenopus laevis* tadpoles. Embryos were exposed to 0-300 nM BPA or BPS for 96 hours. Immunostaining for tyrosine hydroxylase (TH), an enzyme critical for dopamine production, allowed two-dimensional visualization of midbrain dopaminergic neuronal clusters in the posterior tuberculum via confocal microscopy. Areas of these TH+ neurons were then analyzed using quantitative morphology. Statistical comparisons showed that neither BPA nor BPS altered the 2D area of TH+ neuronal clusters. These null results may be due to an inability to quantify 3D clusters appropriately. We also studied the effects of BPA and BPS on the developing tadpole nervous system by examining swimming behaviors and hyperactivity. BPA has been linked to hyperactivity in both children and zebrafish. We hypothesized that BPA and BPS would cause hyperactivity in tadpoles swimming behavior, but the results showed no influence of BPA or BPS on the swimming behaviors observed. Further measurements of tadpole swimming behavior should be assessed to explore the link between BPA and BPS on hyperactivity.

## **Characterization of the Role of CG12479 in *Drosophila melanogaster* Mitochondrial Morphogenesis**

Taylor Simmons and Dr. Karen Hales

In *Drosophila melanogaster*, the fruit fly, CG12479 codes for Mic10, a subunit of the Mitochondrial Contact Site and Cristae Organizing System (MICOS) complex. Localization of the MICOS complex, as well as oligomers of Mic10, on the inner mitochondrial membrane is necessary for mitochondrial cristae formation. Previously conducted studies have shown that mutations in functionally important subunits of the MICOS complex result in abnormal nebenkern morphology. Additionally, phase contrast micrographs of RNAi knocked-down MICOS complex subunits revealed a higher than normal occurrence of dual-lobed nebenkern. This was especially true when Mic10 was knocked down. As a result, this study aimed to determine the specific role of Mic10, in mitochondrial morphology during *Drosophila melanogaster* spermatogenesis. Phase-contrast imaging of testis from CRISPR mutagenized flies showed abnormally high occurrences of dual-lobed nebenkern as compared to dissections of wild-type flies, and fertility testing of suspected mutants showed a decrease in fertility in some strains. Sequencing of isolated DNA from the suspected CG12479 mutants will confirm the role of CG12479 in the observed phenomenon.

## **Legacy of Intensive Agriculture: The Timing and Cause of Gully Formation in the Davidson Area**

Rosalind Spell and Dr. Brad Johnson

Gullies are common geomorphological features in the Piedmont of North Carolina that leave evidence of their erosion and deposition in the form of alluvial fans and gully fill sediment. We hypothesize that the formation of gullies in the Davidson area can be tied to intensive land use in the early years of Euroamerican settlement in Mecklenburg County. Methods of investigation included digital and field mapping of gullies, soil pit observation, loss on ignition and particle size analysis, and radiocarbon dating. Results show that soils in gullies or their alluvial fans are less developed than the typical soil of the region and show evidence of erosion. Radiocarbon data link sedimentary deposition in alluvial fans and gully fill to the 18th century, which is concurrent with early Euroamerican settlements in the Davidson area. This study concludes that land-use practices utilized by Euroamericans had a detrimental erosive effect on Piedmont soils.

## **Rarity, Richness, and Randomness: Assessing the Sampling Effect of Biodiversity at the Local Scale**

Annalee Tutterow and Dr. Kevin Smith

The presence of rare and endemic species is often used to identify areas of conservation priority. However, it is unclear if rare species diversity varies independently of overall species richness or if it is instead an artifact of a sampling effect of biodiversity. We created a null model to test whether, through a random sampling effect, the presence of locally rare species is primarily a function of overall species richness. We conducted a thorough literature review for biodiversity datasets from various taxa occupying environmentally-bound sites (e.g., ponds and islands) and defined rare species as those occurring at 10% or fewer sites in a dataset. To develop the null model, we used a 2x2 swapping algorithm that simulated random combinations of species at different sites, with fixed species occupancy and local richness. In other words, each site retained the same number of species and each species occupied the same number of sites in the simulations. Our simulation results showed a strong, positive curvilinear relationship between total species richness and the number of expected rare species. Across all sites, expected rare species richness from the simulation analysis was a remarkably strong predictor of the observed number of rare species per site ( $R^2=0.92$ ;  $p<0.001$ ), providing strong support for the sampling effect of biodiversity in determining the number of rare species per site. Within individual systems, however, our results were more variable, including cases of strong (gastropods:  $R^2 = 0.99$ ) and weak relationships (aquatic invertebrates:  $R^2 = 0.094$ ) between expected and observed rarity values for certain taxa. Ultimately, our study suggests that at a local level, management efforts directed towards habitats with high species richness are also likely to capture large proportions of rare species of high conservation concern and provides additional evidence for the sampling effect of biodiversity.

## **Computational Study of Excited States of Luminescent Bimetallic 1,1-Bis(diphenylphosphino)methane complexes**

Yufei Wang and Dr. Durwin Striplin

Many bimetallic complexes with bridging phosphorus ligands have a unique luminescence in that they both phosphoresce and fluoresce. The low lying phosphorescence denotes a transition from what is formally three degenerate excited states, a triplet state. In reality the three states are not iso-energetic but split into what is believed to be one lower state and two upper states separated by 10's of  $\text{cm}^{-1}$  in energy, a splitting that occurs because of relativistic spin-orbit coupling (SOC). What was once a prohibitive computation, quantum mechanically, because of computation limitations should now be possible for these large heavy metal complexes. The bimetallic complexes  $[\text{Pt}_2(\text{pop})_4]^{4-}$ ,  $[\text{Pt}(\text{CN})_2\text{Rh}(\text{tBuNC})_2(\hat{\text{A}}\mu\text{-dppm})_2][\text{PF}_6]$ ,  $\text{Pt}_2(\text{CN})_4(\hat{\text{A}}\mu\text{-dppm})_2$ ,  $[\text{AuIrCl}(\text{CO})(\hat{\text{A}}\mu\text{-dppm})_2][\text{PF}_6]$ ,  $[\text{AuPt}(\text{CN})_2(\hat{\text{A}}\mu\text{-dppm})_2][\text{PF}_6]$ ,  $[\text{AuRh}(\text{tBuNC})_2(\hat{\text{A}}\mu\text{-dppm})_2][\text{PF}_6]_2$ , where  $\text{dppm}$  = (diphenylphosphino)methane;  $\text{tBuNC}$  = *tert*-butyl isocyanide;  $\text{pop}$  = pyrophosphate were studied computationally utilizing density functional theory (DFT) to compute molecular orbitals and excited state energies utilizing open shell computations, B3lyp functionals, a SDD pseudopotential for the metals, and a 6-31G(d) basis set for all other atoms. Computational results showed that lowest energy excited state transition in these complexes originate from a metal-metal anti-bonding  $\text{dz}^2$  highest occupied molecular orbital (HOMO) and a metal-metal bonding  $\text{pz}$  lowest unoccupied molecular orbital (LUMO). The results are consistent with the systems ability to both fluorescence and phosphorescence because both orbitals have zero angular momentum and will not couple well with higher lying singlet states. Using the excited state energies and transitions from the computations, SOC perturbations was applied to estimate the energy splitting of the lowest triplet state and the results compared to experimental work.

## **Synthesis of linear and branched glycomacromolecules targeting CD44**

Erin Xu

The affinity between hyaluronic acid (HA) and CD44, a protein overexpressed on the surface of many tumor cells, offers promise for delivering HA-based therapeutics conjugates to tumors. In principle, HA-therapeutic conjugates can selectively target tumor cells, increase the solubility of the therapeutic, and aid in its passage through the blood-brain barrier via receptor mediated endocytosis, thus improving pharmacological uptake. We are particularly interested in HA-phototherapeutics for photodynamic and photothermal therapy due to the less invasive nature of these techniques. One of the main limitations of this work is the synthesis of hyaluronic acid analogs that maximize the HA-CD44 interaction. In this session we present our progress on the synthesis of a series of HA-based mimetics of different lengths and their conjugation to phototherapeutics.

**Analysis of Toxic Metals in Smoked and Unsmoked Waterpipe Tobacco  
Using Atomic Absorption Spectroscopy**

Nick Pohl

The use of waterpipe tobacco smoking (WTS) is common practice in the Arabian Peninsula, the Middle East, and is starting to become more popular in Europe and the United States. The prevalence of WTS is increasing the most with youth and university students. Waterpipes have been used for at least four centuries as a purportedly less harmful method of tobacco use. However, new information about WTS has shown that users are exposed to carcinogens such as heavy metals, carbon monoxide, and phenols. The goal of this study was to determine the concentrations of three known human carcinogens, Cadmium, Cobalt, and Lead, in store-bought shisha before and after it is smoked through a waterpipe. This study determined differences in concentrations between bulk, unsmoked shisha and smoked shisha. The concentrations of the metals in the bulk, unsmoked shisha were significantly more than the smoked shisha. This demonstrates that these three heavy metals may enter the human body through WTS and can lead to adverse health effects.

**The Quantification of Transgene Copy Number in Immune T-Cell Mouse Model**

Paul Brennan

The two transgenic mouse models developed in the Sarafova Lab enable the investigation of the role of a novel cis-regulatory element (NCE) in CD4 expression during T-cell differentiation. To produce the transgenic mice, two bacterial artificial chromosomes (BACs) were inserted into respective mouse genomes; one BAC includes the NCE, and the other BAC has no NCE. The BACs contain a reporter gene called enhanced green fluorescent protein (EGFP) in the place of the CD4 gene, so the expressed level of CD4 can be measured, and the effect of the NCE on CD4 expression can be elucidated. To accurately analyze the EGFP fluorescence and determine the effect of the NCE, we needed to determine how many copies of the BAC integrated into each transgenic mouse genome. Using quantitative real time PCR (qPCR) and Southern blot, we show that the two mouse models contain different copy numbers of EGFP. We also show that variable cycle PCR and qPCR are effective ways to investigate relative gene copy numbers.

## **Social Science**

### **Davidson College Cookbook** Dorothea Allocca

With the advent of the Davidson College Farm's Wednesday Market, students now have the opportunity to purchase fresh produce on campus. We understand that students have limited access to cooking space, time and resources, so we are investigating how an online cookbook would educate students on the resources they have available on campus to cook and encourage them to purchase produce from the Davidson College Farm's Market Stand. The questions we are investigating are "Do Davidson College students lack the needed equipment to cook meals in on-campus living spaces?", and "What would be an effective and useful digital cookbook for students on Davidson Campus that would also encourage produce sales from the Davidson Campus Farm?". To answer these questions, we are conducting qualitative interviews with around twelve students based on different demographic variables including but not limited to experience at the Davidson College Farm, PCC organization, and class year. In our interviews we ask questions about eating and cooking habits on campus, challenges to cooking on campus, and interactions with the Davidson College Farm and Market Stand. We will use the results from these interviews and benchmarking research of other college-related cookbooks to create an online resource for students. This cookbook will outline the cooking resources that students have access to on campus, cooking techniques for dorm rooms and kitchens, and recipes emphasizing the use of the Farm's market produce.

### **Refugee Resettlement in Charlotte, North Carolina: A Qualitative Study of Health Inequity** Hayden Bates

This qualitative comparative study focuses on the perspectives of refugees and stakeholders within Charlotte. Semi-structured interviews were used as a means of understanding the perspectives of both parties. Significant time was invested in this community in order to adequately establish both context and contacts for this research. Contacts served as main informants for their own cluster. Given the lack of access to this population, a snow-ball sample was utilized, in which participants had the opportunity to recommend other contacts. A thematic analysis of both the positive and challenging aspects of resettlement in Charlotte revealed how the perspectives of these sample populations differ and converge. The social ecological model of public health research framed this exploratory research, acknowledging the complex and interconnected determinants of health. Interviews with both stakeholders and refugees revealed challenges with navigating community dynamics and accessing affordable housing and employment opportunities in Charlotte. Interviews with refugees and stakeholders described how Charlotte's lack of upward mobility and low-income housing make resettling into Charlotte especially challenging for refugees. This research reveals the nuances of how specific marginalized populations experience health inequities and how broader trends in employment, housing and community dynamics can exacerbate disparities.

**The Reversal of Amendment to Article 116:  
How Victims of Violence Disappeared from the Dialogue on a Domestic Violence Law**  
Jennifer Belardo

In the summer of 2016 the Russian parliament and President Vladimir Putin signed into law amendments that codified the criminalization of domestic violence; less than a year later, on January 27th, Russia formally rescinded the amendments, thereby softening domestic violence law. This sudden shift in policy represents a larger shift in Russian family policy to more traditional Russian values in opposition to the influence of the “liberal West.” The reversal of this domestic violence law exhibits an attempt to find a new cultural narrative in post-Soviet Russia and President Vladimir Putin’s initiative to position Russia as a cultural power rivaling the west. As President Putin and the Russian parliament arranged this policy reversal female victims of domestic abuse were excluded from the conversation. The intent of this thesis is to illustrate how a bill on domestic violence served to promote Russia as an influential moral authority rather than address issues of gendered violence.

**Perception, Reality & Institutions: Decoding Support for Far Right Parties in Europe**  
Alyssa Bryan

In an increasingly polarized world, ample research has sought to explain mechanisms of polarization. In the political sphere especially, the “Radical Right,” a collection of populist, far right parties in Europe, have made their voices heard. Existing literature has sought to explain either the demand factors “what makes individuals support far right parties?” or the supply factors “why do far right parties emerge in the first place?” that contribute to the success of far right parties on the national scale. Using three years of individual responses to Eurobarometer surveys between 2004 and 2009, I measure determinants of support for and success of far right parties in the 28 countries of the European Union. Where my research is unique is a focus on demand and supply simultaneously, as well as the inclusion of perceived individual-level grievances alongside tangible measurements such as unemployment rates. Finally, I examine differential effects between national elections and elections for the European Parliament. Ultimately, I find that perceived sources of grievances, especially cultural, are the most significant predictors of support for far right parties. Legislative and electoral fractionalization - measures of political opportunity for existing far right parties “also significantly affect the vote share of far right parties on the country level.

## **Applying signal detection theory to understand boundary extension**

Yijiao Chen, Dr. Greta Munger and Dr. Kristi Multhaup

Boundary extension (BE) is a robust phenomenon where people remember seeing things that might have been present beyond the edge of the original image. Participants in two experiments ( $N = 75$ ) studied scenes in either a close (C) or wide (W) version. At test they saw half of the scenes in the same version (CC or WW), and the other half in a different version (CW or WC). They indicated whether the camera position was the same as or different from the one at study and their confidence about the judgment on a 6-point response scale. The SDT-based analysis uses  $d'$  to measure people's ability to discriminate old from new (discrimination sensitivity), and compares meta- $d'$  with  $d'$  to assess how accurately their confidence reflects their performances (metacognitive sensitivity). We found  $d'$  was significantly higher in the wide-study condition (WW and WC), suggesting participants had better discrimination sensitivity when studying the image in its wide version. The data didn't reveal significant differences in metacognitive sensitivity. The findings suggest that discrimination sensitivity contributes to BE effect, and the metacognition of BE tasks is inefficient since meta- $d'$  is smaller than  $d'$  in both conditions.

## **Gender and Sport-Type Differences in Athletes' Self-Talk Use**

Erica Clancy

Self-talk, or the way you talk to yourself, has been a growing area of research for industrial-organizational, clinical, leadership management, and sport psychologists. There are several components to self-talk including whether it is positive or negative, said out loud or in your head, and motivational or instructional in nature. As relatively new area in sport psychology, more research is needed to solidify findings in these areas and how variables like gender and sport type affect athletes' self-talk use. To examine the differences between gender and sport type on athletes' use of self-talk, a survey, modified from Hardy et al. (2005), was sent to Davidson College student-athletes on the basketball, soccer, cross country, track and field, and swim teams on their use of self-talk at practice and competition, with 79 student-athletes responding. Analyses indicate that individual sport athletes use significantly more overt self-talk and more self-talk during practice and competition than team sport athletes, and that female athletes use self-talk before and during practice and competition significantly more than male athletes. While some of these findings are consistent with previous research, it would be beneficial to replicate the study with a larger, more diverse sample.

## **The Perspectives of Medical Professionals on the Nature and Practices of Integrative Medicine: A Qualitative Pilot Study of Integrative Medical Centers in the United States**

Adelaide Cummings

Integrative medical centers have recently increased in number throughout the United States. Subsequently, minimal research exists on this relatively new medical phenomenon. The objectives of this study are to collect and analyze qualitative data, which partially describe the landscape of integrative medical centers currently existing within the United States. Five participants were recruited from four medical institutions currently practicing integrative medicine. Semi-structured qualitative interviews were conducted with each participant in order to gain perspective into his/her (1) definition of integrative medicine; (2) the perceived reasons for the rise of integrative medicine within the United States; (3) the outlook for integrative medicine within the realm of the United States healthcare system; and (4) the organization, practices and standards of care as it is evolving into an integrative setting. These five participants provided perspectives that represent the variability and lack of consensus that currently exists within the integrative medical community on the definitions and concepts that define “integrative medicine” as practiced in these contexts. Integrative medicine is a relatively new and growing phenomenon and continued research into its nature and effectiveness is imperative for the sake of standardization, coordination and patient safety. This study contributes valuable insight and knowledge to this exploration of an emerging practice within the healthcare landscape.

## **Standardized English, Standardized Students: Teaching to the test in ELA**

Madeline Driscoll

This classroom ethnography explores the way standardized testing is affecting language use, linguistic development, and broader sociocultural socialization of middle school English Language Arts (ELA) students. It addresses the existing gaps in understanding of how students' socialization, not just curricular learning, is affected by the language of testing, standardized English. The research draws from transcribed audio recordings of classroom observations, interviews with the teacher, and secondary literature to conduct an ethnography using a critical sociolinguistic lens. Fostered by high stakes testing and created by curricular programs targeted at "turn around schools," standardized English is a modern tool to reproduce existing social hierarchies. It constrains what content to which students are exposed, produces narrow definitions of students' roles in classroom and society, and encourages students to reproduce existing role/identity performances, and creates an incentive system meant to measure achievement but which really measures acquiescence to sociocultural elites' demands of the marginalized. In order to effectively subvert today's oppressive educational practices, we must continue to address these specific ways students are taught to the test beyond just content. We must simultaneously make sure they still have access to standardized testing's credentials, since test scores continue to be used to allow or deny access to educational, and subsequent economic, opportunities to students.

## **American Meritocracy and School Spending**

Madeline Driscoll

This research builds on the existing literature examining public opinion for school spending. Most of the research focuses on connecting various demographic identity markers to one's opinion on school spending. This paper builds on that question to examine whether a belief in the American Meritocracy is related to school spending. Using school spending as an example of a public good, this research focuses more deeply on one of the most widespread public institutions in the U.S. The most recent General Social Survey asks two questions this research used to get a sense of public opinion on both school spending and belief in the meritocracy. Because those who tend to believe in the meritocracy also tend towards a more individualist paradigm of American society, and because those who tend towards more individualist paradigms are less likely to support funding for public goods, I expect the research to show those who believe in the meritocracy are less likely to support school spending. Moving forward, this research can be used to examine differential tax efforts from various communities and individuals, and how to capitalize on citizens' values and ideals to convince them to either maintain their level of support, increase or decrease it.

## **Gender Norms: The Impact on the Labor Force Participation of Highly Educated Women**

Anna Catharine Feaster

This paper investigates the impact gender norms on American society by observing the correlation between education rates and work force participation rates, specifically among women. Women's labor force participation rates have increased tremendously due to laws protecting equality in the workforce, such as Title IX. However, in recent years, this trend has become stagnant for highly educated women (women with a bachelor's degree or more). The stagnation is even more apparent in highly-educated women who have children. In this paper, I use a dataset from the Bureau of Labor Statistics to analyze the extent of the decrease in highly educated women's labor force participation. Comparing men's and women's labor force participation rates combined with their education rates allows for a clear picture of the trends at hand. Further, in analyzing this data, I consider how gender norms play a role in inhibiting the progress of women's labor force participation.

## **Spatial Working Memory Performance on a Radial Arm Maze After Bilateral Fimbria-Fornix Transection in Rats**

Mary Frith, Kylie Leung and Dr. Julio Ramirez

The fimbria-fornix (FF) is a major fiber bundle connecting the hippocampal formation to the septum, hypothalamus, mammillary bodies, and other cortical and subcortical structures. Although lesions of the FF have produced impairments in spatial working memory, it is unclear which of the damaged connections and neurotransmitter systems are critical for this type of memory. In fact, the majority of studies involving bilateral lesions of the FF have produced significant damage to the hippocampal commissure and other structures surrounding the FF. In the present study, rats underwent bilateral FF transection by a procedure that minimizes damage to hippocampal commissural pathways. For six weeks, spatial working memory performance of animals with transections or sham craniotomies was assessed on the radial arm maze (RAM), using a win-shift task with 30s confinement in each arm. Optical densitometry analysis, performed blind to surgery group, quantified acetylcholinesterase (AChE) staining density in the outer molecular layer and supragranular zone of the dentate gyrus. Transection animals with at least 25% staining reduction from the sham average, both dorsally and ventrally, committed significantly more spatial working memory errors than did sham animals across the 6 weeks of testing; they also took longer to acquire the task. Transection animals were no more likely than sham animals to use non-spatial strategies to solve the task. These findings suggest that signals passing through the FF, rather than the hippocampal commissure, are necessary both for unimpaired spatial working memory and spatial task acquisition.

## **Davidson Planned, Davidson Imagined: A Case Study in Town Planning and Theories of Community**

Samantha Gowing

In June 2001, the Town of Davidson, North Carolina passed a land ordinance to control development projects in the town limits and in its extraterritorial jurisdiction (ETJ). The ordinance drew heavily from smart growth planning trends and faced strong dissent from town members and landowners in the ETJ. Through an analysis of the ordinance and conversations with stakeholders involved in the process of its creation, this paper gives voice to the diverse perspectives in Davidson leading up to 2001 and examines the conflicting notions of community that manifested in this case study. The paper follows a constructivist grounded theory methodology and uses a triangulation of theoretical scholarship, archival research, and in-depth interviews to guide an analysis of the ordinance's creation as a case study in conceptualizing community. As a case study rooted in community studies scholarship, this research provides insight into larger questions of community and community development through the planning and zoning regulation process.

## **How Household Income Shapes Religious Piety in the United States**

Mitchell Han

The United States is not only one of the wealthiest countries in the world, but it is also the most religious in comparison to countries of similar economic standing. This poster discusses the impact of household income on religiosity in the United States by breaking down income into three different social classes and examining theories behind religious piety for each of the three. I am testing the validity of the Relative Power Theory as the best potential explanation for the correlation between wealth and religiosity among the greater American population. In order to test this theory, I will run a regression using data taken from the National Study of Youth and Religion with household income being my independent variable and the number of times one has attended religious service over the last 12 months being my dependent variable. I expect low and high income Americans to attend religious services more often, and I also expect middle class Americans to attend less as they fall outside the parameters of the Relative Power Theory. This is important not only for the purpose of identifying a significant correlation between wealth and religiosity, but also for explaining the implications of a system in which wealthy Americans continue to perpetuate inequality between the rich and poor.

## **The Young and the Restless: Depression, Sleep and Resilience in College Students**

Allison Hancock and Dr. Lauren Stutts

College students are increasingly reporting psychological health concerns that warrant attention. In addition to these concerns, examining the resilience displayed in the face of many challenges is also important. The present study examined the relationship between depression and sleep and how those variables predict resilience in college students. Approximately 124 students completed the Pittsburgh Sleep Quality Index, the Inventory of Depressive Symptomatology, and the Brief Resilience Scale. Data were also collected regarding blue light technology usage, study abroad status, and grade point average (GPA). On average, students reported sleeping about six hours a night and reported poor sleep, mild depression, and moderate resilience. Depression and sleep disturbance were moderately correlated, and both were negatively associated with resilience. A hierarchical regression, controlling for gender, showed that only depression was a significant predictor of resilience, and the overall model accounted for 16% of the variance in resilience. Students with greater blue light exposure reported worse sleep than those with less exposure. Similarly, students on campus reported worse sleep than those abroad. GPA was also negatively associated with depression. These results highlight the importance of examining depression and resilience and the need for psychoeducation and treatment regarding sleep hygiene and depression.

## **College Access Para Todos: Sustaining the Latin American Coalition's Efforts to Connect Latino Immigrant Youth to Higher Education**

Nate Harding

In December 2015, College Access Para Todos, a youth-led initiative to equip Latino immigrant students in Charlotte with the knowledge, skills, networks, and resources needed to effectively navigate the college readiness and college application processes, was discontinued. Eight months later, under the leadership of a new Executive Director, regular and ongoing requests for college preparation assistance from Latino immigrant families in the area inspired the Coalition to consider reviving the program. However, due to miscommunication among incoming and outgoing staff throughout the Executive Director's transition to the organization, the Coalition was left with a strong desire to support local students but a lack of clarity around why the program had been discontinued and whether it should return. Inspired by this dilemma, "College Access Para Todos: Sustaining the Latin American Coalition's Efforts to Connect Latino Immigrant Youth to Higher Education" investigates the causes and consequences of the discontinuation of the College Access Para Todos program through analysis of semi-structured interviews with ten key stakeholders including current and former staff and volunteers, former program participants, parents of former program participants, and a program officer at a local foundation. The report then uses the concept of Social Capital Theory to interpret key findings and substantiate recommendations for the consideration of a revision and renewal of the College Access Para Todos program. These findings and recommendations reveal how the Latin American Coalition and similar organizations and initiatives can best support Latino immigrant students in their journey toward higher education. The report was produced in partial fulfillment of the course requirements for a Senior Capstone project in the Education and Community Studies major at Davidson College in collaboration with the Center for Interdisciplinary Studies and the Latin American Coalition in Charlotte.

## **Gender and Credit Taking in Scholarly Publications**

Remy Jennings

This study explores differences in credit taking between men and women as a potential explanation for the gender gap in executive leadership. Previous lab studies have found that women undervalue their contribution to successful work on male sex-typed tasks when working with men but exhibit a self-serving bias when working with women. This study extended research on credit attribution to research teams in academia using a survey of authors who published in the Journal of Applied Psychology and were asked to distribute credit for the publication among themselves and their coauthors. Results indicated that while women were significantly underrepresented as first and second authors, gender and group type (same-gender or mixed-gender research team) did not predict self credit score. Further, contrary to expectations, high levels of agreement were found within research teams about who deserves what credit.

## **Reconciling Contradictions: University Women's Experiences with Shifting Premarital Relations in Fez, Morocco**

Shannon Hayes

The purpose of this study is to examine the changing male-female friendships and relationships that exist in the emerging period of adolescence in Fez, Morocco. As research continues to show increasing rates of premarital sexual debut, the process of forming and maintaining relationships, as well as the importance attributed to them, has been widely left out of academic study. To assess the perspectives of university-age women on romantic relations, the study relied on eleven semi-structured interviews of women in local master's programs, focusing on topics surrounding this discussion: sexual education, contraception, stereotypes, and relationship pressures. The use of anecdotes and stories based in gossip were encouraged to gather a more representative picture of the dating climate. Spending time with a key informant added an ethnographic component and gave more insight into trends in social media and actual dating practices. Using data from both interviews and observations provided a more complete picture of the public attitudes and private behaviors of Moroccan women. Dating continues to be prevalent despite a lack of recognition from official bodies, leading to a general lack of protection for men and women who participate. No systems exist to prevent inappropriate exchanges over social media, and a dismissal of sexual education leaves many adolescents without health coverage. By further exploring the nuances of this emerging culture, strategies can be found for how adolescents circumvent such systems, and recommendations can be made for future changes.

## **Making Memories: Reminiscing with New Zealand Children**

Gillian Highet

This thesis examines whether culture, gender, emotional versus non-emotional events, and positive versus negative events influence children's memory abilities. Data from 42 families were collected in Dunedin, New Zealand and used to answer four research questions: whether Maori children have more advanced recounting skills than Pakeha children, whether there are gender differences in children's ability to recount past experiences, whether children have more advanced recounting skills when discussing an emotional event than when discussing a non-emotional event, and finally whether children have more advanced recounting skills when discussing a positive event than when discussing a negative event. Multiple regression analyses revealed no significant differences in memory development across cultures. Mixed ANOVAs showed no gender differences on memory ability, no significant differences in memory skills when talking about emotional versus non emotional events, and a marginally significant difference in memory skills when talking about positive versus negative events. Finally, there was a significant interaction between gender and event on emotion words used, with boys using more emotion words than girls when talking about messy events and girls using more emotion words than boys when talking about angry events. Overall, when considering memory abilities in children, there are many factors at play.

Keywords: Reminiscing, culture, gender, emotion, Maori, Pakeha

## **The Relationship Between UN Global Compact Participation and Carbon Disclosure Project Performance, and Overall Corporate Environmental Performance**

Chris Johnson

As the effects of climate change become increasingly apparent, the world continues to search for ways to collectively combat this issue. Companies are being held responsible for their impact on the air, water, and land. Yet, the most effective way to control these companies' impacts is still unclear. A debate regarding this topic revolves around the efficacy of government-enforced environmental regulations vs. market-based initiatives. As governments discuss the possibilities and merits of a binding international climate agreement, this debate has more relevance and importance than ever.

I hope to contribute to this debate by examining two of the largest market-based initiatives in order to help to answer and address the following question: Can voluntary market-based programs effectively improve environmental performance? Based on that overarching question, I examine the following questions: Do companies that participate in more than one of these programs have stronger or weaker performance than those who do not participate in any of these programs or only one of them? Does the order of participation in these programs matter? Is there a significant spillover effect between the programs?

The two programs that I will review to answer these questions are the UN Global Compact (UNGC) and the Carbon Disclosure Project (CDP). These programs are two of the largest and most influential platforms for corporate environmental performance disclosure. Over 8,000 companies are a part of the UNGC and roughly 5,600 companies disclose to the CDP.

## **Uncovering Student Perceptions Green and Healthy Food Options and Davidson Dining Services**

Jonathan Lee

Through this project, our group attempted to uncover whether or not Davidson students feel that they have agency to make green or healthy food choices within the Davidson College food system. In order to do so, we sent out a survey to 100 random students in each year to gauge general understandings and impressions of Davidson Dining Services. In our survey, we primarily addressed the topics of cooking and eating habits. In addition, we also found 12 volunteers to participate in a photo-based focus group discussion. Participants were asked to take photos of food, places, and people involved within their "Davidson food ecosystem" and then discussed those experiences in a focus-group environment. Based on initial results, personal experiences, and student-held discussions on campus, we expect to find a general dissatisfaction with Davidson Dining Services in its provision of green and/or healthy food choices to students. We hope to share these findings with Davidson Dining Services so that the school can be better equipped to make knowledgeable decisions about where and what Davidson students eat on campus.

## **The Suppression of African American Votes in North Carolina: Can Fewer Early Voting Hours Decrease African American Turnout?**

Drew Kromer

This paper discusses the impact of electoral rules on African American turnout, with an emphasis on turnout in North Carolina. Did the rules passed, prior to the 2016 General Election, have a noticeable impact on the African American voters in the state and whether they decided to vote? I believe that it did. To prove it, I am testing the theory that, for the average voter, deciding to go vote is a cost-benefit analysis. In previous works, this has been referred to as the calculus of voting. This theory states that voters weigh the cost and benefits before they decide to vote, and any time policies are implemented that increase the cost of voting, we should see a decrease in turnout. I'm testing this hypothesis on voting files obtained from the NC Board of Elections. The data compares the turnout of African Americans and Whites, by county, between the 2012 and 2016 General Elections. I expect to find that the implementation of new rules, allowing counties to decrease the number of early voting locations, hours, and days of operation, increased the cost of voting for African-Americans and, therefore, decrease their turnout. Until the implications of reducing voting hours and implementing other election regulations are fully known, political parties will continue to claim justification for reducing our citizens' access to voting. While many people in academia would assert the impact as common knowledge, the debate continues and is more evenly split with supporters. Therefore, the importance of this research is establishing a direct link between implementation of election laws and decreased turnout so that that change can be demanded.

## **Invasive Pneumococcal Disease and Child Mortality**

Anne Elizabeth Mason

Introduction: Invasive pneumococcal disease is the leading cause of vaccine-preventable death in children younger than five throughout the world, and over 90% of the deaths occur in developing countries (CDC, 2012). It is important to understand the mechanisms behind this problem and how interventions can lower child mortality. Channels available include vaccination programs, as well as cultural/economic/social changes that would improve female status and child health. I draw on theories and empirical methods in the fields of health economics, chemistry and public health. The specific aims of my thesis are: (1) Analyze the relationship between invasive pneumococcal serotypes, pneumococcal vaccines and child mortality using organic synthesis and translational science methods. (2) Analyze the association between child mortality, invasive pneumococcal serotypes and female status in developing countries using the OLS regression method. The findings demonstrated the need for continued gendered policy formation, alongside vaccine program policy approaches. Socio-economic and cultural determinants of health may mitigate or exacerbate the presence invasive pneumococcal serotypes. The findings from the analyses in Part 1 and Part 2 demonstrate the importance for continued inter-disciplinary research to inform future policy formation to address child mortality.

## **A Descriptive Study of Obstetric Fistula Patients at the Hamlin Fistula Hospital Addis Ababa**

Sara Muche

When the Millennium Development Goals were first established in 1990, Ethiopia set a target of reducing maternal mortality by 75% by 2015. This target was not achieved by the target date and the Ethiopian government created a new Health Transformation Plan (HSTP) to address specific objectives that impact maternal mortality. Within these objectives, one that is given priority is a 1% reduction in the prevalence of obstetric fistula by the end of 2020. As a preventable condition, addressing fistula prevalence allows for the reduction in this condition as well as improvements in maternal health outcomes. While the Hamlin Fistula Organization is the main center of treatment and care for obstetric fistula in Ethiopia, to achieve the goal set by the HSTP of fistula reduction, preventative measures must be employed. Since obstetric fistula is seen as an issue of poverty, the social environment has a significant impact on obstetric fistula development and can potentially provide insight into elimination efforts. This study examines the relationship between the social environment and how it impacts when care is sought among patients at the Addis Ababa Hamlin Fistula Hospital. The data set was constructed through patient surveys collecting socio-demographic information. The most important finding was that age was the most predictive variable for length of incontinence but other factors explained by the social environment such as marital status, residence, and education level provide insight into why women delayed when they sought care. Therefore, understanding the distribution of current fistula patients based on these socio-demographic variables provides insight into the burden of obstetric fistula and suggests potential, evidence-based, intervention strategies for fistula elimination.

## **Cognitive and Emotional Evaluations of Congress**

Gloria Nlewedim

It should come as no surprise that the United States Government is currently being held in low regard by the American public. Today, Congress is disliked by most Americans. I aim to evaluate the public's evaluations of The United States Government, with a concentration on Congress and its interworking's. In their article, entitled, *The Media's Role in Public Negativity Toward Congress: Distinguishing Emotional Reactions and Cognitive Evaluations*, authors, John R. Hibbing and Elizabeth Theiss-Morse formulate an expansive theory about media and public opinion. The two theorize that "The nature of political news as presented by the mass media in the modern United States is such that it affects people's emotional reactions more than their cognitive evaluations of political actors and institutions (Hibbing and Theiss-Morse, 475, 1998). I plan to test this theory to see if it withstands the test of time, with a few modifications. I hypothesize that Americans who rely on electronic or social media for their news and people who consume a great deal of news from the modernized mass media will not be more likely to evaluate Congress negatively but will be more likely to have a negative emotional reaction to Congress.

## **Racial Stereotyping in Media that Portrays Marginalized Groups as Criminals**

Ryan Samuels, Ryan Leak, and Scott Jaris

Racial stereotyping is a system of beliefs about typical characteristics of members of a given racial group, their status, and society and cultural norms. Stereotyping arises out of the need to generalize in order to make sense out of a very complicated environment. It allows people to easily categorize unfamiliar ideas or realizations into comfortable spaces already defined by their experiences. We analyzed how marginalized groups are represented in three different types of media: movies / TV shows, protests / riots, and sports. Through our analysis, we decided to narrow in on these three media avenues because we believe each category builds upon teaching and developing racial stereotypes in society. In turn, we examined how the Social Cognitive theory and priming theory are found within these media's teachings of roles to society. We used these theories to explain why there are contrasting ways that the media portrays racial groups, and therefore why those representations flow into societal portrayals. For example, media illustrations about protest and riots amongst Whites and Blacks is problematic, and we believe that has much to do with how blacks and whites are portrayed in movies, TV shows, and sports. In each media venue, we found Blacks are commonly referenced as "thugs" who riot and commit acts of violence; while Whites are often portrayed as successful individuals and given excuses for their flaws. We hope to portray this misrepresentation of blacks in the media in order for society to challenge media representations of marginalized groups.

## **Ethnocentrism on Immigration Attitudes**

Syed Sammy

Ethnocentrism is the act of assessing and comparing of one's own culture, beliefs, and practices with those of others. Essentially, it is the psychological aspect of creating in-groups and out-groups and without always realizing it, people tend to favor their in-group over the out-group(s). In America, the diverse society it has is caused by immigration. What it means to be "American" is debatable but historically it has meant being a Caucasian with Protestant Christian beliefs. As populations of various religious groups, ethnicities, races, and other orientations have grown, there have been periods of backlash against them. Acts and policies of nativism, racism and xenophobia have resulted in the humiliation, discrimination, and violence towards apparent out-groups. This research will outline how ethnocentrism is the underlying principle of negative perceptions and what the repercussions of those perceptions are in relation to Muslims (and those perceived to be Muslim) and the issue of immigration as it has evolved in America.

## **A Content Analysis of the Crisis Communication Strategies by Chipotle Mexican Grill**

Kayla Seymour

Towards the end of 2015, Chipotle Mexican Grill faced a series of E. coli outbreaks that sickened over two hundred customers across the United States. This research investigates what frames were used, how corporate social responsibility was communicated during the outbreaks and how brand loyalty changed. Using the Image Restoration Theory, this study analyzes Chipotle's crisis communication in three ways: a framing analysis of press releases, content analysis and collection of social media posts. The findings revealed that six frames were discovered but the most frequent frames were business development, marketing initiative, or official report frames. Additionally, Chipotle communicated their CSR programs in gaming applications, giveaway campaigns and concerts after the outbreaks. Lastly, majority of the comments on social media sites were cognitive suggesting that consumers expected more explanations why the outbreaks occurred from Chipotle. As far as implications, the Image Restoration Theory encourages public relation individuals to examine their audience, decide what is threatening the reputation and determine how the public needs to be persuaded to restore the positive image. Limitations and directions for future research are also addressed.

## **The Effects of Ovarian Hormones on Heroin Self-Administration**

Michael Zhang, Andrea M. Robinson and Dr. Mark Smith

Clinical and preclinical studies have consistently reported sex and gender differences in drug use patterns, and some of these differences have been attributed to gonadal hormones. Extensive preclinical research has demonstrated that cocaine use is facilitated by estradiol whereas progesterone attenuates this increase. However, the effects of these ovarian hormones on heroin use are poorly understood. Therefore, in this project, we examined the effects of ovarian hormones on heroin self-administration in ovariectomized (OVX) rats (Experiment 1), and intact rats (Experiment 2). In Experiment 1, rats underwent OVX and catheterization surgery, and were trained to self-administer heroin during daily test sessions. Each rat was randomly assigned to one of four treatment groups: progesterone, estradiol, vehicle, and progesterone + estradiol, and received their treatment 30 min prior to each test session. In Experiment 2, the estrous cycle of female rats was tracked. Following catheterization surgery lever-press training, rats began daily test sessions self-administering heroin. Whenever a rat was observed to be in proestrus, they received either raloxifene, an estrogen receptor antagonist, or vehicle. In Experiment 1, estradiol significantly decreased heroin self-administration compared to progesterone treatment. In Experiment 2, heroin self-administration significantly decreased during proestrus, and raloxifene significantly attenuated this effect. Together, these data suggest that estradiol decreases heroin self-administration and may represent a treatment intervention for women who abuse heroin.

## **Effects of a Single Meditation on State Mindfulness and Working Memory**

Henry Siebentritt

The present study tests the hypothesis that a single 20-minute session of mindfulness practice is enough to induce a mindful state, and improve performance on a working memory task. 34 undergraduate students at Davidson College were recruited and assigned to either a meditation or control group. Participants completed a self-report mindfulness scale in addition to a working memory Stroop task. Meditators did not demonstrate significantly reduced Stroop interference or better conflict adaptation than controls. Meditators did increase significantly in state mindfulness from before to after intervention when compared to the control group, who did not. Though extant literature demonstrates positive outcomes for attention and working memory after both long- and short-term meditative interventions, it is likely that a single session of meditation is not sufficient to affect these cognitive networks.

## **Racial Perspectives in the Local Food Movement: An Analysis of Food Justice Discourse in Cookbooks**

Malaika Simmons

This paper explores the relationship between cookbook authors and their perspectives on food justice, race relations and the local food movement. The guiding questions of my research were: What narratives are left out of the mainstream local food movement? How is food justice discourse used in cookbooks? How does race impact cookbook organization and purpose? In what ways does the black food movement seek to dismantle the exclusionary aspects of the local food movement? Through in depth discourse analysis of four different cookbooks, I concluded that African-American cookbook authors utilize cookbooks to disperse historical and cultural practices and recipes as well as to promote sustainable and healthy cooking and eating habits in African-American communities.

## **Assessing Food Waste in Eating Houses**

Davis Temple, Gregory Hunt and Charley Oner

Eating houses are composed of a large percentage of women on campus feeding approximately 750 women. In doing so, these organizations generate a significant amount of food waste that is shuttled directly to landfills. The goal of our project is to assess food waste generated in eating houses by determining waste generated at three separate times: chef produced food waste, leftover food waste, and food waste generated by over serving. In determining where and how much is food waste is generated in eating houses we hope to find places for improvement and specific instances where the mobilization of resources can significantly reduce food waste

## **The Conditional Cash Transfer: A Policy Model for the World?**

Patrick Spauster

For my senior Capstone Project, I explore the development of the conditional cash transfer poverty relief policy in Latin America. Conditional cash transfers (CCTs) give cash to households on the condition that they meet certain education and health goals. In Mexico and Brazil, CCTs emphasize school attendance and health clinic visits. Despite both bearing the name CCT, Mexico and Brazil's programs differ greatly in scope, implementation, and objectives. Using a comparative case study, I try to understand why policy might develop differently or converge. How do differences in culture, political institutions, and political attitudes toward poverty relief influence the creation public programs? What can we learn about political institutions and governments from the implementation of this public policy? Furthermore, I examine how Mexico evaluates its program over time. How do policymakers evaluate poverty relief policies and how effective are they at doing so? Do programs have disproportionate impacts on beneficiaries depending on where the household is located? I compare two CCT programs and recreate program impact evaluations in Mexico to better understand the policy process and how to make and evaluate good policy.

## **The Impacts of Economic Perceptions on Immigration in the European Union**

Graham Steele

Building upon prior research into the causes of support and opposition to immigration into European Union states, this project examines the impact a respondent's perception of the current economic climate has on his or her level of support for immigration. There are several existing studies focused on the issue of immigration, both in regards to the European Union and globally, that posit economic factors as the potential driving force behind a person's views on the issue. This project, however, posits that levels of support and opposition for immigration result not from concrete economic factors, but rather from personal perceptions regarding the state of the economy and one's own financial security. If such a relationship is true, a positive correlation should exist between respondents with a pessimistic view on the economy and their level of opposition to immigration into the European Union by foreign nationals.

**Exploring Topics in Manager Strength, Weakness, and Challenge with Text Mining**  
Yizhen Egin Zhu

Leader effectiveness is crucial to organization well being. However, past research has mainly depended on quantitative ratings to examine leadership competencies and their relationships with performance. The purpose of this study was to understand the common strength, weakness, and challenge of first-level managers by applying topic model, a text mining technique, on to text data. Written comments on strength and weakness from the participants, their peers, their direct reports, and their boss, and comments on challenge from the participants were analyzed with Latent Dirichlet Allocation (LDA). Eight topics were identified for each domain (strength/weakness/challenge). Post-analyses assessing the topics' ability to predict performance and demographic differences in topic prevalence were discussed.

**Reality Check: Debunking the Perception  
of Post-Racialism in the United States Today**  
Morgan Spivey

The 44th President of the United States appeared to be the cure to the nation's racial stratification, and his terms of office did mark racial progress; however, it neglected to erase all of the historical underpinnings that preceded his monumental leadership. I aim to argue that the prevalence of racism still exists despite the colorblind rhetoric and "dog whistle politics" of the present time. I will assess the key tenets of the post-racial society that many politicians aim to enact as well as the various forms of racism that exist. Not only will my research illustrate the present dynamics of racial discrimination, but it will also critically analyze the forms of racism that were present during the Jim Crow Era and beyond. Through this research, I hope to demystify the experiences of marginalized communities that are subjected to the negativity associated with racism, and provide tangible examples for policy analysts and makers to execute change.

## Theatre

### **Befriending Bertha by Kerry Muir**

Directed by Andrew Lott '18 and Designed by Gale Linares '18

Three tweens – a boy who can't stop talking, a girl who can barely speak, and a girl who claims to drive her own Cadillac – are drawn into an unlikely friendship. On the fringes of a playground, they weave a web of fantasy and drama in which they seek refuge from the problems they face in reality.

### **A Separate Peace by Tom Stoppard**

Directed by Blaire Ebert '17 and Designed by Eleanor Seaman '17

John Brown arrives at a country nursing home with a case full of money expecting hotel-style service. He is not apparently ill in any way, and everyone working at the home speculates as to his identity. A quest for understanding ensues. Who is this man and why is he here?